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The effects of an asthma education program on selected health behaviors of school-age children who have recently experienced an acute asthma episode

Talabere, Laurel Ratcliff, Ph.D.

The Ohio State University, 1990

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THE EFFECTS OF AN ASTHMA EDUCATION PROGRAM
ON SELECTED HEALTH BEHAVIORS OF SCHOOL-AGE CHILDREN
WHO HAVE RECENTLY EXPERIENCED AN ACUTE ASTHMA EPISODE

DISSERTATION
Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University
By
Laurel Ratcliff Talabere, M.S., M.A., RN,C.

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ACKNOWLEDGEMENTS

There are many who facilitated this research, and I would like to express my deepest appreciation to each one of them. First, my thanks to the children and their parents who enthusiastically shared their time and themselves. Without their willing participation, this study would not have been possible.

Second, a number of individuals from Columbus Children's Hospital provided expertise and encouragement. Their belief in the importance of helping families of children with asthma enhance their ability to self-manage was a source of inspiration for me. In particular I would like to thank the following persons:

Angie Alison, RN, Head Nurse Emergency Department
Charlene Catt, M.S., RN, Head Nurse, 5 Tower North, the unit initiating the asthma education program and one of two inpatient units involved in the study
Tina Christ, RN, asthma education program instructor
William Cotton, M.D. Emergency Department Physician
Joy Edwards-Beckett, Ph.D., D.N.S., RN, Director of Nursing Research
Susie Fazekis, RN, asthma education program instructor
Bonnie Glandon, B.S.N., RN, course outline developer for the asthma education program used in this study and program instructor
Judy Guenther, RN, Patient Education
John Haynes, Ph.D., Statistician, Wexner Pediatric Research Center
Karen Hiser, Ph.D., Director of Education
Dorothy Jablonski, M.S., RN, Medical Nursing Supervisor
In addition to the support of these agency personnel, this research was funded in part by the Columbus Children’s Hospital Clinical Study Center. I am grateful for this grant for doctoral study.

Third, I wish to thank Moon S. Chen Jr., my advisor and the chair of my dissertation committee, who has always inspired me to reach "even higher." His insightful guidance helped me move forward when the path was unclear. I am very grateful to Mary K. Beyrer and Edna M. Menke, dissertation committee members, for their advice and critique. Michelle Walsh helped to establish content validity for two of the instruments through her expert review.

Fourth, I would like to acknowledge the invaluable assistance of colleagues and friends at Capital University. The Dean, Faculty, and Students of the School of Nursing helped me keep my goal in focus. Dennis Kapinga and Robert Mertens
me keep my goal in focus. Dennis Kapinga and Robert Mertens from the Mathematics and Computer Science Department and the Staff of the Computing Center provided computer and statistical consultation. Students Ken McGuire and Kurt Thaxton contributed their computer expertise and moral support. Finally, I wish to express my deepest appreciation to my family for their special, ongoing encouragement throughout this journey. In particular I would like to thank my husband, Herb, for his unflagging support and balanced perspective; our children, Mark, Andrew, and Deborah for their understanding and patience; our grandson, Brian, for his bright smile and warm hugs; and my Dad, Glenn Ratcliff, who never doubted that this accomplishment would be realized.

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THE EFFECTS OF AN ASTHMA EDUCATION PROGRAM ON SELECTED HEALTH BEHAVIORS OF SCHOOL-AGE CHILDREN WHO HAVE RECENTLY EXPERIENCED AN ACUTE ASTHMA EPISODE

By
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The Ohio State University, 1990
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The purpose of this study was to evaluate the effects of an asthma education program on selected health behaviors of school-age children who recently experienced an acute asthma episode. Asthma, the leading cause of school absenteeism and a major source of disability in children, has increased in this age group in recent years. Furthermore, children in lower socioeconomic groups may be at increased risk for hospitalization due to irregular health care.

A sample of 50 school-age children and their children, obtained from admission and emergency room rosters of a Children's Hospital, was randomly assigned to an experimental group to participate in an asthma education program or to a control group. The education consisted of two 1-hour teaching sessions with a format individualized to the needs of the child and parent.
Hypotheses were tested to determine the effects of the program on seven variables: a) hospitalizations, b) emergency health care visits, c) school absences, d) altered breathing episodes, e) child’s knowledge of asthma, f) child’s attitude about asthma, and g) parent’s perception of the child’s asthma. Parents in both the experimental and control groups kept a 3-month diary to monitor the child’s medication use, wheezing episodes, school absences, emergency care, and hospitalizations. The child’s knowledge and attitudes about asthma and the parent’s perceptions of the child’s asthma were measured by paper-and-pencil instruments upon entry into the study and after completion of the 3-month diary. While keeping the diary, each parent received a reminder phone call every two weeks. Upon completion of the study, a specially designed T-shirt was given to each child, and each child and parent in the control group received a packet of teaching materials.

The findings showed a significant decrease (p = .036) in emergency health care visits and a significant increase (p = .031) in the child’s knowledge of asthma. The other variables changed in a positive direction but were not statistically significant. These findings were congruent with previous research in this area. The significance of this study lies in providing evidence that a targeted asthma education program may reduce the frequency of emergency care and increase the school-age child’s knowledge of asthma.
LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A Summary of Asthma Education Programs</td>
<td>63-64</td>
</tr>
<tr>
<td>2.</td>
<td>Distribution of Demographic Characteristics of the Children and their Relationship to the Study Groups</td>
<td>109</td>
</tr>
<tr>
<td>3.</td>
<td>Distribution of Factors Affecting Prior Knowledge and Attitudes about Asthma and their Relationship to the Study Groups</td>
<td>113</td>
</tr>
<tr>
<td>4.</td>
<td>Distribution of Factors Affecting Severity and their Relationship to the Study Groups</td>
<td>115</td>
</tr>
<tr>
<td>5.</td>
<td>Distribution of Factors that Trigger Asthma and their Relationship to the Study Groups</td>
<td>121</td>
</tr>
<tr>
<td>6.</td>
<td>Descriptive Data and Analyses of Variance and Covariance for Hospitalizations</td>
<td>124</td>
</tr>
<tr>
<td>7.</td>
<td>Descriptive Data and Analyses of Variance and Covariance for Emergency Health Care Visits</td>
<td>130</td>
</tr>
<tr>
<td>8.</td>
<td>Descriptive Data and Analyses of Variance and Covariance for the Actual Number of School Absences</td>
<td>136</td>
</tr>
<tr>
<td>9.</td>
<td>Descriptive Data and Analysis of Variance for the Actual Number of Altered Breathing Episodes</td>
<td>140</td>
</tr>
<tr>
<td>10.</td>
<td>Descriptive Data and Analyses of Variance and Covariance for the Asthma Knowledge Questionnaire (AKQ)</td>
<td>144</td>
</tr>
<tr>
<td>11.</td>
<td>Descriptive Data and Analyses of Variance and Covariance for the Asthma Attitude Survey (AAS)</td>
<td>148</td>
</tr>
<tr>
<td>12.</td>
<td>Descriptive Data and Analyses of Variance and Covariance for the Survey of Asthma Problems and Severity (SAPS)</td>
<td>152</td>
</tr>
</tbody>
</table>
13. Measures of Association to Show the Relationship Between Eight Influencing Factors and Seven Dependent Variables

14. Descriptive Data for the Instructor and Location of the Asthma Education Program and Effects on the Seven Dependent Variables

15. A Summary of the Dependent Variables and their Significance in this Study
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Randomized block, pretest-posttest control study design</td>
<td>75</td>
</tr>
<tr>
<td>2. Demographic characteristics of the experimental and control groups</td>
<td>110</td>
</tr>
<tr>
<td>3. A comparison of hospitalizations and emergency health care visits between the experimental and control groups for the two prestudy periods and the study period</td>
<td>126</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ii</td>
</tr>
<tr>
<td>VITA</td>
<td>v</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
</tbody>
</table>

## CHAPTER

### I. INTRODUCTION

- Purpose of the Study                             1
- Rationale for the Study                          1
- Hypotheses                                      2
- Definition of Terms                              3
- Delimitations                                   4
- Limitations                                     6
- Assumptions                                     8
- Summary                                         10

### II. REVIEW OF RELATED LITERATURE

- Epidemiology                                    11
  - Prevalence                                    12
  - Morbidity and Mortality                       14
  - The Changing Profile of Asthma                15
- Increased Use of Health Care Services           17
  - Emergency Room Use                            17
  - Hospitalization                               19
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Instruments for Collecting Data</td>
<td>81</td>
</tr>
<tr>
<td>Nursing Assessment of the Child with Asthma and the Family</td>
<td>81</td>
</tr>
<tr>
<td>Asthma Knowledge Questionnaire (AKQ)</td>
<td>82</td>
</tr>
<tr>
<td>Asthma Attitude Survey (AAS)</td>
<td>83</td>
</tr>
<tr>
<td>Survey of Asthma Problems and Severity (SAPS)</td>
<td>84</td>
</tr>
<tr>
<td>Parent Diary</td>
<td>86</td>
</tr>
<tr>
<td>Telephone Log</td>
<td>87</td>
</tr>
<tr>
<td>Asthma Severity Scoring System</td>
<td>88</td>
</tr>
<tr>
<td>The Asthma Education Program (AEP)</td>
<td>90</td>
</tr>
<tr>
<td>The Behavioral Objectives</td>
<td>90</td>
</tr>
<tr>
<td>The Content</td>
<td>91</td>
</tr>
<tr>
<td>The Methods</td>
<td>94</td>
</tr>
<tr>
<td>The Time Frame</td>
<td>96</td>
</tr>
<tr>
<td>Data Collection Period for the Subjects</td>
<td>97</td>
</tr>
<tr>
<td>Pre- and Post-treatment Comparison</td>
<td>97</td>
</tr>
<tr>
<td>The Procedures</td>
<td>99</td>
</tr>
<tr>
<td>Informed Consent</td>
<td>99</td>
</tr>
<tr>
<td>Confidentiality</td>
<td>100</td>
</tr>
<tr>
<td>Intervention</td>
<td>100</td>
</tr>
<tr>
<td>Data Collection</td>
<td>101</td>
</tr>
<tr>
<td>Rewards</td>
<td>102</td>
</tr>
<tr>
<td>Statistical Analysis</td>
<td>102</td>
</tr>
<tr>
<td>Levels of Measurement</td>
<td>103</td>
</tr>
<tr>
<td>Statistical Tests</td>
<td>104</td>
</tr>
<tr>
<td>Agency Support</td>
<td>105</td>
</tr>
<tr>
<td>Summary</td>
<td>106</td>
</tr>
<tr>
<td>IV. RESULTS OF THE STUDY</td>
<td>107</td>
</tr>
<tr>
<td>The Sample</td>
<td>108</td>
</tr>
<tr>
<td>Demographic Variables</td>
<td>108</td>
</tr>
</tbody>
</table>
Factors Affecting the Dependent Variables...... 111

Grade in School............................. 111
Asthma Camp and Support Group Participation................. 112
Age of Onset................................ 114
Primary Health Care Provider.................... 116
First Action in an Asthma Episode............. 117
Passive Smoking............................. 119
Pets......................................... 119
Discussion of the Influencing Factors.... 120

The Null Hypotheses............................. 122

Null Hypothesis 1: Number of Hospitalizations............. 122
Null Hypothesis 2: Number of Emergency Health Care Visits........ 128
Null Hypothesis 3: Number of School Absences............. 135
Null Hypothesis 4: Number of Altered Breathing Episodes........ 139
Null Hypothesis 5: The Asthma Knowledge Questionnaire (AKQ)........ 142
Null Hypothesis 6: The Asthma Attitude Survey (AAS)........... 147
Null Hypothesis 7: Survey of Asthma Perception and Severity (SAPS)...... 150

Relationship Between Factors and Variables.... 154
Effects of Instructor and Location on the Dependent Variables........ 156
Summary............................................. 159

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS........ 162

Summary............................................. 162
Conclusions........................................... 165
Recommendations for Further Research........ 168
APPENDICES .................................................... 172

A. Randomized Block Technique ........................... 173

B. Nursing Assessment of the Child with Asthma and the Family .......................... 174

C. Asthma Knowledge Questionnaire ....................... 177

D. Asthma Attitude Survey ................................ 179

E. Survey of Asthma Problems and Severity ............. 181

F. Parent Diary ........................................... 184

G. Telephone Log .......................................... 186

H. Asthma Severity Scoring System ...................... 188

I. Columbus Children’s Hospital Patient and Family Teaching Record on Asthma ................. 189

J. Asthma Course Outline for Nurses .................... 193

K. Contents of Asthma Teaching Materials Packet ...... 202

L. Informed Consent Document ............................ 203

M. Letter of Support and Signature of Endorsement..... 207

N. Institutional Approvals to Conduct the Study ...... 211

O. Continuing Education Program for Nurses ............ 214

LIST OF REFERENCES ............................................ 218
Asthma is the leading cause of school absenteeism and a significant cause of hospital admissions and emergency room use for children (Berman, 1989; Clark, 1986, Evans, 1987; Paul & Fafoglia, 1988). The prevalence and morbidity of asthma has increased in children 6 to 11 years of age in the United States (Evans, 1987; NHLBI Data Fact Sheet, 1989). However, this chronic lung disease is much more than descriptive statistics for the child with asthma and the child’s parents. It is an ongoing, recurring threat to breathing that challenges the family to manage its complexities and to minimize its disruptions of daily living at home and at school. The primary focus of this study was to evaluate an asthma education program designed to enhance the family’s ability to self-manage asthma effectively.

Purpose of the Study

The purpose of this study was to determine whether or not a planned asthma education program for school-age children and their parents could (a) reduce the use of health care
services, (b) decrease school absences and episodes of altered breathing, (c) increase the child's knowledge about asthma, and (d) change the child's and parent's perception of the child's asthma. This study was conceived in response to an inpatient audit by the nursing staff conducted in 1987 at Columbus Children's Hospital (CCH) which recommended the development of a formalized asthma teaching program, based on a deficit in parent knowledge about asthma medications (Quality assurance document, undated).

Rationale for the Study

A number of studies has shown that asthma education programs can reduce hospitalizations, emergency health care visits, and school absences (Blessing-Moore, 1985; Blumenthal, 1972; Clark, 1986; Creer, 1981; Fireman, 1981; Hindi-Alexander, 1984; Kohen, 1985; Krutzsch, 1987; McNabb, 1985; Lewis, 1984; Rachelefsky, 1985; Rakos, 1985; Robinson, 1985; Rubin, 1986; Selner, 1979; Staudenmeyer, 1981). It is less clear how these programs change the children's knowledge and perceptions regarding their asthma. Furthermore, many of the programs did not address influencing factors related to severity, previous participation in asthma programs, passive smoking, and pets. Also, there were wide differences in the size, settings, and methodologies of these studies (Clark, 1986; Fireman, 1981; Krutzsch, 1987; Lewis, 1984; Wilson-Pessano, 1985).
None of the described programs were directly applicable to the needs identified at CCH. Therefore, the inpatient nursing staff and the investigator collaborated to design an asthma education program (AEP), modeled in some respects after CCH's successful Diabetes Education Program. The AEP was developed specifically for 8 to 12-year old children with asthma who were served by CCH.

Hypotheses

This study was designed to test the following null hypotheses at the 0.05 level of significance between children and parents who participated in the AEP and those who did not participate.

1. There was no significant difference between the two groups of children at the end of 12 weeks in the number of hospital admissions as identified in the Parent Diary and the child's medical record.

2. There was no significant difference between the two groups of children at the end of 12 weeks in the number of emergency health care visits as identified in the Parent Diary and the child's medical record.

3. There was no significant difference between the two groups of children at the end of 12 weeks in the number of school days missed as identified in the Parent Diary.
4. There was no significant difference between the two groups of children at the end of 12 weeks in the number of episodes of altered breathing as identified in the Parent Diary.

5. There was no significant difference between the two groups of children in their knowledge about asthma as measured by the Asthma Knowledge Questionnaire at the end of 12 weeks.

6. There was no significant difference between the two groups of children in their perceptions related to assuming responsibility for self health care as determined by the Asthma Attitude Survey at the end of 12 weeks.

7. There was no significant difference between the two groups of parents in their rating of selected asthma-related behaviors of their children as measured by the Survey of Asthma Problems and Severity at the end of 12 weeks.

Definition of Terms

The following definitions were accepted for this study:

Acute Asthma Episode: an acute exacerbation of asthma. This term is preferred to "asthma attack," which has frightening connotations for children.
**Altered Breathing Episode**: any change in breathing pattern including wheezing, coughing, rapid breathing, shortness of breath, gasping for air, and difficult breathing.

**Asthma**: a disease characterized by increased responsiveness of the airways to various stimuli which results in breathing difficulty because of generalized narrowing of the airways and slowing of forced expiration, both of which change in severity either spontaneously or in response to treatment (American Thoracic Society, 1962; American College of Chest Physicians and American Thoracic Society, 1975).

In this study, the subjects had one of the following medical diagnoses from the International Classification of Diseases (ICD): (a) 493.00 extrinsic asthma, (b) 493.10 intrinsic asthma, (c) 493.90 asthma and acute asthmatic bronchitis, (d) 493.91 status asthmaticus, (e) 519.10 other diseases of the trachea and bronchus including reactive airway disease, and (f) 786.09 wheezing.

**Asthma Education Program (AEP)**: a planned teaching approach for 8- to 12-year old children with asthma and their parents that focused on the self-management of this chronic health problem. The AEP was specifically designed by the investigator and the nursing staff at CCH
for this study.

Asthma Severity: the seriousness of asthma as measured by the number of (a) hospitalizations, (b) emergency health care visits, (c) school absences, (d) altered breathing episodes and by the type and frequency of medications that are used to control the asthma.

Emergency Health Care Visit: an unscheduled visit made for an acute asthma episode to an emergency room, urgent care center, or a physician.

Parent: primary adult caretaker living with the child.

Self-management: "an educational process whereby persons with various health problems learn to work with their health care providers to help themselves, thereby enhancing the therapeutic intervention" (Hindi-Alexander, 1985).

Delimitations

This study was delimited to children 8 to 12 years of age with asthma who either had been hospitalized or seen in the emergency room at Columbus Children's Hospital just prior to their entry into this study. The parent(s) of these children were included also. The data for this study were collected within the particular time frame of November 13, 1988 to April 13, 1990.
Limitations

This study was limited by the following factors:

1. The subjects were volunteers who consented to participate in this study between November 13, 1988 and April 13, 1990.

2. When a subject entered the study, two questionnaires were completed by the child and one by the parent, either in the hospital or at home. At the end of the 12 weeks, the same questionnaires were mailed to the subject’s home and were completed without the investigator present. The differences in testing environments might have affected the group differences in the posttest scores.

3. The parents in both groups recorded specific information each day for 12 weeks in the Parent Diary. This study was limited by any incompleteness or inaccuracies in this self-reported data.

4. The heightened awareness created by keeping the Parent Diary could have influenced the posttest scores on any of the three questionnaires for both groups, and thus limited this study.

5. A cover letter mailed with the posttest questionnaires reminded parents that the two questionnaires for the child were to be completed without parental or other assistance. This study was limited by the degree of adherence to this request.
6. The three to four months of maturation in the children that occurred between the pretests and posttests could have contributed to increases in questionnaire posttest scores in both groups.

7. Subject involvement in previous asthma education efforts such as asthma camps and family asthma education programs could have limited the amount of actual change in the experimental group.

8. The sample size of 50 may have been inadequate to show changes that were statistically significant.

9. Twelve out of 62 subjects did not complete the study, leaving a sample of 50 children and their parents. Most parents stated family crises as the reason for not finishing the study. The attrition of these subjects could have limited the representativeness of the findings of this study.

Assumptions
The following assumptions were made in this study:

1. Although subjects were not randomly selected for this study, they were randomly assigned to either the experimental or control groups, using a randomized block design. It is assumed that the experimental and control groups were similar in gender, race, and age as a result of this design.
2. An Asthma Knowledge Questionnaire (AKQ) was constructed specifically for this study. The overall test-retest reliability in a pilot study was 0.81 with a range on individual questions of 0.38 to 1.0. The instrument was revised accordingly. It is assumed that the AKQ was a reliable measure of asthma knowledge for this study.

3. The children and parents in the experimental group were taught by different staff nurses as well as the investigator. The staff nurses were trained by the investigator, and all instructors used the same detailed content outline. It was assumed that the differences in teaching styles and experiences were not significant.

4. The children and parents in the experimental group were taught in different locations, some at the hospital and some at home. It was assumed that the differences in locations did not affect the teaching of the program or the learning by the child and parent significantly.

5. Two of the questionnaires, the Asthma Attitude Survey (AAS) and the Survey of Asthma Problems and Severity (SAPS), required subjective answers based on the respondent's perception of particular situations. It was assumed that the answers given were accurate and honest representations of the respondent’s perceptions.
Summary

Asthma is a chronic respiratory disease characterized by acute episodes. Appropriate, early intervention can affect the outcome. The parent’s and child’s perception of these episodes and their knowledge of how to manage them may influence the number of school absences and the frequency of emergency health care visits and hospitalizations. The purpose of this study was to determine the effects of an asthma education program designed specifically for school-age children with asthma served by CCH. This chapter discussed the rationale for this study, formulated the hypotheses, defined the terms, and presented the delimitations, limitations, and assumptions.
Asthma is derived from the Greek word *asthma*, which means "to pant." This is an apt description of the breathing experience of those who have this chronic health problem, which is the leading cause of school absenteeism and disability in children (Clark et al., 1986; Nelson et al., 1989; Paul & Fafoglia, 1988). The review in this chapter is presented in six major sections: a) epidemiology, b) increased health care services, c) the nature of asthma, d) current management, e) the impact of asthma on children and families, and f) asthma education programs. The review of the epidemiology of asthma focuses on patterns of prevalence, morbidity, and mortality. Health care utilization is discussed in terms of emergency room use and hospitalizations. The nature of asthma is presented through an overview of the definition, onset, risk factors, etiology, and triggers, all of which are still debated even though asthma has been recognized for centuries. Both the pharmacological and the nonpharmacological aspects of current management are discussed. The chapter continues with a summary of the impact of asthma on the child and family. An indepth
analysis of asthma education programs over the past two decades and a discussion of the common elements of these programs and the self-management literature conclude Chapter II.

Epidemiology

The prevalence, morbidity, and mortality of asthma have been increasing in the United States as well as other countries since the early 1970's (U.S. Department of HHS, 1990). This not only adds to the burden of health care services, but it also impacts the daily lives of millions of children and families.

Prevalence

The reported prevalence of asthma is increasing in the United States. During the past 10 years, "the percentage of the U.S. population with asthma increased by one-third" (Lenfant & Hurd, 1990) According the National Heart, Lung, and Blood Institute (NHLBI), there was an increase in asthma prevalence from 3 percent to 4 percent of the population during the 9 year period from 1979 to 1987 (NHLBI Data Fact Sheet, 1989). However, the statistics vary from one source to another; they are "limited by the accuracy of self-perception and self-reporting" and confounded by the difficulties in diagnosing asthma (Buist, 1989).
The classification of asthma has complicated further the accuracy and comparability of data. The International Classification of Disease (ICD) (1980) lists separate codes for seven medical conditions that overlap with each other and may or may not be considered the same as asthma, depending on the perspective of the health professional making the diagnosis. These conditions are: asthma, chronic asthmatic bronchitis, extrinsic asthma, intrinsic asthma, reactive airway disease, status asthmaticus, and wheezing. Unless specifically indicated, the data sources discussed in this chapter did not indicate which of these seven conditions were included or excluded for any given statistic.

The prevalence of asthma is proportionately greater among children than adults. According to NHLBI, about 10 million Americans have asthma. Of these, 3 million, or 30 percent, are children under the age of 18 years. In 1987 the prevalence of asthma in persons under 18 years of age was 5.2 percent. In the other age groups of 18-44 years, 45-64 years, and 65 years and older, the prevalence was less than 4 percent (NHLBI Data Fact Sheet, 1989). Two national health surveys also provided data (cited in Gergen, 1988): (a) the Health Examination Surveys (HES II, 1963-1965) and (HES III, 1966-1969), and (b) the National Health and Nutrition Examination Surveys (N-HANES I, 1971-1974) and (N-HANES II, 1976-1980). According to these sources, the prevalence of asthma for children 6 to 17 years
ranged from 4.8 to 7.6 percent. The surveys also showed a higher prevalence in the same age group for boys, 5.6 to 9.0 percent, and for Blacks, 5.1 to 10.1 percent (Gergen et al., 1988). According to the American Lung Association, the estimated prevalence of pediatric asthma in children 15 years and younger in 1987 was 1.3 percent for both the state of Ohio and Franklin County (Estimated Prevalence, 1989). It is not known why this figure varied considerably from national data.

Morbidity and Mortality

Asthma morbidity is increasing in children 6 to 11 years of age. Based on data from the National Health and Nutrition Examination Surveys (N-HANES) and the National Health Interview Survey (NHIS), the prevalence has increased by 50 percent in children aged 6 to 11 years during the 16-year period from 1964-1980 (Evans et al., 1987) and as much as 54 percent in children under 18 years during the 15-year period from 1970-1985 (Statistical Compendium, 1987).

Although mortality from asthma in the United States is one of the lowest in the world, it has risen sharply since 1977 with no conclusive explanation (Buist, 1989). From 1980 to 1987, the asthma death rate increased 31 percent (U.S. Department of HHS, 1990) When adjusted for age, however, the lowest annual death rates occurred in the 5-14 age group (Robin, 1988).
In 1979 the death rate for asthma in all age groups was twice as great in Blacks as in whites, and by 1987 the disparity had increased so that the asthma death rate was almost three times greater among Blacks than whites (Lenfant & Hurd, 1990; NHLBI Data Fact Sheet, 1989). Yet, the ambulatory-care visits for asthma were higher for whites (28.0 per 1000 population) than for Blacks (24.3 per 1000 population) (U.S. Department of HHS, 1990). In a study of 140 asthmatic children by Mascia and colleagues (1989), most children who died were 12 to 16 years old, Black or Hispanic, and males who were aggressive, depressed and/or anxious. Mellon (1989) gives a rationale for asthma education by stating, "The fact that most of the deaths occur out of the hospital reflects a crisis-related approach to asthma therapy and a parental environment unprepared to deal with the acute onset of wheezing."

The Changing Profile of Asthma

Several reasons have been suggested for these increases in prevalence, morbidity, and mortality. First, in 1979 the ICD revisions placed "asthmatic bronchitis" as a cause of death under "asthma" rather than "bronchitis." This produced an immediate increase in asthma mortality which was expected. However, the mortality rate from asthma has not leveled off, as was expected, but has continued to rise (Buist, 1989), suggesting that the change in ICD codes does not explain the
increasing mortality from asthma.

A second reason for the increasing statistics is that asthma may be diagnosed more frequently and accurately because there are more pulmonary specialists and greater use of pulmonary function tests. Third, asthma may be undertreated in the emergency room, leading to unnecessary hospitalizations. Fourth, there may be increased exposure to infections, air pollution, and other triggers. Fifth, it is possible that certain combinations of drugs used in treatment may be toxic. Sixth, asthma may be becoming more virulent. This possibility has been considered, although there does not seem to be any evidence to support such a position (Buist, 1988; Buist, 1989; Canny et al., 1989).

Despite these inconclusive reasons for its increase, asthma continues to be a serious and growing health problem. Prevalence, morbidity, and mortality are rising in the United States (Woolcock & Peat, 1989), and it appears that mortality is increasing faster than prevalence. Thus, the severity of asthma may also be increasing.

One of the goals in The Year 2000 Health Objectives for the Nation is to reduce asthma morbidity (U.S. Department of HHS, 1990). However, the increasing statistics suggest four major steps that need to be taken if this goal is to be realized. First, the process for collecting data about asthma needs to be improved (Buist, 1989). Second, there needs to be
consensus on the definition and diagnostic criteria for asthma (Samet, 1987). Third, the management of asthma needs to be reevaluated and possibly altered to become more timely and aggressive (Berman, 1989; U.S. Department of HHS, 1990). Fourth, more emphasis needs to be placed on the co-management of asthma by the health professional and the child and family (U.S. Department of HHS, 1990).

**Increased Use of Health Care Services**

From the previous discussion of increasing prevalence, morbidity, and mortality, it is clear that asthma contributes significantly to increased health care utilization which is disproportionately greater for children than for adults. In 1988 approximately 35 percent of all visits to physicians for asthma were made by children under 20 years of age (Lenfant & Hurd, 1990)

**Emergency Room Use**

Patterns of health care use indicate that the emergency room is becoming an increasing source of primary care (Ross, 1989). It has been estimated that one-third of all children do not have a specific physician for health care (Klingelhofer & Gershwin, 1988). In one study of 1,864 children seen for asthma in an emergency room over a 16-month period, 93 percent were self-referred (Canny et al., 1989). The rate of emergency
room utilization by children with asthma has risen from 2.5 percent in 1974 to 7.8 percent in 1985 (Berman, 1989). In a study of 445 Black and Hispanic children, these factors were positively associated with emergency room visits: the number of days with asthma symptoms, the number of prescribed asthma medications, prior hospitalization for asthma, and low parental confidence in medication effectiveness. Negatively associated factors included the child's age and parental judgement about medication effectiveness as a basis for selecting emergency room versus home care (Wasilewski, 1990).

In 1987, 1988, and 1989, children for whom asthma was the first-listed medical diagnosis comprised the second most frequent category of visits to the emergency room at Columbus Children's Hospital (CCH). In 1987, the 1880 visits accounted for 3.5 percent of all emergency room visits to CCH. In 1988, there were 2070 emergency room visits for asthma, which represented 5.1 percent of all visits. In 1989, the 1703 visits for asthma accounted for 3.1 percent of all visits (Children's Hospital Automated, 1987, 1988, 1989). The increase in emergency room visits at CCH from 1987 to 1988

\[\text{Asthma includes the following classifications from the International Classification of Diseases (ICD): (a) 493.00 extrinsic asthma, (b) 493.90 asthma and acute asthmatic bronchitis, (c) 493.91 status asthmaticus, (d) 519.10 other diseases of the trachea and bronchus including reactive airway disease, and (e) 786.09 wheezing. None were admitted with intrinsic asthma 493.10.}\]
follows the national trend of increased emergency room utilization. However, the decline from 1988 to 1989 presents an interesting but welcome departure from the national trend.

Hospitalization

Asthma is also a significant cause of hospital admissions in children. The rate of the increase in hospitalization varies with the data source. According to Evans and associates (1987), hospital admissions increased more than 200 percent in the 18-year period from 1965-1983. Gergen and colleagues (1988) cited a 145 percent increase in the 14-year period from 1970 to 1984. A study of trends for the same period of time of members of Kaiser Permanente in the Northwest showed an increase of 427 percent in boys aged 0 to 14 years and only 53 percent in girls the same ages (Vollmer, 1990). Statistics from the NHLBI for the 8-year period from 1979 to 1987 showed that the hospitalization rate rose 43 percent for children under 15 years who have asthma as the first-listed medical diagnosis (NHLBI Data Fact Sheet, 1989). In the 5 years from 1982 to 1987, the hospitalization rate rose from 22.1 to 28.4 percent for children 15 years and younger. Furthermore, the hospitalization rate for inner city Black youths with asthma has increased six to ten times since the 1960s (Mellon, 1989). A review of 1988 admissions for asthma at Children’s Hospital of Los Angeles showed that patients tended to be young, boys,
and Black, and that many of them had frequent and severe symptoms and were undertreated (Richards, 1989).

In 1984, national data showed that 4.7 percent of all hospitalizations for children were for asthma (Clark et al., 1986). The average length of stay in 1987 for children 15 years and younger was 3.3 days (Ross, 1989). In 1987, 1988, and 1989, children for whom asthma was the first-listed medical diagnosis comprised the second most frequent category of admission to CCH. In 1987, the 1013 admissions for asthma accounted for 3249 patient days and 5.8 percent of all admissions to CCH. In 1988, there were 900 admissions for asthma for a total of 2911 patient days and 5.2 percent of all admissions. In 1989, the 823 admissions for asthma added up to 2345 patient days and 4.5 percent of all admissions (Children's Hospital Automated, 1987, 1988, 1989). The decline in hospital admissions at CCH over the past 3 years is a positive direction for the Columbus Metropolitan area that stands in contrast to the national trends of increasing health care use associated with asthma.

\footnote{Asthma included the ICD codes for intrinsic asthma (493.1), asthma (493.9), status asthmaticus (493.91), and wheezing (786.09).}
The Nature of Asthma

"One of our perpetual problems ... is to understand what others mean -- or do not mean -- when they say 'asthma'"
(Wasserman, 1989). This summarizes the ongoing debate that characterizes this multifaceted health problem.

Definitions

Asthma, which is characterized by episodic symptoms and a variety of clinical presentations, has no single definition. Samet (1987) stated that "expert groups have offered definitions, but none of them lead to specific operating criteria for distinguishing asthmatic from non-asthmatic persons." Thus, the term asthma is applied to a heterogeneous group of individuals, and its use depends on the subjective interpretation of the health professional rather than on standard criteria.

Perhaps the most widely accepted definition, however, comes from the American College of Chest Physicians and the American Thoracic Society. Asthma is a disease that is characterized by increased responsiveness of the airways to various stimuli, which results in breathing difficulty because of generalized narrowing of the airways and slowing of forced expiration (American Thoracic Society, 1962; American College of Chest Physicians and American Thoracic Society, 1975).
The World Health Organization offers another definition. "Asthma is a chronic condition characterized by recurrent bronchospasm resulting from a tendency to develop reversible narrowing of the airway ... in response to stimuli of a level ... not inducing such narrowing in most individuals" (World Health Organization, 1975). In this definition asthma is identified as a condition rather than a disease with a different emphasis on physiological dysfunction.

Wasserman (1989) points out that clinically there are varying perspectives. Asthma may be seen primarily as reversible airway obstruction that is easily treatable with the right medication. It may be viewed as a chronic problem of hyperreactive airways leading to an approach of trigger avoidance as well as medications. More recently, the chronic inflammatory component of asthma has been recognized (Buist, 1989), lending support to a more comprehensive approach that includes asthma education and focuses on prevention as well as management of asthma episodes.

Onset, Risk Factors, and Etiology

Onset: For most individuals, the onset of asthma occurs early in life. A review of over 13,000 medical records spanning a 20-year period from 1964 to 1984 showed that the median age of onset was 2.9 years in males and 7.6 years in females (Silverstein et al., 1990).
Risk Factors: Early childhood respiratory infections and maternal passive smoking are notable risk factors for asthma in children. A large study of 2336 school-age children showed that respiratory infections in early childhood are a significant risk factor in asthma (Corbo et al., 1990). In a follow-up study of 48 infants who were hospitalized with bronchiolitis, Sly and Hibbert (1989) found that 44 (92%) of these infants had asthma symptoms within the 5 years after their hospitalization.

Passive smoking also puts children with asthma at risk. In a large study of 4331 children, Weitzman and colleagues (1990) found that asthma was present in 4.8 percent of the children whose mothers smoked one-half pack or more of cigarettes. For those children whose mothers smoked less than one-half pack per day or did not smoke, asthma occurred in 2.9 percent and 2.3 percent, respectively. Also, the prevalence of onset of asthma before one year of age was 4.5 percent if the mother smoked one-half pack or more per day and only 1.6 percent if she did not smoke.

In another study of 153 children, passive smoking was associated with a 36 to 60 percent increase in wheezing (McConnochie & Roghmann, 1989). Also, asthma itself may be a risk factor for the development of chronic obstructive pulmonary disease in adulthood (Cropp, 1987).
**Etiology:** The cause of asthma involves a complex interaction between hyperreactivity of the airways, a consistent finding in most children with asthma (Bierman & Shapiro, 1989), and environmental factors. The resulting triad is widely recognized: constriction of the airways, increased secretion of mucus, and edema of the airway lining. All of these lead to increased airway obstruction, which in turn produces the characteristic difficult breathing. Hyperreactivity of the airways is an underlying component of this triad and can be subdivided into early and late phases, both characterized by increased responsiveness and inflammation.

**Triggers**

Substances or events that set off this hyperreactivity are called triggers. Both the degree of hyperreactivity and the particular triggers vary from child to child, adding to the diverse clinical picture and the challenge to effective management. For many individuals, the triggers are multiple rather than singular, so that the effects are cumulative until a threshold is reached. When the threshold is exceeded, an episode of asthma occurs (Ferguson & Webb, 1979).

The major categories of triggers include viral infections, allergies, environmental factors such as weather and air pollution, vigorous exercise, and certain medications.
such as aspirin. Most children have multiple triggers, so it is the additive effects that lead to the asthma episode. Since the avoidance of triggers and the early recognition of them when they are present are essential elements in asthma education, these major triggers are reviewed.

Viral infection, an identified risk factor in childhood asthma, is a frequent trigger. For many children, an acute episode is preceded by an upper respiratory infection. In one study of 1864 children seen in an emergency room over a 16-month period, most of the acute episodes were associated with infection (Canny et al., 1989). Another study found that hospital admission patterns were consistent with a viral etiology. There were admission peaks during the school term and a lower rate of hospitalization during the holidays (Storr & Lenny, 1989). Viral infection destroys the ciliated epithelial cells lining the airways. This tends to increase the sensitivity of underlying nerve fibers, which respond with exaggerated bronchoconstriction (Simkins, 1981).

Allergens cause two types of responses in the child with asthma: (a) an immediate response that lasts about 30 minutes, and (b) a later inflammatory response that begins three to eight hours after exposure and may last for several days (Mellon, 1989). There are many allergens, but the most common ones include foods, pollens, dust and molds, pets, and medications. Any one or combination of these may trigger an
asthma episode in the susceptible child. The most effective approach is to avoid the offending substance completely; however, this is not always possible or practical. Dampness in homes, which promotes the growth of mold spores, is a particularly prevalent concern. Brunekreef and colleagues (1989), in a study of 4625 children in six U.S. cities, concluded that dampness in the home is common and is a strong predictor of respiratory illness symptoms. In a survey of 1,000 children, significantly more of those living in damp homes experienced wheezing, coughing, and colds (Strachan et al., 1989).

Environmental irritants such as second-hand smoke and air pollution can raise the threshold level considerably, thus increasing the risk of an asthma episode (Burgess & Chernick, 1982). Maternal passive smoking is both a significant risk factor and a trigger. In a study of 415 children with asthma, respiratory symptoms were more severe if the mother smoked, boys were more sensitive to the effect of the smoking than girls, and the adverse effects increased with the child’s age and with the duration of exposure (Murray et al., 1989). Air pollution also aggravates asthma. Dockery and colleagues (1989) found a much higher prevalence of respiratory symptoms in children with a history of wheezing or asthma when exposed to air pollutants. In a study of 248 children with asthma, Berciano and colleagues (1989) found that children living in
polluted areas had significantly more wheezing episodes. Also, there was an increased incidence of severe asthma. Neither Dockery nor Berciano found any significant correlation between the levels of air particulates and respiratory symptoms, however, suggesting that air pollution may potentiate wheezing rather than be a direct trigger.

Exercise is a trigger for some children. It can have a specific bronchoconstrictive effect, leading to exercise-induced asthma. The activities that are usually the most difficult to handle for these children are the quick-start exercises like running. Sustained activities like swimming are tolerated quite well by most children with asthma.

Stress is a secondary trigger in some children. If the underlying pathophysiology is present in a child, then the child’s response to a stressor may contribute to the threshold level and possibly trigger an asthma episode. Dysfunctional behaviors, however, do not seem to be any more prevalent in children with asthma than in other children (Behrman & Vaughn, 1983).

Current Management

There is substantial variation in the current management of asthma, but the overall goal is greater normalization and a reduction in unnecessary use of health care services (Feldman, 1983). Management involves a three-pronged approach:
medication, nonpharmacological methods, and asthma education. The first two are discussed in this section. Asthma education is reviewed in depth later in this chapter.

Medications

The goal during an acute episode is reversal of airway obstruction (Nelson et al., 1989). Medications that prevent or relieve airway obstruction are the primary mainstay of medical treatment, but many have significant adverse effects in addition to the beneficial ones. Generally these medications are self-administered by the parent and child. Therefore, it is imperative that parents know when to give these medications and which side effects to report to the physician. "Sound patient instruction in how, when, and why to take bronchodilators [and other medications] cannot be overstressed" (Eigen, 1989). Because of their critical relevance to asthma education, these medications are reviewed.

Theophylline: Theophylline preparations are highly effective bronchodilators even though they reduce neither hyperreactivity nor the later inflammatory response (Berman, 1989). They are the major medications used to control moderate asthma in children (Rooklin, 1989). By inhibiting an enzyme known as phosphodiesterase, theophylline prevents the breakdown of cyclic adenosine monophosphate (cyclic AMP), a substance that relaxes bronchial smooth muscle. However, the effect of
theophylline on a given individual varies considerably due to differences in theophylline metabolism. Even individual dosages within the same age group may vary widely (Eigen, 1989). Fortunately, serum levels can be monitored to determine a therapeutic range.

Common side effects of theophylline include nausea, vomiting, and heart arrhythmias. In addition, the close pharmacological relationship between theophylline and caffeine produces "coffee-like" effects in some children, including irritability, difficulty falling asleep, and restlessness, as well as increased learning and behavior problems, even when theophylline serum levels are within the therapeutic range (Furukawa et al., 1984, 1988; McLoughlin et al., 1983). In addition, certain medications and foods may either lower or raise theophylline levels in the body (Mellon, 1989). It is important that parents know what therapeutic effects to expect from theophylline, the possible side effects, and whether their child is ingesting other substances that may alter the therapeutic effect.

The Beta-adrenergics: These medications are also potent bronchodilators, but their effects tend to be short-lasting (Mellon, 1989). They act by stimulating the production of cyclic AMP, which relaxes bronchial smooth muscle. They may be used alone or in conjunction with theophylline, but like theophylline, they neither reduce hyperreactivity nor the later
inflammatory response (Berman, 1989). The newer β-adrenergics are much less likely to cause the marked cardiovascular side affects attributed to earlier forms; however, any β-adrenergic medication may cause tolerance and a rebound effect that can lead to a later increase in the hyperreactivity of the airways (Vathenen et al., 1988). Since these medications can bring fast and marked relief, the parent or child may use them for their short term effects and then set them aside. This sudden starting and stopping could put the child at risk for more severe episodes later on (Berman, 1989). It is essential that parents understand that these medications must be taken as prescribed and not used as a quick way to help the child feel better. If the medication is inhaled, the child often self-administers it with a metered dose inhaler (MDI), which is carried in the pocket. Thus, it is easy for the child to over- or underuse this drug throughout the day. Parents should "spot check" both the frequency and technique of MDI usage.

Corticosteroids: These medications are important for asthma because they reduce the later inflammatory response that tends to maintain the hyperreactivity of the airways. Often, oral corticosteroids are given in a "short burst" lasting a few days following an acute episode. This minimizes their systemic effects of altered bone growth, weight gain, mood swings, immunosuppression, and cataracts. Some severe asthmatics are steroid-dependent, however, and require daily doses. Thus,
they are at increased risk for these side effects. Brunette and colleagues (1988) found that having parents give an oral corticosteroid at the first sign of a viral infection caused a marked reduction in emergency room visits and hospitalizations without significant side effects. Chapman and colleagues (1990) showed that a short course of oral corticosteroids given to children seen in the emergency room for an asthma episode reduced relapse rates significantly. Other investigators remain skeptical of this liberal use of corticosteroids because of potential negative side effects (Berman, 1989). In any case, parents should know that oral corticosteroids, when given in a "burst," need to be taken as prescribed for several days, which includes "tapering" as the end of the dosage time approaches. This gives the body time to readjust to any immunosuppression that may have occurred. (Davis, 1989). Inhaled corticosteroids, a fairly recent adjunct to asthma therapy, have a much wider margin of safety than oral forms, but they still require caution (Davis, 1989; Konig, 1989; Koumelotnig, 1988). Again, parental monitoring of MDI frequency and technique is essential.

**Cromolyn Sodium:** This preventive medication corrects abnormal hyperreactivity and blocks both the immediate and late asthmatic response (Bierman & Shapiro, 1989; Mellon, 1989). It stabilizes the mast cell membrane, so the release of cell mediators that cause bronchospasm are inhibited (Sheffer,
1989). Cromolyn sodium causes no significant side effects, and it has been shown to decrease the need for concomitant bronchodilators (Selcow et al., 1989). It is preferred as the first-line medication by many physicians because of its safety (Konig, 1989). It comes only in inhaled form, and since it is not a bronchodilator, it must be taken when the airway is clear. Parents must understand this medication cannot be taken for an acute episode. Its effectiveness occurs from regular use over time and cannot be measured by immediate results.

Nonpharmacological Methods

Nonpharmacological methods also play an important role in asthma management. They include adequate fluids, breathing exercises, relaxation techniques, avoidance of triggers, and recognition of early warning signs. These methods are particularly important to include in an asthma education program because they are easy to accomplish, can be done at anytime, and have no adverse side effects.

Adequate Fluids: There is a direct relationship between the hydration status of the body and the thickness of the mucus in the airways. The child with asthma is at risk for dehydration because of the water that is lost through rapid breathing and increased urination due to theophylline. In asthma the mucus tends to be thicker than normal, and dehydration exacerbates the formation of mucus plugs in the
small airways causing air to be trapped behind the obstructions. Therefore, the child should be encouraged to drink adequate fluids on a regular basis. For a school-age child, this means 1 1/2 to 2 1/2 quarts of water per day. In the event of an asthma episode, the child’s fluid intake should be increased if breathing permits drinking fluids by mouth. Room-temperature liquids are preferable, because ice-cold beverages may cause further bronchoconstriction.

**Breathing Exercises:** Breathing exercises for children with asthma focus on using the diaphragm, the largest and most efficient muscle for breathing. The goals are to (a) improve ventilation, (b) eliminate secretions, (c) teach efficient use of respiratory muscles, and (d) gain an increased sense of control over the breathing process (Burgess & Chernick, 1982). Children who use breathing exercises as soon as wheezing begins have reported shorter asthma episodes and decreased fear (Talabere, 1987). McCaully (1980) showed that children who practiced breathing exercises every day for 12 weeks had improved vital capacity of their lungs as measured by spirometry.

**Relaxation:** A review of the role of relaxation in asthma suggested that methods that included a component of mental as well as physical relaxation produced both subjective improvement and objective improvement as measured by pulmonary function tests (Erskine-Milliss & Schonell, 1981). Relaxation
can help the child reduce the tension associated with an asthma episode; however, to be effective, both breathing exercises and relaxation techniques need to be learned prior to the episode and practiced on a regular basis.

**Trigger Avoidance:** The avoidance of triggers has long been accepted practice in asthma management. Some triggers are relatively easy to avoid, such as a specific food like strawberries, or a specific animal like a cat. Other substances are ubiquitous, and avoiding them is no small task. For example, children who have a true allergy to corn may need to avoid corn, corn oil, corn syrup, and corn meal. This presents a challenge to even the most determined parent. Likewise, the avoidance of dust and mold is a demanding and time-consuming task, requiring not only frequent housecleaning but also limiting choices in the selection of furniture and carpeting. Triggers may also involve a family pet or a family member who smokes. It is of critical importance that the family play a major part in planning the trigger avoidance strategy rather than having it thrust upon them. If effective, long term avoidance is to be achieved, a balance must be struck between what the family considers realistic and what the health care professional considers sound practice.

**Recognition of Early Warning Signs:** This area has received much attention in asthma education programs. The focus is on helping children with asthma and their parents
become aware of the very first signs that signal an asthma episode. These signs vary from child to child and may include changes in breathing patterns, feelings of chest tightness or discomfort, headache, nausea, fatigue, pallor, or anxiety. Because the child experiences many of these signs before they can be observed by the parent, emphasis is placed on having the child "tune in to these messages from the body" and then take appropriate action. The rationale is that the longer an asthma episode continues without intervention, the more difficult it may be to reverse it.

The Impact of Asthma on Children and Families

The impact of asthma is multidimensional. It poses several areas of concern for the children and their families: socioeconomic issues, considerations related to school attendance and performance, concerns about psychologic adjustment, and the complexities of managing asthma at home and school.

Socioeconomic Issues

Increased health care utilization brings increased costs. In 1987 and 1988 the annual cost of health care for asthma exceeded $4 billion (Lenfant & Hurd, 1990; U.S. Department of HHS, 1990) The annual price tag for hospitalization for asthma is estimated to range from $0.5 to $1.0 billion to $2.6 billion
Emergency room expenses run around $1.5 billion, and outpatient medications cost about $3.6 billion. The estimated total cost for all direct health care for asthma ranged from $2.8 billion in 1986 to $8.7 billion in 1989. The addition of indirect costs to patients, families, and employers raises the total annual health care cost to $4 to $11 billion (Lenfant & Hurd, 1990; Ross, 1989).

It is useful to translate these staggering sums into costs per patient, because the costs for an individual child with asthma may use a significant portion of the family income. One study reported that direct health costs for physician, medications, emergency room, and hospitalization consumed as much as 33 percent of the family income. The total asthma-related expenses per patient per year ranged from $88 to $3,965 with an average of $1080 (Marion et al., 1985). In another study, a single emergency room visit cost $200 to $500 or more. The estimated annual cost of medications for a child with moderate asthma ranged from $300 to $600 (Ross, 1989). In 1987 the total cost of care for children admitted to CCH with asthma as the first-listed medical diagnosis was $1,535,937, or $1,857 per admission (Children's Hospital Automated, 1987).

Children with asthma from lower socioeconomic groups may be at greater risk for hospitalization and school absenteeism because of a lack of regular health care (Evans et al., 1987; Lewis et al., 1987; Parker & Wolle, 1987). Clark and
colleagues (1980) found that one-third of minority patients with asthma report that they rarely or never ask their physicians questions about their asthma. Although local data by socioeconomic group were not available, local data by ethnic group suggested that in central Ohio there may be an increased risk among Black children for hospitalization due to asthma. In 1987, 58 percent of the children between 8 and 12 years of age admitted to CCH for asthma were Black (Children’s Hospital Automated, 1987). This was a disproportionately high figure, compared with the 1980 Black population percentages of 10 percent for Ohio, 15.1 percent for Franklin County (in which Columbus is located), and 22.1 percent for Columbus (Franklin County Community Profile, 1988).

These patterns of health care use translate into considerable expense for both the family involved and the community. With the recent advent of Diagnostic Related Groups (DRGs), a cost containment effort that stipulates the number of days of hospitalization for a given illness for which reimbursement may be received, programs to effectively reduce hospital costs by reducing both the number of emergency room visits and hospitalizations as well as the length of hospital stay become even more important. Although the length of hospital stays for asthma at CCH in 1987 of 2.84 days was well within the DRG parameter of 3.77 days, the actual number of hospitalizations was high, as discussed previously (Children’s
Hospital Automated, 1987). This also raises the question of whether the present length of hospitalization at CCH provides adequate time for effective health teaching.

School Attendance and Performance

The impact of asthma is more than socioeconomic. Parcel and colleagues (1979) found that the school absenteeism rate for children was 8.5 percent compared with a rate of 5.9 percent for children without asthma. In a study by Freudenberg and associates (1980), children with asthma missed an average of 3 days a month or 26 days a year with an absenteeism rate 24 percent higher than children without asthma, based on school records. A study by Howland and associates (1988) showed that asthma accounted for 23 percent of all school absences, making it the leading cause of days missed from school. No state or local data were available for school absenteeism due to asthma.

The effect of asthma-related school absenteeism on school performance is unclear. Children with asthma who miss a lot of school may be at risk for falling behind in their schoolwork. However, in a study of 99 children with asthma by Gutstadt and colleagues (1989), the overall academic capabilities in reading and mathematics were average to above average. History of continuous oral corticosteroid use was the one asthma-related factor that was significantly associated with low school performance. School absenteeism and the use of other asthma
medications did not affect school performance. Freudenberg and colleagues (1980) found that inadequate communication between the school personnel and the child with asthma and parents disrupted the child's social functioning in the school setting. In the same study 40 percent of the parents reported that their children had problems in school including reading and other academic difficulties, and 17 percent of the children with asthma needed to repeat the grade they were in.

**Psychologic Adjustment**

Problems of psychologic adjustment may occur at any level of severity. In a study by Perrin and colleagues (1989), children whose parents rated their asthma as mild or severe had significantly lower adjustment scores on the Health Resources Inventory than those children whose asthma was rated moderate. Hermanns and associates (1989) looked at maternal-child communication in a random design study of 50 children, aged 7 to 13 years. Mothers of the children with asthma made significantly more critical remarks and engaged in longer negative verbal interaction than the mothers of the children without asthma.

Psychological problems have also been attributed to asthma medications. However, Creer and Gustafson (1989), in a review of ten studies designed to evaluate the behavioral and psychological effects of theophylline, found the results to be
inconsistent and contradictory. The one consistent finding was that there appears to be a subgroup of individuals who have a heightened central nervous system response to theophylline. Creer and Gustafson drew two conclusions. First, future research on the effects of theophylline in children should exclude this sensitive subgroup. Second, theophylline does not seem to cause adverse behavioral and psychological effects in most children with asthma.

Managing Asthma at Home and at School

The episodic and chronic nature of asthma places numerous demands on the child and family. Several factors in home and school management of asthma have been identified that may contribute to increases in morbidity and mortality. The child and parent may not recognize the early warning signs, may misjudge the severity of an asthma episode, may take medication inappropriately, and may not seek medical help quickly enough. (National asthma education program, undated)

Asthma Education Programs

In the last two decades, numerous asthma education programs have been developed to promote children’s self-management. A number of recent randomized, controlled studies have shown that asthma education programs are effective in reducing the number of asthma episodes, the number of emergency
room visits and hospitalizations, the amount of school absenteeism, the cost of health care and/or in improving self-management skills and school performance. These programs have provided the children and their parents with (a) a better understanding of the cause and management of asthma, (b) the skills needed to carry out the complex and often changing preventive and therapeutic approaches to asthma, and (c) the motivation to follow the management regimen (Mellins, 1989). Studies evaluating six major programs are reviewed: (a) Open Airways, (b) Living with Asthma, (c) Air Wise and Air Power, (d) Superstuff, (e) the Family Asthma Program (FAP), and (f) the Asthma Care Training (ACT) for Kids. Other programs are then summarized in chronological order.

Open Airways

Clark and associates from the Pediatrics Department of Columbia University in New York City have published more asthma education program evaluations than any other investigators. In 1980 they developed Open Airways, a clinic-based, asthma self-management program for parents and children supported by a grant from the NHLBI. Written in both English and Spanish and offered in seven group sessions, Open Airways was designed to increase the ability of parents and children to manage asthma and to decrease school absences, emergency room visits, hospitalizations, and disruption of family life due to asthma.
The program involved families from a low socioeconomic, minority population who attended clinics in four inner-city hospitals (Kaplan et al., 1986).

Clark and associates (1981, 1984, 1986, 1986) conducted randomized studies of 310 children from 290 families who attended Open Airways sessions timed to coincide with regular clinic visits. This clinic-based program for 4-to 14-year old children with a mean age of 9.2 years was focused on six topics: medications, activities, managing an asthma episode at home, communicating with the physician, staying healthy, and doing well in school. Illustrated lectures and pamphlets were provided by health educators and others. The education program spanned six months with each topic presented in a 50-minute session once a month. A self-management index measured the child and family's ability to (a) manage an asthma episode, (b) obtain needed information and support from health care professionals, teachers, and others, and (c) prevent symptoms by eliminating triggers and using medications appropriately (Mellins, 1989).

In 1981, the preliminary findings from a convenience sample of 140 families showed that the children in the experimental group tended to have fewer school absences and emergency room visits and that both parents and children experienced significantly less fear and anxiety associated during wheezing episodes. Initially, 44 percent of the parents
reported that they lacked confidence in their ability to manage asthma, 78 percent said they were worried or frightened by asthma episodes, and 41 percent expressed fear that their child might die (Mellins, 1989).

Later studies (Clark et al., 1984, 1986, 1986) showed significant improvement in both the child's asthma management activities ($p < .05 - 0.004$) and in the parent's ability to establish guidelines for the child's activity ($p < .05 - .01$) after 1 year. Families scored significantly better on the self-management index and used more nonpharmacologic actions such as breathing and relaxation exercises than the control group families. School absences based on school records decreased in both the experimental and control groups, but the difference was not statistically significant. However, children in the experimental group had better grades. There was a significant reduction in emergency room visits ($p < .05$) for those children who had been hospitalized for asthma one or more times in the year preceding the intervention. The decrease in hospitalization was significant ($p < .05$) for those children in the experimental group who had been hospitalized within the previous year. Data for the use of health care were obtained from medical records.

The reduction in the number of emergency room visits and hospitalizations resulted in a savings of $11.22 in health care costs for every dollar spent on health education. This
translated to an annual savings of $780 to $1950 per patient, assuming a cost of $200 to $500 per visit (Ross, 1989).

Kaplan and associates (1986) and Wasilewski (1990) reported on the results of transferring the clinic-based Open Airways program to a public school setting. The goals were to (a) overcome the problem of the low attendance rate of about 50 percent seen in the outpatient program, (b) explore the role of self-efficacy in learning new asthma management skills, and (c) explore the ability of the children to self-initiate appropriate health behaviors and influence parent management decisions. Child development theory suggests that 8 to 11 year old children can begin to make independent decisions and act on cues in their environment (Piaget, 1967).

The school-based Open Airways program was changed to increase the number of hands-on activities and opportunities to practice decision-making and asthma management skills. Six 1-hour sessions were taught to third, fourth, and fifth graders who had had at least three episodes of asthma in the past year. Child participation in the pilot study was predictably high because it was in the school setting, but parent attendance continued to be low. In a second study, parental participation was eliminated, shifting the program to a child-centered endeavor. Six 60-minute group sessions were taught to 239 children aged 8 to 11 years. Twelve schools in New York City were paired by racial and socioeconomic composition. Within
each pair, the schools were randomly assigned to the control or experimental group. Follow-up data (Evans et al., 1987) were obtained 1 year later. Children in the experimental schools had significantly higher scores on an index of asthma management ($p < .005$), greater self-efficacy in managing their asthma ($p < .05$), more influence on their parents' asthma management decisions ($p < .05$), better grades in school ($p = .005$), and fewer episodes of asthma that were shorter in length ($p < 0.01$). Interestingly, there was no effect on school absenteeism.

**Living with Asthma**

Living with Asthma is a self-management program developed and tested by Creer and his colleagues at the National Asthma Center in Denver under a NHLBI grant. Based on social learning theory, the program focus was on three major components: (a) the acquisition of knowledge and skills by the children which were transmitted through teaching, (b) the performance of the self-management skills, and (c) the consequences or outcomes of these behaviors. This intensive program was comprised of eight 90-minute sessions plus a variable number of individual sessions. The parents' program emphasized the improvement of family and social dynamics that can interfere with effective asthma management. The children, 8 to 12 years, were directed toward basic asthma management, using a variety of activities.
In 1981, Creer and Leung conducted a study in which 123 children and their parents were assigned randomly to groups of ten. Parent and child knowledge increased in the experimental groups. Attitudes about asthma became more positive. The parents experienced an internal shift in locus of control, the children showed growth in self-esteem, and there was a reduction in school absences and asthma episodes. All of these results were described as significant, but statistical tests of significance were not given. In a later study, Creer and Winder (1986) also reported a significant decrease in school absenteeism as well as a reduction in health care costs. Subsequent research has switched from evaluating the acquisition of self-management skills to assessing participant performance. A review by Creer (1987) of several replications and extensions of the Living with Asthma program showed that children in a variety of settings acquired those skills necessary to cope effectively with their asthma and that they continued to perform those same skills five years later.

Air Wise and Air Power

The development of Air Wise and Air Power began in 1977 at the American Institutes for Research in the Behavioral Sciences in Palo Alto under a NHLBI grant. The development process included detailed behavioral analysis, instructional design, pilot testing, formative evaluation, and revision
Air Wise, designed for children 9 to 13 years who had asthma that was difficult to manage, was a one-on-one, clinic-based program in which the instruction was given by a nurse in four or five sessions of 45 minutes to 1 hour in length. The number and duration of the sessions varied with the child, depending on an individualized needs assessment. Based on this information, the instructor selected those learning objectives that matched the child’s self-management needs from a list of 25 objectives (Krutsch et al., 1987). A randomized pilot evaluation of 17 children who were followed for 4 months before and after participating in Air Wise showed an average decrease of 3.2 in emergency room visits in the experimental group compared with a decrease of 0.3 in the control group (Wilson-Pessano & McNabb, 1985). In a randomized study of seven matched pairs of children, the experimental group improved in knowledge and self-management behavior and decreased the number of emergency room visits. A 12-month posttest comparison of acute care visits showed 1.9 for the experimental group and 7.4 for the control group; however, neither statistical tests of significance nor the data source for these visits were reported (McNabb et al., 1985).

Air Power, a group-oriented program with four separate sessions of one hour each for parents and children, emphasized exercise-induced asthma, handling stressful situations,
understanding medications, and being "upfront" about asthma. This program was evaluated through a health maintenance organization, using a study of 180 children, 9 to 13 years old. Parents reported an increased frequency of self-management behaviors in their children.

**Superstuff**

Superstuff was developed under the auspices of the American Lung Association. It is a boxed kit containing a detailed newspaper for the parents and a variety of hands-on learning activities for the child. The focus is on basic asthma information and coping skills. After a 1-hour orientation session, this printed program, designed for children 6 to 12 years old and their parents, is given to families to be used freely at home. A series of evaluative questions to which 20 families responded determined that knowledge improved slightly (no significance tests were applied) and that the materials were attractive and at the appropriate level (Weiss & Hermalin, 1984). In a much larger randomized study, 321 families with children aged 6 to 12 received the kit in the mail. Those in the control group received the materials 6 months after those in the experimental group. A 6-month follow-up of the experimental group revealed fewer problems with asthma including significantly fewer days missed from school; however, there was no increase in
knowledge. Those in the control group showed similar changes after receiving the kit (Krutzsch et al., 1987).

A randomized study of Superstuff by Rakos and colleagues (1985), involving 43 children 7 to 12 years old, showed no gain in knowledge in the experimental group. The older children in this group, however, reported increased self-management skills. Both groups showed gains in self-esteem and locus of control. Based on school records, the ratio of total days absent from school to total days present decreased in the experimental group and increased in the control group after one year, but the changes were not significant.

A Comparison of Living with Asthma, Air Wise, Air Power, and Superstuff

At the World Lung Health Conference in Boston, Wilson (1990) reported on a comparison of four asthma education programs: Living with Asthma, Air Wise, Air Power, and Superstuff. The programs were offered in a health maintenance organization in Minneapolis, a location different from the original site for each program. The study involved 316 children aged 7 to 12 years and their parents who had been seen for asthma in the previous year and had been on asthma medication for 2 or more months. They were randomly assigned to one of four experimental conditions or one of two control conditions. The control groups were either data contributing,
that is they completed the same questionnaires as those in the experimental groups, or else they were followed by medical record only. Data were collected at baseline and then at 4, 8, and 12 months. A variety of instructors with a wide range of experience participated in the study, including clinic nurses, health educators, and lung association volunteers. Although there were large changes in symptoms and health care utilization between baseline and follow-up, the differences between the experimental and control groups were not statistically significant. The children and parents who were in the Living with Asthma program showed significantly greater gains in their use of nonpharmacological techniques to manage asthma and in parent knowledge. The Air Wise children showed greater declines in self-blame and other negative feelings about asthma. Also, attendance was best for those in Air Wise, the individually delivered program. Children who participated in Air Power had greater gains in symptom recognition and the taking of medication, and more decline in feelings of embarrassment about asthma. The Superstuff participants showed no significant gains over the controls. Overall, the decline in visits to seek medical care for an acute episode was significant (Wilson, 1990). The impact on the behavior of both families and health care professionals was sufficient enough that the health maintenance organization in which the programs were compared was convinced asthma education was effective.
The Family Asthma Program (FAP)

Hindi-Alexander and Cropp (1981) designed a two-part program in Buffalo, New York, in conjunction with the American Lung Association: (a) The Community Asthma Program (CAP), and (b) The Family Asthma Program (FAP). The purpose of CAP was to raise community awareness about asthma in general and about FAP in particular by providing information through the media, health fairs, and schools. FAP, developed for children with asthma and their parents, babysitters, and other caretakers, was a clinic-based program that met 2 hours a week for 6 weeks in separate sessions for children and caretakers. It was taught by health professionals. A 12-month follow-up showed significant increases in knowledge in both the children and their parents ($p < .05$ to $p < .001$).

In 1984, Hindi-Alexander and Cropp reported further results from the FAP for 133 children with mild to severe asthma and their parents who completed a 1 year follow-up. A 48 percent decrease ($p < .005$) occurred in the total days absent from school, using a pre-/posttest study design. Interest in assuming more responsibility for self-management increased significantly for both children and parents ($p < .05 - .005$). Additional significant changes included an increase in total activities ($p < .001$), and a decrease in unscheduled health care visits ($p < .005$). Analysis of health care use showed a non-significant decrease in both emergency room visits and hospital
admissions after 1 year. Also, there was no change in the number of wheezing episodes or the amount of medication taken.

**Asthma Care Training (ACT) for Kids**

The Asthma Care Training (ACT) for Kids was developed to help 6-to 12-year-old children take charge of asthma rather than being controlled by it (Lewis et al., 1984). Based on the theme "You’re in the driver’s seat," ACT consisted of five 1-hour sessions for small groups of children and their parents offered at weekly intervals. It was conducted in clinics, health professionals' offices, and classrooms by nurses, health educators, and elementary teachers. The ACT curriculum was evaluated, using a randomized clinical study of 76 children of middle-class, working families enrolled in a health maintenance program. The control group received three 1 1/2-hour lecture/discussion sessions covering the same information base as the experimental group. The difference between the groups was the focus on decision-making skills. Although the program showed no improvement in knowledge in either group, both groups demonstrated a high level of knowledge prior to entry into the study. There were significant changes in self-reported compliance behaviors ($p < .05$) as well as significant reductions in the perceived severity of asthma episodes ($p < .001$), emergency room visits ($p < .001$), and days of hospitalization ($p < .01$) in the experimental group. However, there was no change
in the hospitalization rate. Medical records were used as the data source for health care utilization. The annual saving for each child in the experimental group was estimated to be $180.

In 1985, Rachelefsky and associates further evaluated ACT in a randomized study of 58 children. Parents in the experimental group reported less anxiety and more calm in their children, while the control group remained unchanged after 6 months. Seventy percent of the experimental group engaged in relaxation exercises while this was true for only 7 percent of the control group. Emergency room use decreased 30 percent, but there were no changes in unscheduled visits to the physician or in hospitalizations. ACT has been adopted for distribution by the Asthma and Allergy Foundation of America (Goldstein, 1985).

In 1987, ACT was adapted for Hispanic children with asthma and their parents by Lewis and associates. A pilot study showed that these families encountered major socioeconomic barriers in accessing health care; however, the need for cultural modifications was minimal as verified by health professionals in Santiago, Chile. The delivery of ACT was redesigned to involve a nurse to reduce barriers and coordinate care. The curriculum placed more emphasis on concrete learning experiences with repetition at key points. A pilot study of the adapted ACT program in Spanish in Los Angeles with 10 Hispanic families in 1985 showed it was
teachable. In a randomized trial of 30 children aged 7 to 12 years and their parents and siblings, preliminary results identified a major problem of lack of effective and consistent medical care. The lack of medical continuity combined with a significant knowledge deficit in children and parents underscored the need for this program. Thus, ACT was modified to link families with quality, ongoing health care and to begin the sessions with information on the early recognition of symptoms.

Other Asthma Education Programs

Blumenthal and colleagues (1972) developed a 16 hour, clinic-based, comprehensive family education program to increase physical capabilities and self-confidence. A pre/posttest design was used to evaluate 221 children, 4 to 19 years old. The total number of school absences for all reasons decreased for 50 percent of the children in a 12 month posttest, based on parent report.

Robbins and Finkelstein (1973) developed a program for children with asthma and showed fewer hospital admissions of acute episodes. Classes held twice a month for parents were taught by a nurse specializing in asthma.

A 16-hour, school-based program developed by Parcel and Nader (1977) showed a significant shift toward internal locus of control in the experimental group ($p < .02$), but no
significant change in self-concept, illness anxiety, or the number of asthma episodes. Neither school absences nor acute care visits (emergency room and emergency physician visits combined) changed significantly after one year; however, there were only 13 children, aged 5 to 10, in this pre-/posttest study. The data were obtained from school and medical records.

Creer and Burns (1979) developed a hospital-based, self-management program for children with severe asthma. Based on a case-study approach, behavioral management techniques were used to decrease the length of hospitalization.

In 1979, Parcel and associates wrote a book, Teaching Myself About Asthma, and the following year they reported on the results of a randomized study involving 104 children to evaluate the effects of using this book as a primary educational tool. There was a significant gain in knowledge and a significant internal shift in health locus of control. Illness anxiety was significantly reduced, but self-concept remained unchanged.

In 1979, Selner and Staudenmayer studied Child’s Asthma Self Help (CASH-IN), an education-exercise program modeled after the Winning Over Wheezing program developed by Rusnak. The program consisted of eight 1 1/2 to 2 hour sessions, given once a week for 8 weeks. The results were based on questionnaires completed by the parents of the 56 children in the study. Fifty-two percent reported fewer or no asthma
episodes, 49 percent indicated fewer or no school absences, 45 percent stated that their child had more tolerance for exercise, 34 percent reported more participation in sports activities, and 39 percent indicated a need for fewer medications. No statistical tests were stated.

Freudenberg and associates (1980) were among the first to conduct a randomized clinical trial study. The Asthma Self-Management Project involved the development, implementation, and evaluation of an asthma education program for children 4 to 16 years of age and their parents over a 4-year period. The purpose of the study was to assess the impact of asthma on school attendance and performance. They identified three problem areas that disrupt the social functioning of the child with asthma in the school setting. First, school personnel often lacked the information needed to manage the child with asthma. Second, parent-teacher communication usually did not encourage the sharing of information about the child’s asthma and how to handle it effectively. Third, participation in physical education classes was characterized either by unnecessary restrictions or inadequate rest periods.

In 1980, Parcel and colleagues designed a 24-session school-based program that significantly improved the child’s knowledge of asthma, increased the child’s sense of control over health, and reduced asthma-related anxiety.
Schneider and associates (1980) looked at the effects of a school exercise program on school absenteeism. Their randomized study of 186 children showed significantly fewer absences in the first year but no significant differences in the second year.

Fireman and colleagues (1981) developed a clinic-based program for children and parents that involved a total of 26 children, aged 2 to 14 years. The teaching was provided by a nurse-educator with follow-up telephone contact. There were two 2-hour group sessions and individual 1-hour sessions which averaged two per family. Both the number of asthma episodes and the number of school absences due to asthma were significantly less for the experimental group, \((p < .01)\) and \((p < .05)\) respectively. There were fewer emergency room visits and hospitalizations in the experimental group, but no statistical analysis was given. The source of the data was school and medical records.

Staudenmayer and associates (1981) evaluated a 16-hour, clinic-based, self-help, education-exercise program using a pre-/posttest design. Forty children aged 8 to 17 years were involved. There was a significant reduction in asthma episodes \((p < .01)\) and in the number of wheezing episodes \((p < .009)\). Although not statistically significant, 67 percent of the children showed a decrease in total days absent from school, based on parent report. Eighty-eight percent of the children
not only reduced their emergency room visits, but also showed significant improvement. Six of the 40 children showed a significant decrease in hospitalization ($p < .01$), but the other 34 did not deviate from baseline. Data for health care utilization were based on parent's reports.

Blessing-Moore and associates (1985) evaluated a 5-day summer camp program, Camp Wheeze, for children with chronic asthma. The goal of this program was to provide information about asthma for children and their parents and to encourage the development of self-management skills. Pre-/posttest reports from 160 children and their parents showed improved knowledge and increased ability to cope with acute asthma, to discuss concerns, and to use community resources. Eight-two percent said their understanding of asthma increased. Sixty-two percent reported fewer school absences due to asthma, and 28 percent reported fewer visits to the physician and fewer hospitalizations.

Kohen (1985) conducted a clinic-based, pre-/posttest study. Neither the ages of the 59 children nor the length of the posttest study time were given. Fifty-nine percent of the children reportedly had fewer school absences, and there was a 70 percent decrease in emergency room visits as reported by the parents. No tests of statistical significance were given.

In 1985 Reynolds began his study of children with asthma who attended the Superkids camps sponsored by the American Lung
Association of Ohio. The first phase included the development and piloting of instruments and a program evaluation of one of the camps. The results showed an enthusiastic parent response to a perceived improvement in the child’s ability to manage asthma, a reported decrease in the use of over-the-counter medications, improved child attitudes toward self and asthma, improved child knowledge about early warning signs and triggers, a marked decrease in school absenteeism, and improved parent perception of the child’s maturity and independence.

In 1988 Reynolds and colleagues completed a year-long, multisite, statewide evaluation of Ohio’s four Superkids camps. Two of the camps used mainstreaming, and the other two camps were specifically designed for children with asthma. All four of the camps were 1-week residential programs. A total of 207 children with asthma, ranging in age from 7 to 16 years, were involved in these camps at the time of this study. They were compared with a control group of 48 children with asthma. The total hours of asthma education ranged from 2.5 to 5.5 per week. The children were evaluated for changes in (a) the frequency of asthma episodes, (b) asthma symptoms, (c) use of medications, (d) cognitive and behavioral changes, and (e) psychological functioning. Cognitive changes in the parents were also considered. The findings were not statistically significant, and the researchers attribute this in part to the high attrition rate. Only 73 out of the 207 participants
completed the study. However, several positive outcomes for the children were suggested by this study, including decreased use of health care services, increased maturity and independence, increased use of self-management behaviors, the development of a more positive self-concept and of more positive attitudes towards asthma and its management, the use of more active coping skills, decreased anxiety and depression, and improved knowledge about early warning signs and triggers.

Robinson (1985) conducted a time series evaluation of a residential, 1-week camp program that involved 90 children, 10 to 14 years old, with moderate to severe asthma. The children received instruction in six 45-minute modules which focused on the nature of asthma, early warning signs, triggers, allergies, environmental control, breathing exercises, psychosocial aspects, and communicating with health professionals. Children were tested at the beginning of camp, at the end of camp, and 3 months later. There were significant positive changes in the parents' perceptions of the child’s health ($p < .05$), level of disability ($p < .01$), frequency of illness ($p < .01$), and in the child’s and parents’ perceptions of medication compliance ($p < .01$). At the end of a 3-year follow-up period, there were reductions of 12 percent in the number of asthma-related school absences and 20 percent in the number of emergency room visits.

Whitman and associates (1985) looked at the Self-Care Rehabilitation in Pediatric Asthma program (SCRPA). This
program was leveled for preschoolers, aged 2 to 5 years, and school-aged children, 6 to 14 years of age. Eight 90-minute classes for both the children and their parents were scheduled twice a week for 4 weeks. The 21 children and parents in the preschool program served as their own controls in a pre-/posttest design. A randomized study was conducted for the 38 school-aged children and their parents. A comparison of the number of asthma episodes in the three months before and after the program revealed a significant decrease in the preschool group but not in the school-aged group. There was no change in the severity of episodes for any group. There were significant increases in knowledge \((p < .01)\), and skills relating to breathing control, relaxation, and physical conditioning \((p < .01)\), and positive parental attitudes \((p < .01)\) in the school-age experimental group. Curiously, there was a significant increase in positive attitudes \((p < .01)\) in the school-age control group but not the experimental group. The researchers did not address this in their discussion.

Creer (1986) conducted a randomized study of 20 children, 6 to 16 years old, to determine if medication compliance would improve with a 2-hour teaching session designed to enhance self-management skills. The site of the program was not identified. Although there were no differences between the two groups in medication compliance, self-concept, or health locus of control, one significant difference did emerge. The
children in the experimental group showed a marked increase in getting away from a trigger as a first step in dealing with an asthma episode.

Rubin and associates (1986) developed an interactive computer game called Asthma Command. A randomized clinic-based study, involving 54 children aged 7 to 12 years, showed a significant increase in asthma knowledge in the experimental group. There was a slight increase in the total number of days absent from school in both groups after 1 year, but the difference was not significant. Acute care visits and days of hospitalization decreased somewhat but not significantly. The data were obtained from school and medical records.

Discussion

A number of asthma education programs have been developed, implemented, and evaluated over the last 20 years. Several of these have received assistance from the National Heart, Lung, and Blood Institute, the National Institute of Allergy and Infectious Diseases, and the American Lung Association. These programs were designed to reduce health care utilization and school absences and to increase the self-management of asthma by the children and their parents. Many of the asthma education programs, for which research data were available, were reviewed in this chapter. The characteristics and outcomes for 20 of these studies are summarized in Table 1.
Table 1
A Summary of Asthma Education Programs

<table>
<thead>
<tr>
<th>First Author</th>
<th>Year(s)</th>
<th>Design Setting</th>
<th>Subjects</th>
<th>Ages (Yrs.)</th>
<th>Number Exp. Con. Groups</th>
<th>Program Length</th>
<th>Decreased Hospitalizations</th>
<th>Decreased Emergency Visits</th>
<th>Decreased School Absences</th>
<th>Decreased Frequency of Asthma Episodes</th>
<th>Significance of Outcomes*</th>
</tr>
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<tbody>
<tr>
<td>Blumenthal, M.</td>
<td>1972</td>
<td>Pre-Clinic Posttest</td>
<td>Children</td>
<td>4-19</td>
<td>221</td>
<td>16 1-hr. session</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Parcel, G.S.</td>
<td>1977</td>
<td>Pre-School Posttest</td>
<td>Children</td>
<td>5-10</td>
<td>13</td>
<td>16 1-hr. sessions</td>
<td>not</td>
<td>sig.</td>
<td>not</td>
<td>sig.</td>
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<tr>
<td>Seiner, J.C.</td>
<td>1979</td>
<td>Pre-Clinic Posttest</td>
<td>Children</td>
<td>6-17</td>
<td>56</td>
<td>8 2-hr. sessions</td>
<td>yes</td>
<td></td>
<td>yes</td>
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<td></td>
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<tr>
<td>Creer, T.L.</td>
<td>1981</td>
<td>Living RCT w/Asthma</td>
<td>Children</td>
<td>8-12</td>
<td>123 total</td>
<td>8 90-min sessions</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
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<tr>
<td>Fireman, P.</td>
<td>1981</td>
<td>RCT Clinic</td>
<td>Children</td>
<td>2-14</td>
<td>13</td>
<td>2 2-hr. &amp; yes</td>
<td>p &lt; .05</td>
<td>p &lt; .01</td>
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<tr>
<td>Staudenmeyer, H</td>
<td>1981</td>
<td>Pre-Clinic Posttest</td>
<td>Children</td>
<td>8-17</td>
<td>40</td>
<td>16 1-hr. sessions</td>
<td>p &lt; .01</td>
<td>yes</td>
<td></td>
<td>p &lt; .01</td>
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<tr>
<td>Hindi-Alexander FAP*</td>
<td>1984</td>
<td>Pre-Clinic Posttest</td>
<td>Children</td>
<td>6-14</td>
<td>92</td>
<td>6 2-hr. sessions</td>
<td>not sig.</td>
<td></td>
<td>p &lt; .005</td>
<td>no change</td>
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<tr>
<td>Lewis, M.A.</td>
<td>1984</td>
<td>ACT* RCT School</td>
<td>Children</td>
<td>6-12</td>
<td>48</td>
<td>28 5 1-hr. sessions</td>
<td>p &lt; .01</td>
<td></td>
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<td>Racholefsky, G.</td>
<td>1985</td>
<td>RCT</td>
<td>Children</td>
<td>58</td>
<td></td>
<td>5 1-hr. no change</td>
<td>yes</td>
<td></td>
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<td>Clark, N.M.</td>
<td>1984, 1986</td>
<td>Open RCT Airways</td>
<td>Children</td>
<td>4-14</td>
<td>207</td>
<td>103</td>
<td>6 1-hr. sessions</td>
<td>p &lt; .05</td>
<td>p &lt; .05</td>
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<td>Blessing-Hoore, Whoose</td>
<td>1985</td>
<td>Camp Pre-Clinic Posttest</td>
<td>Children</td>
<td>6-14</td>
<td>150</td>
<td>5 1-hr. sessions</td>
<td>yes</td>
<td></td>
<td>yes</td>
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<td></td>
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<td>Kohen, D.P.</td>
<td>1985</td>
<td>Pre-Clinic Posttest</td>
<td>Children</td>
<td>59</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
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<tr>
<td>McGuire, W.E.</td>
<td>1995</td>
<td>RCT Clinic Children</td>
<td>9-13</td>
<td>7</td>
<td>7</td>
<td>4-5 1-hr. sessions</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robinson, L.B.</td>
<td>1995</td>
<td>Time Series Camp</td>
<td>Children</td>
<td>10-14</td>
<td>90</td>
<td>1 week</td>
<td>yes</td>
<td></td>
<td>yes</td>
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</table>

*Significance of Outcomes: 'p < .05' indicates statistical significance at the 5% level; 'p < .01' at the 1% level; 'p < .005' at the .5% level; 'p < .001' at the .1% level; 'no change' indicates no significant change.
Table 1 (continued)

<table>
<thead>
<tr>
<th>First Author</th>
<th>Name of Program</th>
<th>Design</th>
<th>Setting</th>
<th>Subjects</th>
<th>Ages (Yrs.)</th>
<th>Number</th>
<th>Decreased Hospitalizations</th>
<th>Decreased Emergency Visits</th>
<th>Decreased School Absences</th>
<th>Decreased Frequency of Asthma Episodes</th>
<th>Increased Knowledge</th>
<th>Increased Asthma Self-management</th>
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<tr>
<td>Whitman, N.</td>
<td>SCRPA* Pre-Posttest</td>
<td>Children</td>
<td>Parents</td>
<td>2-5</td>
<td>21</td>
<td>8 90-min sessions</td>
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<tr>
<td>Wilson-Pessano</td>
<td>Power RCT</td>
<td>HMO* Children</td>
<td>Parents</td>
<td>9-13</td>
<td>15</td>
<td>37 4 1-hr. sessions</td>
<td>yes</td>
<td>p &lt; .01</td>
<td>p &lt; .01</td>
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<td>Superstuff RCT</td>
<td>Home</td>
<td>Children</td>
<td>6-12</td>
<td>321 total Self-led study</td>
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<td>RCT</td>
<td>Home</td>
<td>Children</td>
<td>7-12</td>
<td>43 total Self-led study</td>
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<td></td>
<td>no change</td>
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<td>Rubin, D.H.</td>
<td>Command RCT</td>
<td>Clinic</td>
<td>Children</td>
<td>7-12</td>
<td>54 total Computer yes program</td>
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<td>Evans, D.</td>
<td>Open RCT</td>
<td>Airways</td>
<td>School</td>
<td>Children</td>
<td>8-11</td>
<td>117</td>
<td>84 6 1-hr. sessions</td>
<td>no change</td>
<td></td>
<td></td>
<td></td>
<td>p &lt; .005</td>
</tr>
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Statistical significance given when available. Otherwise, description given as provided by author.

* CASH-IN is an acronym for Child's Asthma Self Help.

* FAP is an acronym for Family Asthma Program.

* ACT is an acronym for Asthma Care Training (ACT) for Kids.

* HMO refers to health maintenance organization.
Several observations can be made about these programs. The research findings in 12 (60 percent) of the programs were based on a random design. The settings varied, but 10 were located in hospital clinics. Ten of the programs were for children only, and ten included parents as well as children. The overall age range for all of the programs was 2 to 19 years with the median age being 7 years. For the programs with a random design, the sample size ranged from 14 to 321 subjects. The programs varied in length from 4 to 16 hours of asthma education instruction.

School absenteeism due to asthma, the most frequently researched variable, was analyzed in 14 (70 percent) of the studies. In 11 of the programs there was a decrease in the number of school absences from asthma, but statistical significance was cited in only two of the studies. The number of emergency health care visits for asthma was researched in 12 (60 percent) of the programs with a decrease occurring in 10 of the programs, but statistical significance was reported in only two of the studies. Asthma self-management, frequency of asthma episodes, and hospitalizations were analyzed in 9 (45 percent), 8 (40 percent), and 7 (35 percent) of the programs, respectively. There was an increase in asthma self-management in each program in which it was studied with statistical significance cited in four of the programs. Asthma episode frequency was reduced in six of the programs and statistically
significant in three. The number of hospitalizations decreased in five of the programs with three being statistically significant. The least studied variable, knowledge about asthma, was researched in only five programs with four reporting an increase and, of these, only one stating statistical significance. Overall, the number of asthma education studies citing statistical significance was low, ranging from 44 percent of the studies including the variable for asthma self-education to 14 percent for school absenteeism. This review of these programs suggests that more research is needed and that future studies should be conducted with increased attention to research design and statistical analysis.

The most successful asthma education programs included the following premises. First, the parent, child, and health professional were co-managers in which the unique knowledge of each was respected. Second, the context for the management of asthma varied according to the child's status, the environment, and the knowledge and skills that were needed. Third, it was recognized that the parent and child exercised a high degree of independent decisionmaking in order to manage the asthma on a day-to-day basis. Fourth, the child was taught to become as competent as possible in asthma self-management. Fifth, it was acknowledged that management tasks were most likely to be undertaken when they fit the family's lifestyle (Clark, 1990;
These premises are congruent with eight principles of patient education and research identified by Bartlett (1985) from his review of over 450 empirical studies, literature reviews, and other published reports:

1. The programs need to identify specifically the expected child and parent behaviors as well as the obstacles to accomplishing these behaviors;

2. It is more effective to combine educational and behavioral approaches than to rely on one method. However, the impact on resources must be considered;

3. The quality of the education, and individualization in particular, may be more important than the method that is used;

4. A personal approach is more effective than audiovisuals and handouts, but it requires good interpersonal skills on the part of the educator;

5. Knowledge is necessary but not sufficient for behavior change;

6. The instruction should be directed toward what the child and parent can do and not just what the child should know. Both instructional and behavioral strategies need to be included;

7. More attention needs to be directed toward long-term performance of the desired behaviors by enhancing the child’s and parent’s social support and coordinating the program with other community-based efforts;

8. Asthma education programs need to be coordinated with regular health care, although the program instructors do not need to be the direct caregivers.

The core content elements, in the curricula of the asthma education programs that were reviewed, included (a) recognizing the signs and symptoms of acute episodes, (b) administering the
prescribed therapy correctly and managing the side effects, (c) remaining calm when signs and symptoms occur, (d) recognizing and responding to symptoms requiring emergency care, (e) reducing the exposure to known triggers, (f) normalizing the child’s physical and social activities, and (g) communicating effectively with health professionals.

Many of these asthma education programs employed self-management strategies, not only to decrease health care costs, but also to enhance the health and wellbeing of the child and family system (Creer & Burns, 1979). Self-management has been defined as:

"...an educational process whereby persons with various health problems learn to work with their health care providers to help themselves, thereby enhancing the therapeutic intervention. ... The most important ... skill is to develop a decision-making protocol based on a problem-solving approach which enables one to 'manage' the problem and thus to lead a more satisfying life" (Hindi-Alexander, 1985).

The goals of asthma self-management are to (a) minimize the severity of asthma symptoms, (b) decrease the frequency of asthma episodes, (c) minimize the dysfunction caused by asthma, (d) increase the level of self-care, (e) improve the attitudes of the child and family about asthma and its management, (f) reduce direct and indirect costs to the family and community, and (g) promote optimum participation in normal behaviors (Hindi-Alexander & Cropp, 1981; Reynolds & Creer, 1987; Parcel,
Two broad areas of self-management behaviors in an asthma education program include medical self-care and adjustment and coping. The latter involves using coping strategies to manage problems in asthma, communicating effectively about asthma, engaging in developmentally appropriate activities, and utilizing health care services.

The theoretical basis for many of the asthma education programs has been social cognitive theory or social learning theory as described by Parcel (1990). The teaching methods for this approach have included modeling, goal-setting, self-monitoring, skill-training, and reinforcement. In modeling the learner observes someone performing the desired behavior. Many of the asthma education programs used written materials, stories, games, activities, or a magazine format for modeling. Goal-setting is a process of establishing priorities and setting criteria for learning and performing new behaviors or modifying behavior. In many of the programs the child and family met with a health care professional to establish goals at selected points in the program. Self-monitoring involves the learner in keeping track of self performance of the targeted behaviors identified as goals. Many of the programs involved the parent and child in tracking their progress toward their goals and then reporting back. Skill-training focuses on the development of the knowledge and skills needed to develop self-management behaviors. A number of the programs
incorporated skills ranging from the specifics of medication administration to the complexities of making decisions in an emergency situation. Positive reinforcement occurs when positive feedback is given to the family and child by the health care professional, to the child by the parents, and to the parents by the child. Many of the programs fostered trust and communication skills among those involved.

The establishment of the National Asthma Education Program (NAEP) underscores the current priority that is being placed on asthma education at the national level. This initiative, launched in 1989, grew out of a workshop sponsored by NHLBI in 1988. The coordinating committee is comprised of representatives from many health professional disciplines, mothers of children with asthma, and organizations with an interest in minority populations. Three major areas are spearheaded by expert panels: (a) school asthma education, (b) professional education, and (c) patient and public education (Lenfant & Hurd, 1990). There is an across-the-board emphasis on high-risk and minority populations (U.S. Department of HHS, 1990).

The purpose of NAEP is to "coordinate the efforts of ... major medical associations, private and voluntary health organizations, and community programs to educate health professionals, patients and the public about asthma treatment and control" (Lenfant & Hurd, 1990). Specific goals include:
"...to raise awareness among patients, health professionals, and the public that asthma is a serious chronic disease, and to ensure that patients, their families, and the general public recognize the symptoms of asthma and that health professionals diagnose it properly, to encourage a partnership among patients, health professionals and the public to promote effective control of asthma through modern treatment and education programs." (Lenfant & Hurd, 1990).

NAEP provides strong support for the inclusion of parent and child education as a regular part of asthma health care.

When economic concerns are coupled with a humanistic perspective, a clear mandate emerges to improve the ability of children with asthma and their parents to self-manage and to reduce the utilization of emergency and acute health care services. Prevention and early intervention may be the most human-effective and cost-effective approaches for managing asthma. Because the parent and child play a major and critical role in the management of asthma, an education program is a logical vehicle for providing families with the knowledge and skills to enact these effective preventive and early intervention strategies.

Summary

This chapter began with an analysis of the changing statistical profile of asthma which indicated a significant increase in prevalence, morbidity, and mortality in school-age
children. This translates into increased use of health care services as well as increased health care costs. Furthermore, children from lower socioeconomic groups may be at greater risk due to irregular health care.

Asthma impacts not only the health care system but also the child and the family. Recently, increased emphasis has been placed on a co-manager relationship between health professional and family, with both making unique and respected contributions to the plan of health care. The management of this episodic and chronic health alteration is a complex process that involves the family in giving medications, using nonpharmacological approaches, and applying the knowledge and skills learned through asthma education. In addition, school-age children are ready developmentally to assume an increased role in the challenge of managing their own health. Thus, the concurrent development of mutually supporting child and parent knowledge, attitudes, and behaviors through asthma education increases the likelihood of positive change.

During the past 20 years, many asthma education programs have been developed and evaluated. In this chapter, six major asthma education programs were reviewed in depth and several others were summarized. Several of the studies used a random design with a pretest-posttest control group. While many showed positive directions toward reducing health care use, decreasing school absences and altered breathing episodes, and
increasing self-management, relatively few demonstrated statistical significance.

This chapter concluded with a discussion of: (a) the overall characteristics and outcomes of these programs, (b) the common elements of the successful programs and their congruence with the principles of patient education, (c) self-management strategies, (d) social learning theory, and (e) the National Asthma Education Program.
CHAPTER III
METHODOLOGY

The purpose of this study was to determine if the Asthma Education Program (AEP), a program designed for this study and used as the independent variable, would reduce the need for health care services, decrease school absences and altered breathing episodes, increase the child's knowledge about asthma, and change the parent's and child's perceptions of the child's asthma. In this chapter, the following methodological issues are discussed: (a) study design, (b) selection of the sample, (c) the instruments for collecting data, (d) the asthma education program, (e) the time frame, (f) the procedures, (g) statistical analysis, and (h) agency support.

Study Design

The randomized block, pretest-posttest control design (see Figure 1) chosen for this experimental study provided control over selected variables which helped to ensure similarity between the experimental and control groups. This study was considered an experimental design because the investigator (a) manipulated the independent variable, the AEP,
(b) used a control group, and (c) randomly assigned the children and their parents to one of two conditions, either to take part in the AEP or not to participate (Polit & Hungler, 1987).

**Internal Validity**

This study design, considered to be robust in its control of internal validity, reduced the variance from four extraneous variables which were threats to the internal validity of this study: (a) maturation, (b) history, (c) regression artifacts, and (d) selection. A fifth extraneous variable, testing, was not controlled for in this study (Campbell & Stanley, 1963; Green & Lewis, 1986).

**Maturation, History, and Regression Artifacts:** Random selection was not feasible for this study because the total available pool of subjects was the same size as the sample. Because of random assignment, the effects of the first three of

![Figure 1. A randomized block, pretest-posttest control study design (adapted from Wilson, 1989).](image-url)
these extraneous variables were assumed to be uniformly distributed between the experimental and control groups, minimizing sampling errors from these factors. For example, it was assumed that the experimental and control groups would mature equally and would have the same exposure to events that occurred during the study period (Wilson, 1989). The control group also helped to counterbalance the effects of regression artifacts, that is, the tendency of extreme scores to regress toward the mean, even without intervention.

Selection: The process of selecting subjects from the sample for the experimental and control groups poses a significant threat to internal validity because of potential group inequality. In this study, a blocking technique was used in conjunction with random assignment to assure group similarity (Wilson, 1989) across the demographic variables of gender, race, and age. Thus, the amount of variance introduced through the selection process was reduced. Blocking for these three variables was important because an analysis of the admission data for Columbus Children's Hospital (CCH) from January 1 through December 31, 1986 showed considerable variation in gender, race, and age among the children admitted during this time period (Children's Hospital Automated, 1986). Also, these gender-, race-, and age-specific differences are congruent with national data patterns (U.S. Department of HHS, 1990).
Testing: The pretest-posttest control aspect of the design provided baseline data against which to compare the data at the end of the study period within groups as well as a basis for between-group comparisons for the preintervention and postintervention differences.

The disadvantage of the pretest-posttest design was the threat it posed to internal validity from testing the children and their parents twice. This was especially true of the cognitive measure, the Asthma Knowledge Questionnaire (AKQ), but also applied to the attitudinal and behavioral tests, the Asthma Attitude Survey (AAS) and the Survey of Asthma Problems and Severity (SAPS) (Green & Lewis, 1986). This study did not control for the extraneous variable of testing.

The Randomization Process

"Random assignment is the most secure way to achieve equivalence of groups and thereby to offset the selection bias" (Green & Lewis, 1986). The subjects in this study were randomly assigned to one of two groups as follows. After parental consent was obtained to participate in the study, the child was placed in the non-overlapping block that corresponded with the child’s gender, race, and age (see Appendix A). Then the child and parents were assigned randomly to either the experimental or control group. If the numbers of children in both the experimental and control sections of the non-
overlapping block were equal, the child was randomly assigned to the experimental or control group by the flip of a coin. The coin was selected and flipped by the child or family in the presence of the investigator. Heads meant assignment to the control group, and tails resulted in experimental group assignment. If the numbers of children in the experimental and control sections of the non-overlapping block were unequal, the child was assigned to the group that had one less child. This randomized block design met the assumptions for univariate analyses of variance (Kennedy & Bush, 1985).

**External Validity**

There were threats to external validity as well. The primary one was the absence of random selection of the sample from the population (Seaman, 1987). Thus, the sample may not have been representative of the population of school-age children with asthma that are seen at CCH. A secondary threat was the possible interaction of the posttest questionnaire scores and the AEP, resulting from pretest sensitization (Wilson, 1989). Because of its cognitive nature, the instrument most immediately vulnerable to this interaction was the AKQ. Therefore, the results of this study may not be generalizable to the population of all school-age children with asthma.
The Sample

The subjects selected for this study were 50 children, 8 through 12 years old, receiving treatment at CCH with a primary medical diagnosis of asthma. Each had recently experienced an acute episode that required either a visit to the emergency room or hospitalization. Children with asthma who had one or more of the following characteristics were excluded from the study:

1. Children with additional chronic health problems that were not related to asthma. This included, but was not limited to, all children admitted with asthma as a secondary or tertiary medical diagnosis.
2. Children requiring a Community Health Nurse referral for postdischarge follow-up.
3. Children participating in another concurrent asthma education program. However, there was no attempt to exclude children who had previously participated in an asthma camp program, an asthma support group, or any other asthma education program.

The participants were selected over a 12 1/2 month period from one of two populations: (a) those admitted for asthma to either of the two inpatient units at CCH that offered the AEP or (b) those seen in the CCH emergency room for an acute episode of asthma.
Although the sample size of 50 was small, the representativeness of the sample was strengthened by the length of data collection which spanned an entire year. Thus, the sample represented variations due to seasons and the academic calendar. The subjects were randomly assigned to either the experimental or control group.

The children and parents who agreed to participate in this study willingly shared their time, questions, concerns, and eagerness to learn with the nursing staff and the investigator. Most of those who were randomly assigned to the control group indicated that they would have rather been in the experimental group, suggesting that many children with asthma and their parents desire more information. There were numerous requests from the families in both the experimental and control groups for a summary of the study results. A summary was mailed to every family in the sample.

In addition to the 50 children and parents who completed the study, there were 12 subjects who did not finish the study (see Appendix A). The primary reason was loss of contact with the family because of a disconnected phone or moving with no forwarding address. Family crises were a secondary reason. Also, there were several subjects who met the sample criteria but declined to participate because of time constraints or because they felt they did not need additional information about asthma.
The Instruments for Collecting Data

After a careful literature review, seven instruments were either adapted from existing questionnaires or designed by the investigator. Permission to adapt existing instruments was obtained from the authors. Most of the instruments were pilot-tested as indicated in the following discussion.

Nursing Assessment of the Child with Asthma and the Family

This instrument (see Appendix B) was designed in 1988 by the investigator to gather information from the parent and child about the child’s asthma history and about the parent’s and child’s knowledge base in regard to asthma. This 37-item questionnaire was administered in an interview during the initial meeting with the parent and child by the investigator. Sixteen items provided baseline data for six of the seven dependent variables in this study as well as eight of the influencing factors and three of the demographic variables that could have contributed to differences between the experimental and control groups. Twenty-eight items provided the nurse teaching the AEP with data about the learning needs of the parent and child.

This instrument provided important baseline information and helped establish initial trust with the family. The majority of parents, most of whom were mothers, readily answered the questions and were reliable informants, except for
a few who had difficulty remembering dates. Some of the questions, for example those on medications, could have been combined to facilitate flow of the interview process.

**Asthma Knowledge Questionnaire (AKQ)**

This 14-item paper-and-pencil instrument (see Appendix C) was designed by the investigator in 1988 to measure the child's knowledge of asthma, its effects, and its management. It was comprised of nine multiple-choice questions and a five-part question that asked the child to label a diagram of the respiratory system. The correct answers were based on standardized content given in the educational program. The content validity was established through careful review of the literature and existing asthma knowledge tests and through expert review by Michelle Walsh, Ph.D., R.N., The Ohio State University (OSU) College of Nursing. A pilot study, conducted during the summer of 1988 with 13 children 8 to 12 years old with asthma who did not utilize CCH for health care, showed a test-retest reliability of 0.81 for the AKQ.

This instrument determined the child's basic knowledge about asthma and its management. The pretest, taken in the presence of the investigator, provided a positive challenge for

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3 Dr. Walsh's doctoral dissertation was entitled, "The Experience of Asthma in Childhood." She has presented nationally on the subject of asthma in children. In addition she is a pediatric nurse and has served on the staff of asthma camps.
most of the children who read the questions carefully before answering them. A few of the 8-year old children needed help in reading and understanding some of the terms. This provided an opportunity for the investigator to role model for the parent how to conduct the posttest at home without influencing the child’s answer. For some of the 12-year old children, the AKQ was too easy. They were able to answer the questions quickly and correctly. Three children got 100 percent on the pretest. If this instrument is used again, it would be useful to construct two parallel versions, one for 8- to 10-year old children and one for those 11 to 12 years old.

Asthma Attitude Survey (AAS)

The original version of this instrument was developed by Rakos and colleagues (1985) to evaluate Superstuff, the American Lung Association’s self-management asthma education program for school-aged children who were 6 to 12 years old. It was designed to assess attitudes and behaviors related to asthma self-control. The instrument was adapted by Reynolds in 1985 and again by the investigator in 1988. For this study the AAS (see Appendix D) was adapted to clarify the language of some items and to change from a 3-point to a 5-point Likert scale. The content validity of the original instrument was established by the authors. Again, the content validity of the adapted 20-item instrument was established through expert
review by Michelle Walsh, Ph.D., R.N., OSU College of Nursing. A pilot study, conducted during the summer of 1988 with 13 children 8 to 12 years old with asthma who did not utilize CCH for health care, showed a test-retest reliability of 0.66 for the AAS.

This questionnaire was taken very seriously by the children. Most of them were able to use the Likert scale easily after an initial explanation. As might be expected, the younger children tended to answer either "true" or "false" to most of the statements whereas the older children selected the intermediate choices as well. The statement requiring the most explanation during the pretest was, "My asthma never gets better, no matter what I do." The positive response was "False," making it a double negative. This was confusing for the children and should be reworded if the instrument is used again.

Survey of Asthma Problems and Severity (SAPS)

This 12-item questionnaire was originally developed by Creer and Reynolds (1987) and then adapted with permission by the investigator in 1988. It gathered information from the parent in two areas: (a) the duration and number of asthma episodes as measured by the Severity and Frequency Subscale and (b) the extent to which parent thought the child’s behavior or lifestyle problems were asthma-related as indicated by the
Maturity and Independence Subscale (Reynolds, 1985). The author established a test-retest reliability of 0.82 - 0.88. SAPS was adapted by the investigator (see Appendix E) to increase the internal consistency in terminology and to substitute the term "asthma episode" for "asthma attack." It was piloted with 18 parents of the children in the pilot study for the AKQ and the AAS. A test-retest reliability of 0.69 was obtained on the adapted version. Based on this, the wording of the instrument was clarified.

This multiple-choice instrument gave parents an opportunity to express their perceptions about their child's asthma. Several stated that the questionnaire was difficult for them to complete because of the variable and episodic nature of asthma. One answer might apply one day, and another answer might be accurate another day. The questions did require careful reading, and question 8 in particular was often answered the opposite of what would have been expected, based on the answers to other questions. This was probably because the most positive answer was "e" whereas the most positive answer for all of the preceding questions was "a." If this questionnaire is used again, it should be revised so that the same letter represents the most positive response for all questions.
Parent Diary

This self-report, calendar format instrument (see Appendix F) was designed by the investigator in 1988. It was used by parents during the 12-week study period to record the dates and frequency of five specific events: (a) hospital admissions due to asthma, (b) emergency health care visits due to asthma, (c) days absent from school due to asthma, (d) episodes of altered breathing, and (e) the name, frequency, and route of all medications given for asthma. A cover sheet of instructions including examples was provided. The parent was given calendar sheets with the dates filled in for each month or part of a month in the 12-week study period. In the pilot study, the calendar and instruction sheet were given to the same 18 parents who did the pilot study for SAPS. They used it for a 2-week period and found the instruction sheet easy to follow and the blocks for each day on the calendar adequate in size.

Parents were asked to write down specific events for each day or to leave the block for the day blank if there was nothing to enter. These instructions were given orally and in writing. Some parents wrote in great detail with additional notes on the back of the page. Others left most of the blocks blank. Both methods of recording information may have been accurate for the given child, but, as with any self-report instrument, it was difficult to determine the reliability of
the information. A better design might have been to have listed each requested event in every daily block and then asked the parent to circle those that applied. Also, a few of the parents lost the diary and requested a second one to complete. They reassured the investigator either that there was very little to enter so it was easy to remember or that they had kept track on a separate calendar and could easily transfer the information. This, of course, introduced additional potential for error.

**Telephone Log**

One small but effective asthma education program reviewed in the literature included a follow-up component of telephone availability and monitoring during the 12 months over which post-treatment data were collected (Fireman et al, 1981). Such a component was planned for this study, the rationale being that changes in health behaviors require more than a short-term infusion of knowledge (Parkinson et al, 1982; Rubinson & Alles, 1984). If behaviors are to change, there need to be opportunities over time for the children and their parents to try out new behavioral patterns or skills within the context of the situations that demand them. The telephone log (see Appendix G) was devised to record the reminder phone calls that were made every other week to the parent by Alexis Jordan, a
MS. JORDAN'S SERVICES WERE MADE AVAILABLE THROUGH A GRANT FROM THE CLINICAL STUDIES CENTER AT COLUMBUS CHILDREN'S HOSPITAL.
and frequency of medications used, (b) the frequency of altered breathing episodes, (c) the number of hospitalizations, (d) the number of emergency health care visits, and (e) the number of days absent from school. In this study the asthma severity scoring system was "prorated" for 3 months.

The authors had used the scoring system in a study of 147 children with asthma who were 6 to 14 years old, but made no mention of its reliability. The reliability was discussed with Karen McCoy, M.D., Chief of Pulmonary Medicine at CCH. She was familiar with the instrument and stated that the categories, although arbitrary, are congruent with current clinical practice and do provide an appropriate basis for categorizing ordinal data related to asthma severity.

This rating system was selected because most of the controlled studies of asthma education programs discussed in Chapter II did not address differences in severity between groups. However, this system did not provide the needed information which was an indication of severity at baseline. This scoring system would have required precise information about medications and altered breathing episodes for a period of time prior to the study period and these data were not available. The scoring system was used to compare levels of severity during the study period, but since the severity criteria were also some of the dependent variables, the severity of the experimental group was altered by the asthma
education program. As might be expected, the severity level was higher in the control group. However, the difference between the two groups was not statistically significant.

The Asthma Education Program (AEP)

The development of a patient education program requires careful attention to the behavioral objectives, content, and the methods. In asthma, the triggers, early warning signs, and management strategies vary considerably from child to child, making asthma a health alteration that requires a combination of child-specific and standardized teaching content. The AEP, the independent variable for this study, was developed by Bonnie Glandon, B.S.N., R.N., a staff nurse on one of the two participating units at CCH, in collaboration with the investigator.

The Behavioral Objectives

The CCH Patient and Family Teaching Record on Asthma (see Appendix I) lists 24 specific, measurable teaching objectives. This record was revised during the summer of 1988 by the nursing staff and the investigator at CCH to incorporate two changes: (a) to state the teaching objectives in measurable terms, and (b) to sequence the objectives so they followed the "Asthma Course Outline for Nurses" (see Appendix J).
The CCH Patient and Family Teaching Record on Asthma contained the objectives for the program which were realistic for the given time frame and appropriate for the identified needs of the families in the study. For those children in the hospital, this record also provided a mechanism for documenting the teaching that occurred. However, there was no way to include this document in the medical record of the child taught at home.

The Content

The "Asthma Course Outline for Nurses," provided to each nurse teaching the AEP, provided the content outline for each of the two classes. This detailed outline was intended to be used as an instructor resource rather than a literal guide to content and sequence. The depth of content for any particular topic and the sequencing of content varied with the individual parent and child, based on the data obtained from the Nursing Assessment of the Child with Asthma and the Family and the nurse’s ongoing assessment of the child’s and parent’s learning needs.

Individual needs and differences were taken into consideration and thus helped shape each session. For example, the concepts of taking medication regularly and avoiding allergens were emphasized with all parents and children, but the discussion of particular medications and allergy avoidance
approaches was child-specific.

Two 1-hour classes were conducted individually with each child in the experimental group and at least one other adult member of the child's household. Both the child and the same parent (or other adult) were present for both sessions. The time between classes ranged from 1 day to 1 week, depending on the schedules of the family and the AEP instructor. While the targeted time was 1 hour, more emphasis was placed on the time needed to cover the information and answer the child's and parent's questions. Thus, the duration of class sessions ranged from 45 to 75 minutes.

**Class I.** The first class focused on normal lung anatomy and physiology, three changes that occur in the lungs during an asthma episode, medication actions and side effects, the concept of triggers and their avoidance, early warning signs of an asthma episode, assessing levels of respiratory distress, and breathing exercises.

**Class II.** The second class provided a brief review of Class I plus a return demonstration by the child of breathing exercises, more indepth information about child-specific triggers and how to manage them, additional discussion of early warning signs, what to do when an asthma episode first begins, when to get medical help, feelings of the parent and child, school concerns, support groups, and camps.

The content outline contained in the "Asthma Course
Outline for Nurses" was a helpful guide for planning the teaching sessions and for assuring reasonable consistency among instructors. However, the detail of the outline, necessary to provide instructor with resource information for a variety of parent and child needs, could misguide the novice instructor into teaching content intensive sessions that would eclipse the real learning needs of families. Thus, instructor preparation was an important component of this program and should be continued if the AEP is adopted by CCH.

The program was limited to two 1-hour individual sessions because the average length of hospitalization at CCH for the child with asthma is less than 3 days. However, the time was not adequate to help the parent and child assess altered breathing patterns. Parents did not ask for this, but the apparent inaccuracies in recording this information in the Parent Diaries (see Chapter IV, Discussion of Results, Altered Breathing Episodes) suggested that this may be an important need. Also, more time was needed for discussion of (a) feelings related to asthma episodes and their management, (b) problem-solving strategies for actual situations that might arise, and (c) the concept of self-management. Two alternatives are offered for expanding the program which is constrained by the short time the child is hospitalized. A third session could be given at the hospital on a monthly basis, to be attended by each child with asthma and parent
following hospital discharge. Individual telephone follow-up calls, with specific teaching objectives, could be made within two weeks of hospital discharge to the child and parent by the primary nurse.

The Methods

Instruction was provided to the families by registered nurses who met four criteria. They were (a) regular staff members of the unit to which the child was admitted, (b) had had previous experience in teaching children with chronic health problems and their parents, (c) had completed a 2 1/2 hour continuing education program about teaching the AEP conducted by the investigator, and (d) had taught the AEP at least once to an 8 to 12-year old child with asthma and the child’s parent prior to teaching participants in the study.

The asthma education program was designed to be taught by nursing staff on the unit to which the child was admitted. The nurses were well versed in the needs of the child and parent and were likely to see the family during subsequent hospital admissions, providing continuity in care and instruction. However, because of staffing limitations and high acuity levels which tended to shift the focus of nursing care away from patient education, the asthma education program sessions were conducted in the child’s home by the investigator as well as in the hospital by the nursing staff. Because there is no ongoing
health care service vehicle for providing this program at home on a regular basis, Columbus Children's Hospital should explore ways for this program to continue to be taught by staff nurses on the unit to which the child is admitted.

The asthma education program was an interactive event. The discussion format, individualized to the learning needs of the child and parent, created a relaxed and non-threatening milieu for learning. Both child and parent were present. Almost without exception, the child and parent asked many questions and shared their own experiences as a context for learning. Child and parent alike spontaneously expressed appreciation for the opportunity to talk with a health professional about asthma.

A packet of carefully selected printed materials (see Appendix K for the list of items) was provided to each parent and child. Some of these items were used in Class I, some were given to the parent and child to review between Classes I and II, and the remainder were addressed in Class II. Included were a variety of Helping Hands (CCH's Patient Teaching Sheets), a diagram of asthma-related changes occurring in the lungs, articles on dust and mold-spore allergies, an asthma find-the-word game, a body relaxation guide, information on asthma camps and support groups, Asthma Alert (information for school personnel), and The Asthma Handbook (a brochure). Both Asthma Alert and The Asthma Handbook are published by the
American Lung Association.

The packet of materials provided written and graphic reinforcement of the information presented through patient education handouts, diagrams, word games, articles, and brochures. The response by parents was enthusiastic. Many of the parents stated that they were glad to have information in writing so that they could refer to it as needed. Several expressed either that it was the first time they had received printed materials about asthma or that they had not been given any additional information since the diagnosis was first made. Others said some of the materials had been handed to them previously but without explanation so they did not appreciate them until now. A few of the parents requested extra packets to share with a relative or friend. The extra materials were provided. Parents assigned to the control group were especially pleased when told they would receive the packet of materials at the end of the study period.

The Time Frame

The total time for data collection for this study was 16 months. For each subject, it was 12 weeks plus another 2 to 4 weeks to retrieve the poststudy questionnaires.
Data Collection Period for the Subjects

Families who agreed to participate in the study took part in an initial assessment and completed the three prestudy questionnaires. Those who were randomly assigned to the experimental group also participated in two 1-hour AEP sessions. All of the families then maintained the 12-week Parent Diary described previously. At the end of the 12 weeks the three questionnaires were mailed to them for poststudy completion.

Based on 1985-1987 data from Children's Hospital Automated Medical Program (CHAMP), it was projected that a 12-week period would be enough time to determine whether a change had occurred in the frequency of health care service use following participation in the AEP. In 1987, 158 children with asthma who were 8 to 12 years old were admitted to CCH. Of these admissions, 68 were readmissions for 22 children. The average length of time between readmissions was 1.5 months (Children's Hospital Automated, 1985, 1986, 1987).

Pretreatment and Posttreatment Comparison Periods

Twelve months would have been the ideal data collection period, because it would have minimized variations related to seasonal asthma triggers and the school calendar. However, a modification that both minimized these variations and shortened the data collection period was included in the study design.
For each child, a comparison was made of the pretreatment and posttreatment periods that spanned the same calendar segment. For example, the posttreatment hospitalizations and emergency health care visits for a child in the study September 18 to November 18, 1989 were compared to the pretreatment use of health care services for September 18 to November 18, 1988. These comparisons were then analyzed as group data to determine if there was any difference (a) between the experimental and control groups or (b) between the immediate 12-week prestudy time and the 12-week prestudy time corresponding to the same calendar segment as the study period.

Although the 12-week data collection period for each subject was minimal, the study period did provide a beginning basis for evaluating the effectiveness of the asthma education program in relation to the use of health care services. Also, it may not have been realistic to collect this type of data for longer periods of time. Several families dropped out of the study during the 12-week data collection period. The attrition rate would undoubtedly increase if the data collection period were extended.
The Procedures

Informed Consent

The study was explained by the investigator to each child and parent who were qualified to participate in the study. The explanation took place in the child's hospital room or home and included the following information: (a) the time involvement, (b) the instruments, (c) the potential benefits and risks, (d) the voluntary nature of participation with the right to terminate at any time, (e) confidentiality, (f) the fact that all participants in both groups who were hospitalized would receive the "usual teaching" about asthma, and (g) the random assignment of participants to either an experimental or control group. When a signed informed consent form (see Appendix L) was obtained from the parent and the child for voluntary participation in the study and for medical record review, a copy of the signed consent form was offered to them (Silva & Sorrell, 1984).

This document was designed to meet the specifications of the Children's Hospital Research Foundation. Most parents commented on how difficult it was to read and understand. Some just signed it without reading it. Several parents expressed concern about the statement, "In the event of physical injury resulting from participating in this study, I understand that ... the costs of such treatment will be at my expense and that financial compensation is not available." The investigator
explained that the statement did not apply to this study, but that it was a required part of the document. No one refused to sign the consent form. Many of the children were curious about the consent form and asked questions about the study.

Confidentiality

All information obtained about the child and parent from the medical records, instruments, and the interviews was coded so that only the investigator could identify the children and parents. The results of this study were reported by groups only and not by individual child or parent. The coding procedures were deemed effective for maintaining strict confidentiality.

Intervention

Following voluntary, signed consent to participate, the child and parent were randomly assigned to either the control or the experimental group, as described previously. If the child was hospitalized and in the experimental group, the AEP was taught by the nursing staff or investigator after the child was medically stable and at a time when a parent or other adult living in the child's household could be present. If the child was at home and in the experimental group, the AEP was begun at the earliest date and time mutually convenient to the parent,
Data Collection

All instruments were completed by the person indicated in parentheses in the following discussion. Upon entry into the study and prior to participation in the AEP, these instruments were administered: (a) the Nursing Assessment of the Child with Asthma and the Family (investigator), (b) the Asthma Knowledge Questionnaire (child), (c) the Asthma Attitude Survey (child), and (d) the Survey of Asthma Problems and Severity (parent).

During the 12 weeks of the study, these instruments were used: (a) the Parent Diary (parent) and (b) the Phone Log (research assistant). Within 2 weeks of the completion of the 12-week study period, the following instruments were mailed to the child and parent’s home: (a) the Asthma Knowledge Questionnaire (child), (b) the Asthma Attitude Survey (child), and (c) the Survey of Asthma Problems and Severity (the same parent that completed the SAPS before the study). A cover letter instructed the parent to return these three questionnaires plus the Parent Diary in the enclosed self-stamped, self-addressed envelope.

After data collection was completed for all the subjects in the study, the investigator completed the Asthma Severity Score for each child, based on data from the Parent Diary and the child’s medical record.
Rewards

When the three post-study questionnaires and the Parent Diary were received, a thank you note and a specially designed T-shirt saying, "Thanks to a GREAT Kid!" were sent to the child. The parent and child in the control group also received a complete packet of the materials prepared for the AEP.

The T-shirt and thank-you note sent at the completion of the study were tokens of appreciation for the time and commitment invested by the families. In some families there were additional children with asthma who were not included in the study. However, they were invited to participate in the asthma education program, and they were sent T-shirts as well. For the families in the control group who received the packet of materials at the end of the study, it would have been preferable to have been able to offer them the asthma education program.

In addition to these tangible rewards, the enthusiasm of most of the families in the experimental group suggested that the opportunity to participate in the program itself was a reward.

Statistical Analysis

The data for this study were analyzed using the computer program, Statistical Package for the Social Sciences (SPSS-X), Prime Version 3.0, available through Capital University.
Levels of Measurement

There were seven dependent variables, three blocking variables, and ten influencing factors in this study. The seven dependent variables were interval level data and included the number of (a) hospitalizations, (b) emergency health care visits, (c) school absences, and (d) altered breathing episodes, and the posttest and change scores on the (e) AKQ, (f) AAS, and (g) SAPS. The prestudy data for the dependent variables were also interval level.

The variables of gender, race, and age at entry into the study were controlled through a blocking technique used in conjunction with random assignment. Gender and race were nominal level data, and age at entry into the study was interval level data.

The ten, nonparametric, influencing factors\(^5\) included (a) the grade in school at entry into the study, (b) previous participation in asthma camp, (c) previous participation in an asthma support group, (d) the age at onset of asthma\(^6\), (e) the

\(^5\) The influencing factors, although nonparametric, met three important criteria for covariates: (a) there was a linear relationship between the factors and the dependent variable; (b) the measurement of the factors occurred prior to the beginning of the study; and (c) factors were not affected by the independent variable (Kennedy & Bush, 1985).

\(^6\) The age of onset of asthma was interval level data, and thus it met the definition of covariate. However, there were more than five empty cells when it was analyzed by contingency table. Therefore, the data was recoded to ordinal level, making age at onset an influencing factor.
source of primary health care, (f) the first action taken in an asthma episode by the child or parent, (g) the presence of smokers in the household, (h) the presence of a pet in the household, (i) the instructor in the AEP, and (j) the location of the AEP. The latter two factors applied only to the experimental group. All ten of these influencing factors were nominal level data except the grade in school and the age of onset, which were ordinal level data.

**Statistical Tests**

Crosstabs were calculated to determine the frequencies within groups and the measures of association between pairs of variables. The significance of ordinal data was analyzed, using the nonparametric Mann-Whitney $U$ test.

The differences between the experimental and control groups were analyzed, using one-way analyses of variance (ANOVAs) for all of the dependent variable prestudy data and analyses of covariance (ANCOVAs) for all of the dependent variable study data, except altered breathing episodes. The ANCOVAs adjusted for initial differences between groups, using interval level prestudy data as covariates and nonparametric influencing factors as factors, in the multiple analysis of variance (MANOVA) feature of SPSS-X (Kennedy & Bush, 1985; SPSS-X User's Guide, 1988). There was no prestudy data available for altered breathing episodes, so this dependent
variable was analyzed, using an ANOVA.

Agency Support

Agency support for this study, conducted through CCH, was essential. A letter of support from Karen McCoy, M.D., Chief of Pulmonary Medicine at CCH, and a signature of endorsement from Joy Edwards-Beckett, Ph.D., D.N.S., R.N., Director of Nursing Research at CCH are included in Appendix M. This study was approved by the Human Subjects Research Committees at The Ohio State University (OSU), the Children's Hospital Research Foundation, and the Clinical Studies Committee at CCH (see Appendix N). The latter awarded the investigator a research grant which (a) funded a research assistant who organized the packets of materials and conducted the follow-up phone calls to the families in the sample, (b) covered the costs of duplicating materials and postage, and (c) provided specially designed T-shirts as a reward to the children for their participation.

As a member of the planning committee of the AEP, the investigator collaborated in the design of the educational intervention (independent variable). In addition CCH granted the investigator permission to offer a continuing education program for those staff nurses who were involved in teaching the AEP (see Appendix O). This 2 1/2 hour program, which was approved for continuing education units by the Ohio Nurses’
Association, was given during the weeks of July 18 and 25, 1988, to eight staff nurses from 5 Tower North and 6 Tower South, the two patient care units that participated in this study. The continuing education program was co-taught by the investigator and by Bonnie Glandon, B.S.N., R.N., the course outline developer and a staff nurse on 5 Tower South.

Summary

This chapter discussed the design of this experimental study, a pretest-posttest design that used a randomized block technique for random assignment of the subjects. The selection of the sample of 50 school-age children with asthma and their parents was described. The seven instruments, used to collect the data, are included in the appendices of this study. The 2-hour asthma education program, which was the independent variable, was discussed in detail, including the objectives, content, and methods. The time frame and the procedures relating to informed consent, confidentiality, intervention, and data collection were presented. This chapter concluded with a discussion of the statistical analysis and the support received from CCH, the agency through which the research was conducted.
CHAPTER IV
RESULTS AND DISCUSSION OF THE STUDY

The purpose of this chapter is to present results that demonstrate the effects of an asthma education program, designed for school-age children with asthma and their parents, on seven dependent variables: (a) the number of hospitalizations, (b) emergency health care visits, (c) school absences, and (d) altered breathing episodes, and the posttest scores on (e) the Asthma Knowledge Questionnaire (AKQ), (f) the Asthma Attitude Survey (AAS), and (g) the Survey of Asthma Problems and Severity (SAPS). The chapter begins with a discussion of the demographic characteristics of the children and eight influencing factors which could have contributed to differences between the experimental and control groups. Then, the effects of the asthma education program on each of the dependent variables are analyzed. The chapter continues with a summary of the relationship between the factors and the dependent variables. A discussion of the effects of the instructor and the location on the outcome variables concludes the chapter.
The Sample

The 50 children in this experimental study were assigned to either an experimental or control group, using a randomized block technique to control for the effects of gender, race, and age. There were 25 children in each group. Table 2 shows the distribution of gender, race, and age as well as the association between the assignment to a study group and each of these demographic characteristics.

Demographic Variables

The sample was comprised of 30 (60%) boys and 20 (40%) girls. Thirty-one (62%) of the children were white and 19 (38%) were Black. The relationship between the random assignment of children to one of two groups and the factors of gender and race was examined. The phi coefficients were 0.08 and 0.04, respectively, indicating negligible association between the group assignment and gender and race. Thus, the experimental and control groups were similar for these two demographic characteristics, as shown in Figure 2.

Two of the children were 7 years old, but they were within 1 month of 8 years. For purposes of data analysis they were considered to be 8 years old. Thus, the children ranged in age from 8 to 12 years with a mean of 9.84 and a standard deviation of 1.49. In the randomized block design, the children were categorized as 8 to 10 years and 11 to 12 years.
Table 2  
Distribution of Demographic Characteristics of the Children and their Relationship to the Study Groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Sample</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Measures of Association Between Study Group &amp; Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>20</td>
<td>40</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>Boys</td>
<td>30</td>
<td>60</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>31</td>
<td>62</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>Black</td>
<td>19</td>
<td>38</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Age at Entry in Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 to 10</td>
<td>28</td>
<td>56</td>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>11 to 12</td>
<td>22</td>
<td>44</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>
In the sample, 28 (56%) were in the younger group, and 22 (44%) were in the older group. The association between the random assignment to a group and the age category was negligible, as shown by a phi coefficient of 0.08 for ages by category and a Pearson's $r$ of -0.08 ($p = .287$) for ages by actual years. Thus, the experimental and control groups were similar with respect to age, as shown in Figure 2.

**DEMOGRAPHIC CHARACTERISTICS**

![Graph showing demographic characteristics](image)

Figure 2. Demographic characteristics of the experimental and control groups.
Factors Affecting the Dependent Variables

There are many factors in addition to demographics that can contribute to differences between groups and act as confounding variables, making the findings less definitive. In this study, there were eight additional factors that were not controlled through the design but that could have contributed to group inequality. Three of these eight factors related to prior knowledge and attitudes about asthma: the grade in school and previous participation in asthma camp or an asthma support group. Three factors related to severity: the age of onset, the source of primary health care, and the first action taken when an asthma episode occurred. Two factors have been identified as common triggers of asthma: smoking and pets in the household. The distribution of these eight factors and the measures of their association with the random assignment of children to a group are discussed in the remainder of this section and presented in Tables 3, 4, and 5.

Grade in School

The grade in school, an indicator of cognitive ability and the complexity of health information received in the school setting, could have affected scores on the AKQ. The children were in grades 2 through 7 with a mean grade level of 4.4. Grade levels were divided into two categories: grades 2 through 4 and grades 5 through 7. In the sample there were 26 (52%) at
the lower grade level and 24 (48%) in the upper grades. The experimental and control groups of 25 were evenly matched with 13 (52%) in the lower grades and 12 (48%) in the upper grades for each group. Thus, there was no association between the random group assignment and the grade level category as indicated by a phi coefficient of 0.00 (see Table 3). It can be assumed that any effect on the AKQ scores that could be attributed to the grade in school was similar for both groups.

Asthma Camp and Support Group Participation

Previous participation in an asthma camp or an asthma support group could have influenced pretest scores for the AKQ, AAS, or SAPS. Few of the children had participated in camp, and even fewer of the children and parents had been involved in an asthma support group. In the total group only five subjects had attended an asthma camp and only two had taken part in an asthma support group. The phi coefficients for camp participation and attending a support group were 0.07 and 0.00, respectively. Thus, there was negligible association between assignment to a random group and participation in asthma camp and no association between random group assignment and support group involvement (see Table 3). Any effects of previous participation in a camp or support groups on the scores for the questionnaires was similar for both groups.
Table 3

Distribution of Factors Affecting Prior Knowledge and Attitudes about Asthma and their Relationship to the Study Groups

<table>
<thead>
<tr>
<th>Study Groups</th>
<th>Sample</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Measures of Association Between Study Group and Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and Attitude Factors</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Grade in School</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 to 4</td>
<td>26</td>
<td>52</td>
<td>13</td>
<td>52</td>
</tr>
<tr>
<td>5 to 7</td>
<td>24</td>
<td>48</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Camp Participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>No</td>
<td>45</td>
<td>90</td>
<td>23</td>
<td>92</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Support Group Participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>48</td>
<td>96</td>
<td>24</td>
<td>96</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>
The literature suggests that there may be a relationship between increased severity and the younger the age at which wheezing episodes begin (Behrman and Vaughn, 1983). The level of severity, in turn, may have affected the dependent variables of hospitalizations, emergency room use, days missed from school, and altered breathing episodes. The age of onset was based on parent report and analyzed from two perspectives: by category and by actual years. The four categories for age of onset were (a) 0 to 1 year, (b) 2 to 3 years, (c) 4 to 6 years, and (d) 7 to 11 years. In each group of children, 13 (52%) had experienced asthma prior to 3 years of age. In the control group, the age of onset for 6 (24%) children was during infancy, whereas in the experimental group, the earliest age of onset was 1 year. The relationship between the random group assignment and the age of onset by category was moderate, as shown by Cramer's V of 0.36 (see Table 4). Because of this moderate association, the Mann-Whitney U Test was conducted. The U statistic = 256 with a Z score of -1.13 and a 2-tailed p = .26. The critical value for a Z score for a 2-tailed test at alpha = .05 is ±1.96. Although the age at which asthma was first identified was younger for the control group, the difference between the two groups in age of onset by category was not significant.
Table 4
Distribution of Factors Affecting Severity and their Relationship to the Study Groups

<table>
<thead>
<tr>
<th>Severity Factor</th>
<th>Sample</th>
<th>Study Groups</th>
<th>Measures of Association Between Study Group and Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Age of Onset (by age category)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1 years</td>
<td>11</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 years</td>
<td>15</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-6 years</td>
<td>12</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-11 years</td>
<td>12</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Primary Care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td>31</td>
<td>62</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER or UCC</td>
<td>15</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic</td>
<td>4</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
</tr>
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<td>First Action</td>
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<tr>
<td>Oral Med</td>
<td>11</td>
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<td>7</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Rest/Relax</td>
<td>11</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td></td>
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<tr>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td>3</td>
<td>6</td>
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</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>
The age of onset in actual years ranged from infancy to 11 with a mean of 4.02 years and a standard deviation of 3.1. The coefficient for Pearson's $r$ was 0.15 ($p = .149$), indicating a low association between the random group assignment and the age of onset in actual years. Thus, any group differences in the use of health care services or in school absences that are due to the age of onset were assumed to be minimal.

**Primary Health Care Provider**

The source of primary health care may also be related to severity and therefore influence health care utilization and school absences. Children who are followed by a private physician have the benefit of consistent care over time. Children who use the emergency room, urgent care center, or clinic for primary care are often seen by a different physician at each visit. This can interfere with a consistent relationship with a health care provider and may introduce varying approaches to the management of asthma which can be confusing to the family.

In this study, the primary providers were categorized as private physician, emergency room or urgent care center, and hospital clinic. The majority of the children in the sample,

\footnote{Infancy was defined as younger than 1 year or 12 months of age. For purposes of this study, onset of asthma in infancy was assigned a value of 0 years.}
31 (62%), used a physician for primary care. In the experimental group, 19 (76%) of the children were seen by a private physician for primary care, while the control group utilized a physician only slightly more than they used the emergency room or an urgent care center, 12 (48%) and 11 (44%), respectively. Cramer’s $V$ statistic of 0.31 showed a moderate association between random group assignment and the primary provider, suggesting some group inequality on this basis (see Table 4). Because of this moderate association, the Mann-Whitney $U$ Test was calculated. The $U$ statistic = 232 resulted in a $Z$ score of -1.82 and a 2-tailed $p = .07$. The critical value for a $Z$ score for a 2-tailed test at alpha = .05 is $\pm 1.96$.

Most of the children in the experimental group saw a private physician whereas the control group was nearly equal in their use of a private physician and the emergency room. However, the differences between the experimental and control groups in the use of health care services and in school absences were influenced only minimally by the choice of primary health care provider according to statistical analysis.

**First Action in an Asthma Episode**

The first action taken by the parent or child for an asthma episode could have influenced the outcome of the episode and thus affected the number of school absences and the need
for emergency health care. First actions were divided into
seven categories based on parent report: aerosol, inhaler, oral
medication, contacting a physician (either by phone or making a
visit), rest or relaxation, other (taking the child's
temperature, assessing the breathing problems, encouraging
breathing exercises), and "unsure." In the experimental group,
the majority of the children and parents, 18 (72%), took first
actions that were related to giving medications and obtaining
medical help. In the control group, the first actions were
equally divided between medications and physician, and rest or
relaxation and other approaches, with 12 (48%) in each
division. Cramer's $V$ coefficient of 0.41 showed a moderate
association between the study group and the first action taken,
suggesting some group inequality on this basis (see Table 4).
However, the Mann-Whitney $U$ Test gave a $U$ statistic of 266.5
with a $Z$ score = -.91 and a 2-tailed $p = .36$. The critical
value for a $Z$ score for a 2-tailed test at alpha = .05 is
$\pm 1.96$.

The first action of most subjects in the experimental
group was the administration of medication while the control
group relied more heavily on nonpharmacological approaches.
However, the group differences in emergency health care visits
and in school absences attributable to the first action taken
by the child or parent were minimal.
Passive Smoking

Passive smoking has been shown to be a trigger and a significant aggravating factor in asthma. Boys are more sensitive to cigarette smoke than girls, and older children who have had more exposure to second-hand smoke are more affected by it (Murray & Morrison, 1989). Therefore, passive smoking could have impacted the number of altered breathing episodes and days missed from school in the children in this study. In the sample, there were smokers in 22 (44%) of the households. One or both parents of 9 (36%) of the children in the experimental group were smokers. The number of parents who smoked in the control group was 13 (52%). The phi coefficient of 0.16 showed a low association between the random group assignment and the presence of smokers in the household (refer to Table 5). It is unlikely that group differences in school absences and in altered breathing episodes were attributable to passive smoking.

Pets

Fur-bearing and feathered pets are aggravating factors for children who are sensitive to these allergens. The presence of these pets in the household could have affected the number of altered breathing episodes and possibly precipitated asthma episodes, leading to school absences and emergency health care visits. No distinction was made between indoor and
outdoor pets. In the sample there were 28 (56%) households with pets. Thirteen (52%) of the families in the experimental group had pets, while 15 (60%) in the control group were pet owners. The phi coefficient of 0.08 showed negligible association between random assignment to a group and the presence of pets in the home (refer to Table 5).

Discussion of the Influencing Factors

This section has described the effects of eight factors that could have influenced the dependent variables in this study. The association with random group assignment was negligible or none for four of the influencing factors that were not controlled by design: grade in school, previous participation in asthma camp and an asthma support group, and the presence of pets in the household. Thus, group differences cannot be explained by these factors.

For a fifth factor, the presence of smokers in the household, there was a low association with the study groups indicating a possible effect on group differences. There was a moderate association between random assignment to a group and the remaining three factors which were all related to severity: the age of onset of asthma, the source of primary health care, and the first action taken by the parent or child when an asthma episode occurred. This suggested that these factors may have been confounding variables that affected group differences.
for the dependent variables. However, nonparametric analysis of categorical data for these three factors, using the Mann-Whitney U Test, showed no significant differences between the groups. Analyses of covariance were also conducted for each of the seven dependent variables to parcel out the effects of these influencing variables.

Table 5

Distribution of Factors that Trigger Asthma and their Relationship to the Study Groups

<table>
<thead>
<tr>
<th>Triggers</th>
<th>Study Groups</th>
<th>Measures of Association Between Study Group &amp; Trigger</th>
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<tr>
<td></td>
<td>Sample</td>
<td>Experimental Group</td>
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<tr>
<td>Smoking</td>
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<td>%</td>
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<td>Yes</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>No</td>
<td>28</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Pets</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Yes</td>
<td>28</td>
<td>56</td>
</tr>
<tr>
<td>No</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Low Association

Negligible Association
The age at which asthma was first identified was younger for the control group. The source of primary health care for most of the children in the experimental group was a private physician whereas the control group was nearly equal in their use of a private physician and the emergency room. The first action of most subjects in the experimental group was the administration of medication while the control group relied more heavily on nonpharmacological approaches.

The Null Hypotheses

This section analyzes the data for each of the seven null hypotheses and discusses the effects of the asthma education program on the seven dependent variables which include the number of (a) hospitalizations, (b) emergency health care visits, (c) school absences, and (d) altered breathing episodes, and the posttest scores on (e) the Asthma Knowledge Questionnaire, (f) the Asthma Attitude Survey, and (g) the Survey of Asthma Perception and Severity.

Null Hypothesis #1: Number of Hospitalizations

The null hypothesis stated that there was no significant difference between the two groups of children at the end of the 12-week study period in the number of hospital admissions for asthma. The null hypothesis was accepted, based on the following statistical analysis.
Two sources of data were utilized: medical records and parent diaries. Where there was a discrepancy, the parent was telephoned. If the discrepancy could not be satisfactorily explained, the medical record data were used.

Since asthma has a strong seasonal component in many children, the number of hospitalizations for asthma prior to the study was analyzed for three different time periods to determine if the study groups were similar in baseline data for hospitalizations. The three periods were (a) all previous hospitalizations for asthma since birth, (b) the 12 weeks immediately preceding the study period, and (c) the 12-week period prior to the study that was in the same calendar segment as the study period. See Table 6 for descriptive and inferential statistics related to hospitalizations.

The number of all previous hospitalizations for asthma ranged from 0 to 8, with a mean of 2.08 and a standard deviation of 1.85. In the sample 7 (14%) of the children had never been hospitalized, 17 (34%) had been hospitalized once, 12 (24%) had been in the hospital twice, and 14 (28%) had experienced three or more hospital admissions. In both the experimental and control groups, most of the children had had one to two hospitalizations, but the group means differed. In the experimental group, there were one or two hospitalizations for 14 (56%) of the 25 children with a mean of 1.80. In the control group, 15 (60%) of the children had been hospitalized.
Table 6
Descriptive Data and Analyses of Variance and Covariance for Hospitalizations

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<thead>
<tr>
<th>Time Periods</th>
<th>Sample Range</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Previous Hospitalizations</td>
<td>0-8</td>
<td>2.08</td>
<td>1.85</td>
<td>1.80</td>
<td>1.61</td>
<td>2.36</td>
<td>2.06</td>
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<tr>
<td>12-Week Prestudy Period (immedi-</td>
<td>0-2</td>
<td>0.68</td>
<td>0.51</td>
<td>0.60</td>
<td>0.50</td>
<td>0.76</td>
<td>0.52</td>
</tr>
<tr>
<td>ately before)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-Week Prestudy Period (same as</td>
<td>0-1</td>
<td>0.10</td>
<td>0.30</td>
<td>0.08</td>
<td>0.28</td>
<td>0.12</td>
<td>0.33</td>
</tr>
<tr>
<td>study period)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-Week Study Period</td>
<td>0-1</td>
<td>0.10</td>
<td>0.30</td>
<td>0.04</td>
<td>0.20</td>
<td>0.16</td>
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Analysis of Variance

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<th>F*</th>
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<td>All Previous Hospitalizations</td>
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<td>3.92</td>
<td>3.92</td>
<td>1.15</td>
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<td>3.41</td>
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<td>Within Groups</td>
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<tr>
<td>Total</td>
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Analysis of Covariance

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<td>0.03</td>
<td>0.36</td>
<td>0.553</td>
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<td>0.20</td>
<td>0.20</td>
<td>2.19</td>
<td>0.145</td>
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<tr>
<td>Between Groups</td>
<td>47</td>
<td>4.29</td>
<td>0.09</td>
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<td>Within Groups</td>
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<tr>
<td>Total</td>
<td>49</td>
<td>4.52</td>
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Analysis of Covariance

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<td>0.07</td>
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<tr>
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<td>0.19</td>
<td>2.15</td>
<td>0.149</td>
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<td>study period)</td>
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<tr>
<td>Between Groups</td>
<td>47</td>
<td>4.25</td>
<td>0.09</td>
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<tr>
<td>Within Groups</td>
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<tr>
<td>Total</td>
<td>49</td>
<td>4.61</td>
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* The critical F (1,48) = 4.04 at alpha = .05.
* The critical F (1,47) = 4.05 at alpha = .05.
once or twice with a mean of 2.36.

The number of hospital admissions in the 12 weeks immediately preceding the study period ranged from 0 to 2 with a mean of 0.68 and a standard deviation of 0.51. In the sample 17 (34%) of the children had never been in the hospital and 32 (64%) had been hospitalized once. In the experimental group 15 (60%) of the 25 children were hospitalized once during this time period for a mean of 0.60. In the control group 17 (68%) had been hospitalized once, 7 (28%) not at all, and 1 (4%) child was hospitalized twice for a mean of 0.76.

The number of hospitalizations in the 12-week prestudy period that corresponded to the study period had a range of 0 to 1, a mean of 0.10, and a standard deviation of 0.30. Forty-five (90%) of the children in the sample had not been hospitalized during this period. Only 2 (8%) of the those in the experimental group and 3 (12%) of those in the control group were in the hospital, as reflected in the respective means of 0.08 and 0.12.

For each of these three time periods prior to the study, a one-way analysis of variance was used to determine the calculated F ratio, which was compared to the critical value of F (1, 48) of 4.04. There were no significant differences between the experimental and control groups for any of the three prestudy time periods as shown by the calculated F ratios of 1.15, 1.22, and 0.21. Thus, the two groups were similar in
baseline data for hospitalizations.

During the study period, the children in the sample were hospitalized either once or not at all. Forty-five (90%) of the 50 children had no hospitalizations. The sample mean was 0.10, and the standard deviation was 0.04. In the experimental group, only 1 (4%) child out of 25 was hospitalized. Four (20%) were hospitalized in the control group. The experimental and control means were 0.04 and 1.60, respectively. Figure 3 compares the mean number of hospitalizations for the

![Diagram showing Utilization of Health Care Services](image)

Figure 3. A comparison of hospitalizations and emergency health care visits between the experimental and control groups for the two prestudy periods and the study period.
experimental and control groups for the two prestudy periods and the study period.

Measures of association were calculated to determine the relationship between the number of hospitalizations in each of two prestudy periods and the study period. Pearson’s $r$ was $-0.05$ ($p = .36$) for the 12-week study period and the 12 weeks immediately prior to the study period, indicating a negligible association. For the study period and the 12-week prestudy period that corresponded with the same calendar segment as the study period, Pearson’s correlation was $-0.11$ ($p = .22$), showing a low association. The association between the corresponding 12-week prestudy period and the 12-week prestudy period immediately preceding the study period was strong, as shown by Pearson’s $r = .21$ ($p = .07$). This suggests that many of the same children were hospitalized for each of these periods.

Analyses of covariance were used to adjust for initial differences between the groups and to determine the calculated $F$ ratios, which were compared to the critical value of $F(1,47)$ of 4.05. The two 12-week study periods were used as covariates. There were no significant differences between the experimental and control groups as shown by calculated $F$ ratios of 2.19 when the 12-week prestudy period immediately prior to the study period was the covariate, and 2.15 when the prestudy period corresponding to the study period was the covariate.
In summary, the frequency of hospital admissions in the experimental group did not decrease significantly \((p = .16)\) during the study period. The number of hospitalizations during the study period for both groups was very small with experimental and control group means of 0.04 and 1.6, respectively. One-way analysis of variance showed no significant differences between the two groups in total number of prestudy hospitalizations. Analyses of covariance, in which each of the prestudy periods was used as a covariate, showed no significant difference between the two groups in the number of hospitalizations during the study period. Thus, the null hypothesis for the number of hospitalizations was accepted.

**Null Hypothesis #2: Number of Emergency Health Care Visits**

The null hypothesis stated that there was no significant difference between the two groups of children at the end of the 12-week study period in the number of emergency health care visits for asthma. The null hypothesis was rejected, based on the following analysis of data.

Emergency health care visits included visits to the emergency room, an urgent care center, or unscheduled visits to a physician. Two data sources were utilized: medical records and parent diaries. Where there was a discrepancy, the parent was contacted. If the discrepancy could not be satisfactorily explained, the data from medical records were used.
Again, because of the strong seasonal component in many children, the number of visits for emergency health care for asthma prior to the study was analyzed for three different time periods to determine similarity between the experimental and control groups in baseline data for emergency health care visits. These periods were (a) the year prior to the study, (b) the 12 weeks immediately preceding the study, and (c) the 12 weeks prior to the study in the calendar segment corresponding with the study period. See Table 7 for the descriptive and inferential statistics related to emergency health care visits.

The number of emergency health care visits in the year prior to the study ranged from 1 to 8, with a mean of 2.56 and a standard deviation of 1.69. In the sample, 17 (34%) of the children had one visit, 12 (24%) had 2 visits, and 21 (42%) had three or more visits. Eleven (44%) of the 25 children in the experimental group had one emergency health care visit, 5 (20%) had two visits, and 9 (36%) had three or more visits for a mean of 2.32. In the control group, the frequencies for one, two, and three or more visits were 6 (24%), 7 (28%), and 12 (48%), respectively, with a mean of 2.80.

In the 12-week period immediately preceding the study, the number of visits ranged from 1 to 5 with a mean of 1.74 and a standard deviation of 0.94. Twenty-six (52%) of the children made one visit and 14 (28%) made two visits. In the
Table 7
Descriptive Data and Analyses of Variance and Covariance for Emergency Health Care Visits

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>12 Months Prior to Study</td>
<td>1-8</td>
<td>2.56</td>
<td>1.69</td>
<td>2.32</td>
<td>1.62</td>
<td>2.80</td>
<td>1.76</td>
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<tr>
<td>12-Week Prestudy Period (immediately before)</td>
<td>1-5</td>
<td>1.74</td>
<td>0.94</td>
<td>1.48</td>
<td>0.82</td>
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<td>12-Week Prestudy Period (same as study period)</td>
<td>0-2</td>
<td>0.30</td>
<td>0.58</td>
<td>0.36</td>
<td>0.64</td>
<td>0.24</td>
<td>0.52</td>
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<td>12 Week Study Period</td>
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<td>0.76</td>
<td>1.12</td>
<td>0.44</td>
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Analysis of Variance

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<th>ss</th>
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<th>F</th>
<th>p</th>
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<td>12 Months Prior to Study</td>
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<tr>
<td>Between Groups</td>
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<td>2.88</td>
<td>2.88</td>
<td>1.01</td>
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<td>Within Groups</td>
<td>48</td>
<td>137.44</td>
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<tr>
<td>Total</td>
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Analysis of Covariance

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<tbody>
<tr>
<td>12-Week Study Period with</td>
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<td></td>
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<td></td>
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<tr>
<td>12-Week Prestudy Period (immediately before) as Covariate</td>
<td>Regression</td>
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<td>2.47</td>
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<td>0.139</td>
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<tr>
<td>Within Groups</td>
<td>47</td>
<td>51.32</td>
<td>1.09</td>
<td></td>
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<tr>
<td>Total</td>
<td>49</td>
<td>58.47</td>
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Analysis of Covariance

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<th>ms</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-Week Study Period with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-Week Prestudy Period (same as study period) as Covariate</td>
<td>Regression</td>
<td>1</td>
<td>0.78</td>
<td>0.78</td>
<td>0.66</td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>5.49</td>
<td>5.49</td>
<td>4.67</td>
<td>0.036</td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td>55.22</td>
<td>1.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>61.49</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a The critical F (1,48) = 4.04 at alpha = .05.
b The critical F (1,47) = 4.05 at alpha = .05.
experimental group, for which the mean was 1.48, only 8 (32%) of the children made more than one visit. In the control group, twice as many, or 16 (64%), made more than one visit; the mean for this group was 2.00.

Visits in the 12-week prestudy calendar segment that corresponded with the study period ranged from 0 to 2, with a mean of 0.30 and a standard deviation of 0.58. The majority of children in the sample, 38 (76%), had had no emergency health care visits in this time period. In the experimental and control groups, the means were 0.36 and 0.24, respectively. Of those children who had made one or two visits, there were 7 (28%) in the experimental group and 5 (20%) in the control group.

For each of these three prestudy time periods, a one-way analysis of variance was used to determine the calculated $F$ ratio which was compared to the critical value of $F (1,48)$ of 4.04. There were no significant differences between the experimental and control groups for the three time periods, as shown by the calculated $F$ ratios of 1.01, 4.03, and 0.52. The two groups were similar in baseline data for emergency health care visits.

During the study period, the number of emergency health care visits ranged from 0 to 4, with a mean of 0.76 and a standard deviation of 1.12. The mean for the experimental group was 0.44, and the mean for the control group was 1.08.
In the sample, 31 (62%) of the children had no visits and 14 (28%) had one or two visits. In the experimental group 18 (72%) of the children had no emergency health care visits whereas in the control group 13 (52%) had no visits.

Measures of association showed a low relationship between the 12-week period immediately preceding the study period and the 12-week prestudy period corresponding to the same calendar segment as the study, with Pearson’s $r = -0.08$ ($p = .29$). This suggests that these prestudy periods provided baseline data that were quite different. There was also a low relationship between the study period and the prestudy period corresponding in time to the study period, with Pearson’s $r = 0.08$ ($p = .29$). However, the relationship between the 12-week period just prior to the study period and the study period was significant with Pearson’s $r = 0.35$ ($p = .007$). Further evidence for this is provided by a regression analysis for these two time periods, showing $t = 2.07$ ($p = .044$). Thus, the 12-week period just prior to the study period is strongly associated with the study period.

Also, the relationship between the number of emergency health care visits and the number of hospitalizations during the study period was determined, using Pearson’s correlation. The coefficient was $r = 0.43$ ($p = .0008$), showing a very strong association.
A one-way analysis of variance was used to determine a calculated $F$ ratio of 1.01 for emergency health care visits in the year prior to the study at alpha = 0.05. This was compared to the critical value of $F(1,48)$ of 4.04. There were no significant differences between the experimental and control groups. Thus, the groups were similar in baseline data for emergency health care visits during the past year.

Analyses of covariance were used to adjust for initial group differences, with the prestudy periods as covariates, and to calculate the $F$ ratios, which were compared with the critical value for $F(1,47)$ of 4.05 to determine if there were significant differences at alpha = 0.05. The calculated $F$ ratio, with the 12-week period immediately prior to the study period used as the covariate, was 2.26 ($p = .139$). However, the calculated $F$ ratio, with the 12-week prestudy period corresponding to the study period used as covariate, was 4.67 ($p = .036$). Therefore, when initial group differences were adjusted for the 12-week prestudy period corresponding to the study period, there was a significant difference between the two groups in the number of emergency health care visits for asthma during the study period. The null hypothesis was rejected with $p < .05$.

Because there was a significant difference between the groups in the number of emergency health care visits during the study period, when adjusted for visits during the prestudy
period corresponding to the study period, analyses of
covariance were used to determine the effects of the eight
influencing factors. The difference between groups remained
significant at the level shown in parentheses for five of the
factors when each one was analyzed separately as a
nonparametric covariate: (a) previous camp participation ($p = .036$), (b) previous support group participation ($p = .032$), (c)
age at onset of asthma ($p = .043$), (d) smokers in the household
($p = .035$), and (e) pets in the household ($p = .037$). When these
five factors were analyzed together and their effects factored
out, the difference between groups still remained significant at
$p = .037$. Thus, these factors do not account significantly for
between group variability. However, the other three factors:
(a) grade in school ($p = .071$), (b) source of primary health
care ($p = .107$), and (c) first action taken during an asthma
episode ($p = .082$), do account for some of the between group
variability, and therefore, they are confounding variables.

In summary, the number of emergency health care visits
were significantly decreased in the experimental group ($p
< .05$). These findings are congruent with those of two previous
studies in which asthma education programs resulted in a
significant reduction in emergency health care (Clark, 1986;
Lewis, 1984). Figure 3 compares the number of emergency health
care visits for the 12 weeks prior to the study period with the
study period in both the experimental and control groups.
Seventy-two percent of the children in the experimental group had no emergency health care visits during the 12-week study period. In the control group only 52 percent experienced no emergency visits. However, the experimental group also had fewer emergency visits in two of the three baseline periods. In the 12 months prior to the study, the respective means for the experimental and control groups were 2.32 and 2.80. In the 3 months prior to the study, the experimental and control group means were 1.48 and 2.00, respectively. Only in the 12 week prestudy period that corresponded to the study period calendar segment did the experimental group mean of 0.36 exceed the control groups mean of 0.24 for emergency visits. Thus, the significant difference during the study period could be partly explained by baseline differences, even though those differences were not statistically significant. Nonetheless, the asthma education program did reduce the frequency of emergency health care visits in this study.

**Null Hypothesis #3: Number of School Absences**

The null hypothesis stated that there was no significant difference between the two groups of children at the end of the 12-week study period in the number of school days missed due to asthma. Based on the following data analysis, the null hypothesis was accepted.
Data on the number of days absent were available from the schools in which the children were enrolled, but the specific causes of absenteeism were not available. Therefore, the data for this study were based solely on parent report. Because the number of absences prior to the study depended on parent recall, the data were organized into four categories: (a) no days missed until now, (b) less than 1 day missed per month, (c) more than 1 day missed per month but less than 1 per week, and (d) more than 1 day missed per week. Refer to Table 8 for

Table 8
Descriptive Data and Analysis of Covariance for the Actual Number of School Absences

<table>
<thead>
<tr>
<th>Study Groups</th>
<th>Sample</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>50</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Range</td>
<td>0-14</td>
<td>0-8</td>
<td>0-14</td>
</tr>
<tr>
<td>M</td>
<td>1.94</td>
<td>1.36</td>
<td>2.60</td>
</tr>
<tr>
<td>SD</td>
<td>3.23</td>
<td>2.52</td>
<td>3.75</td>
</tr>
</tbody>
</table>

Analysis of Covariance

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>ms</th>
<th>F*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>16.82</td>
<td>16.82</td>
<td>1.74</td>
<td>0.194</td>
</tr>
<tr>
<td>Within Groups</td>
<td>42</td>
<td>405.60</td>
<td>9.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>421.82</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The critical F (1,42) = 4.07 at alpha = .05.
the descriptive and inferential statistics related to school absences.

Prior to the study period, 20 (40%) of the 50 children in the sample were in the third category, 18 (36%) were in the second category, and the remaining 12 (24%) were evenly divided between the first and fourth categories. Most of the children in both groups were in the second or third categories. In the experimental group of 25 children, 10 (40%) were in category two, and 10 (40%) were in category three. In the control group, 8 (32%) were in the second category, and 10 (40%) were in the third category. These ordinal data were analyzed using a Mann-Whitney U Test. The U statistic = 236.5 had a Z score of -1.57 and a 2-tailed p = .12. The critical value for a Z score for a 2-tailed test at alpha = .05 is ±1.96. Therefore, during the current year prior to the study period, there was no significant difference between the two groups in the number of days missed from school.

Data for the 12-week study period were based on the Parent Diary. If part of that 12-week period included weekdays during which no school was scheduled (i.e., holidays and summer), the parent was asked to note on the Parent Diary if the child was sick enough to be kept home from school, in which case it was counted as a school absence. Data for the study period were organized in two ways: the same four categories used for the prestudy period and the actual count of days
absent due to asthma.

Looking at the four categories, 30 (60%) of the 50 children in the sample missed no days of school, and 8 (16%), 11 (22%), and 1 (2%) were in the second, third, and fourth categories, respectively. Within the groups of 25, 18 (72%) missed no school in the experimental group and 12 (48%) missed no days in the control group. Again, these ordinal data were analyzed using a Mann-Whitney U Test. Based on the U statistic of 243, the Z score of -1.54 had a 2-tailed p = .12. The critical value for a Z score for a 2-tailed test at alpha = .05 is +1.96. Therefore, the null hypothesis was accepted. There was no significant difference between the two groups in the number of days missed from school during the study period based on the four categories of absenteeism.

By actual count, school absences ranged from 0 to 14, with a mean of 1.94 and a standard deviation of 3.25. The majority of the children, 30 (60%), missed no school during the study period, but there were differences in the group means. In the experimental group of 25 children, 18 (72%) missed no school for a mean of 1.36. In the control group, 12 (48%) attended school without absences for a mean of 2.52.

An analysis of covariance was used to adjust for initial group differences and to test the hypothesis, based on the actual number of school absences in the study period at alpha = 0.05. The prestudy data were categorical, based on parent
information, and were analyzed as a nonparametric factor. The calculated $F$ ratio of 1.74 ($p = .194$) was less than the critical $F (1,42)$ value 4.07. Therefore, the null hypothesis was accepted.

In summary, there was no significant difference between the two groups in school absenteeism ($p = .194$), when adjusted for initial differences between groups in school absences for the preceding school year.

**Null Hypothesis #4: Number Altered Breathing Episodes**

Wheezing has often been considered the primary clinical sign of asthma. In fact, there are several alterations in breathing patterns in addition to wheezing that may occur during an asthma episode (Taussig, 1989). Therefore, in this study wheezing, coughing, rapid breathing, shortness of breath, gasping for air, and difficult breathing were all considered to be altered breathing episodes.

The null hypothesis stated that there was no significant difference between the two groups of children in the number of episodes of altered breathing during the study period. The null hypothesis was accepted as demonstrated in the following analysis of data.

There was no reliable means to obtain data for the prestudy period. Data for the study period were obtained solely from the Parent Diary for which parents were asked to
record each altered breathing episode. The data were organized in two ways: (a) the number of altered breathing episodes organized into four categories: none, 1 to 4, 5 to 10, and 11 to 93, and (b) the actual count of altered breathing episodes. Refer to Table 9 for the descriptive and inferential statistics related to altered episodes of breathing.

Table 9

Descriptive Data and Analysis of Variance for the Actual Number of Altered Breathing Episodes During the Study

<table>
<thead>
<tr>
<th>Study Groups</th>
<th>Sample Group</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>0-93</td>
<td>0-93</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>8.36</td>
<td>6.68</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>17.81</td>
<td>18.67</td>
</tr>
</tbody>
</table>

One-way Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>ms</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>141.12</td>
<td>141.12</td>
<td>0.44</td>
<td>0.51</td>
</tr>
<tr>
<td>Within Groups</td>
<td>48</td>
<td>15404.40</td>
<td>320.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>15545.52</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The critical $F (1,42) = 4.07$ at alpha = .05.
Based on the four categories, 15 (30%) of the 50 children in the sample experienced no episodes of altered breathing. Fifteen (30%) had 1 to 4 episodes, 11 (22%) had 5 to 10 episodes, and 9 (18%) had 11 to 93 episodes. In 23 (92%) of the experimental group and 18 (72%) of the control group, there were 10 or fewer episodes in the study period or an average of 3.33 or fewer per month.

A Mann-Whitney U Test for ordinal data was used to test the hypothesis at alpha = 0.05 for the categories of altered breathing episodes. The Z score of -1.74 had a 2-tailed p = .08. The critical value for a Z score for a 2-tailed test at accepted. There was no significant difference between the groups in the number of altered episodes of breathing by categories during the study period.

By actual count, the number of altered breathing episodes ranged from 0 to 93 with a mean of 8.36, a standard deviation of 17.81, and mean squares of 141.12 for between groups and 320.93 for within groups. Fifteen (30%) of the 50 children in the sample experienced no episodes of altered breathing in the 12 week study period, 10 (20%) experienced one episode, 10 (20%) had 2 to 15 episodes, and 5 (10%) had 21 to 93 episodes.

A one-way analysis of variance was calculated to test the hypothesis. The calculated F ratio was 0.44. Compared to the critical F (1,48) value of 4.04, the null hypothesis was accepted. There was no significant difference between the
study groups in the actual number of altered breathing episodes in the study period.

In summary, there was no significant decrease ($p = .51$) in the number of altered breathing episodes in the experimental group during the study period. These data, based solely on parent report, were probably the least reliable of any collected in this study. Evidence for this comes from the fact that most of the Parent Diary entries for hospitalizations, emergency health care visits, and school absences made no mention of concurrent altered breathing episodes. This suggests that many altered breathing episodes may have been overlooked. There are two possible explanations. Either there may have been a lack of understanding as to what comprises an altered breathing episode. Or, only the more definitive outcome which implied altered breathing episodes was recorded.

These data were recoded and analyzed by category with a $p = .08$. This showed much more of a decrease in the experimental group, but the difference was still not statistically significant. No baseline data were available for this dependent variable.

Null Hypothesis #5: The Asthma Knowledge Questionnaire (AKQ)

The null hypothesis stated that there was no significant difference between the two groups of children in their knowledge about asthma at the end of the 12-week study period.
as measured by the AKQ. The null hypothesis was rejected, based on the following data analysis.

The AKQ measured the children’s basic knowledge about asthma and asthma management. Three scores were obtained: pretest, posttest, and the change score which was the difference between the pre-/posttest scores. The distribution of scores and related descriptive and inferential statistics are presented in Table 10.

The pretest scores for the total sample ranged from 2 to 14 with a possible minimum of 0 and a maximum of 14. The mean was 9.4, and the standard deviation was 3.23. The means for the experimental and control groups were 9.28 and 9.52, respectively. Based on a one-way analysis of variance, the calculated $F$ ratio from the sample data was 0.07. The critical value for $F (1,48)$ was 4.04. Therefore, there was no significance difference between the two study groups in the AKQ mean pretest scores. This suggests that both groups were similar in their basic knowledge of asthma at baseline.

The AKQ posttest scores for the sample ranged from 6 to 14 with a mean of 11.58 and a standard deviation of 2.21. The means for the experimental and control groups were 12.2 and 11.0, respectively. The AKQ change scores were analyzed also. The change score was the difference between the pretest and posttest score. The range for all subjects was -4 to 11 with a mean of 2.18 and a standard deviation of 0.47.
Table 10

Descriptive Data and Analyses of Variance and Covariance for the Asthma Knowledge Questionnaire (AKQ) Scores

<table>
<thead>
<tr>
<th>Scores</th>
<th>Sample Range</th>
<th>Sample M</th>
<th>Sample SD</th>
<th>Experimental Group M</th>
<th>Experimental Group SD</th>
<th>Control Group M</th>
<th>Control Group SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>2-14</td>
<td>9.40</td>
<td>3.23</td>
<td>9.28</td>
<td>3.60</td>
<td>9.52</td>
<td>2.89</td>
</tr>
<tr>
<td>Posttest</td>
<td>6-14</td>
<td>11.58</td>
<td>2.20</td>
<td>12.20</td>
<td>1.96</td>
<td>10.96</td>
<td>2.30</td>
</tr>
<tr>
<td>Change</td>
<td>-4-11</td>
<td>2.18</td>
<td>3.34</td>
<td>2.92</td>
<td>3.56</td>
<td>1.44</td>
<td>3.00</td>
</tr>
</tbody>
</table>

One-way Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>ms</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Between Groups</td>
<td>1</td>
<td>0.72</td>
<td>0.72</td>
<td>0.07</td>
<td>0.80</td>
</tr>
<tr>
<td>Within Groups</td>
<td>48</td>
<td>511.28</td>
<td>10.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>512.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis of Covariance

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>ms</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest Regression with Pre-test as Covariate</td>
<td>1</td>
<td>21.61</td>
<td>21.61</td>
<td>5.15</td>
<td>0.028</td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>20.75</td>
<td>20.75</td>
<td>4.94</td>
<td>0.031</td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td>197.35</td>
<td>4.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>239.71</td>
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</tbody>
</table>

Analysis of Covariance

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>ms</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Score Regression with Pre-test as Covariate</td>
<td>1</td>
<td>322.65</td>
<td>322.65</td>
<td>76.84</td>
<td>0.000</td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>20.75</td>
<td>20.75</td>
<td>4.94</td>
<td>0.031</td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td>197.35</td>
<td>4.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>540.75</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The critical F (1,48) = 4.04 at alpha = .05.

b The critical F (1,47) = 4.05 at alpha = .05.
Analyses of covariance were used to adjust for initial differences in pretest scores for both the posttest and change scores and to test the hypothesis at alpha = 0.05, with the pretest scores as the covariate. The calculated $F$ ratio was 4.94 for both the posttest and change scores. Compared with the critical $F (1,47)$ value of 4.05, the null hypothesis was rejected. Thus, the posttest and the change scores for the experimental group who participated in the asthma education program were significantly higher than those for the control group, when adjusted for pretest scores.

In summary, the child's knowledge about asthma was significantly increased in the experimental group ($p = .031$), based on both the AKQ posttest and change scores when adjusted for pretest scores. With a maximum possible score of 14, the posttest score means were 12.20 for the experimental group and 10.96 for the control group. The change score mean of 2.92 for the experimental group was more than twice that of the control group mean of 1.44. The difference in pretest scores was minimal, as reflected in experimental and control group means of 9.28 and 9.52, respectively, although the difference, prior to adjustment through analysis of covariance, favored the control group. These findings of increased knowledge about asthma in the school-age child as a result of an asthma education program were congruent with the outcomes of one previous study conducted with children 6 to 14 years of age.
Because there was a significant difference between the groups in the posttest and change scores on the AKQ, when adjusted for the pretest scores, analyses of covariance were used to determine the effects of the eight influencing factors. The difference between groups remained significant for six of the factors when each one was analyzed separately as a nonparametric covariate. The level of significance, shown in parentheses, was the same for both the posttest and change scores: (a) grade in school \( (p = .017) \), (b) previous camp participation \( (p = .038) \), (c) previous support group participation \( (p = .028) \), (d) age at onset of asthma \( (p = .039) \), (e) smokers in the household \( (p = .041) \), and (f) pets in the household \( (p = .036) \). When these six factors were analyzed together and their effects factored out, the differences between groups for both the posttest and change scores still remained significant at \( p = .046 \). Thus, these factors do not account significantly for between group variability. However, the other two factors: (a) source of primary health care \( (p = .538) \) and (b) first action taken during an asthma episode \( (p = .352) \), do account for some of the between group variability, and therefore, they are confounding variables.

Although the differences between posttest and change scores for the AKQ were significant, "One of the most clearly established findings of health education research is that
health-related information is rarely sufficient to initiate or maintain health-related practices (Petosa, 1986)." This suggests that without concomitant changes in attitudes and skills, the effects of these increases in knowledge may be shortlived.

Null Hypothesis #6: The Asthma Attitude Survey (AAS)

The null hypothesis stated that there was no significant difference between the two groups of children in their perceptions related to assuming responsibility for self health care as determined by the AAS. Based on the following analysis, the null hypothesis was accepted.

The AAS was designed to assess the children's view of themselves and their asthma (Reynolds, 1985). Three measures were obtained: the pretest score, the posttest score, and the change score. The distribution of scores and the related descriptive and inferential statistics are presented in Table 11.

The AAS pretest scores in the sample ranged from 55 to 96 with a possible minimum score of 20 and a maximum of 100. The mean was 75.64, and the standard deviation was 8.79. The experimental and control group means were 73.80 and 77.48, respectively. A one-way analysis of variance calculated the F ratio from the sample data at 2.24. This is less than the critical value for F (1,48) of 4.04 so there was no significant
Table 11
Descriptive Data and Analyses of Variance and Covariance for the Asthma Attitude Survey (AAS) Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>55-96</td>
<td>75.64</td>
<td>8.79</td>
<td>73.80</td>
<td>8.85</td>
<td>77.48</td>
<td>9.01</td>
</tr>
<tr>
<td>Posttest</td>
<td>55-98</td>
<td>79.97</td>
<td>9.72</td>
<td>79.94</td>
<td>10.21</td>
<td>80.00</td>
<td>9.43</td>
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One-way Analysis of Variance

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<th>F</th>
<th>p</th>
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<td>Pretest Between Groups</td>
<td>1</td>
<td>169.28</td>
<td>169.28</td>
<td>2.24</td>
<td>0.14</td>
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<tr>
<td>Within Groups</td>
<td>48</td>
<td>3620.24</td>
<td>75.42</td>
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<tr>
<td>Total</td>
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<td>3789.52</td>
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Analysis of Covariance

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<td>Posttest Regression</td>
<td>1</td>
<td>1764.87</td>
<td>1764.87</td>
<td>28.93</td>
<td>0.000</td>
</tr>
<tr>
<td>with Pretest as Covariate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>75.20</td>
<td>75.20</td>
<td>1.23</td>
<td>0.273</td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td>2867.29</td>
<td>61.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>4687.36</td>
<td></td>
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Analysis of Covariance

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<td>Change Score Regression</td>
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<td>329.71</td>
<td>329.71</td>
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<td>0.024</td>
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<tr>
<td>with Pretest as Covariate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>75.20</td>
<td>75.20</td>
<td>1.23</td>
<td>0.273</td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td>2867.29</td>
<td>61.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>3272.20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The critical F (1,48) = 4.04 at alpha = .05.
* The critical F (1,47) = 4.05 at alpha = .05.
difference between the two study groups in the AAS mean pretest scores. Thus, both groups of children were very similar in their perceptions about responsibility for self-care at baseline.

The posttest scores for the sample ranged from 55 to 98 with a mean of 79.97 and a standard deviation of 9.72. The group means were 79.94 for the experimental group and 80.00 for the control group. The change scores in the sample ranged from -11 to 27 with a mean of 4.33 and a standard deviation of 8.28. The experimental group mean was 6.14 and the control group mean was 2.52.

Analyses of covariance were used to adjust the pretest scores for initial group differences for both the posttest and change scores and to test the hypothesis at alpha = 0.05, with the pretest scores as the covariate. The calculated $F$ ratio was 1.23 ($p = .0273$) for both the posttest and change scores. Compared with the critical $F$ (1,47) value of 4.05, the null hypothesis was accepted. Thus, the posttest and the change scores for the experimental group who participated in the asthma education program were not significantly higher than those for the control group, when adjusted for pretest scores. Therefore, the null hypothesis was accepted. There was no significant difference between the two groups in the AAS actual change scores.
In summary, the child's perceptions about assuming responsibility for self health care did not change significantly for the experimental group ($p = .273$ for both the posttest and change scores) as measured by the AAS which had a maximum possible score of 100. The lack of significant change in the area of attitudes may not be surprising because of the short duration of the asthma education program.

Rokeach (1979), who developed a System of Beliefs theory, stated that behaviors are more subject to change than attitudes, values, and self-concept. Ajzen and Fishbein (1977) reviewed 17 studies on the relationship between attitudes and behaviors and found that there must be correspondence between attitudes and behaviors if change is to occur. This was further supported in the work of Ajzen and Timko (1986). The AAS in this study was not designed to correlate with the specific behaviors identified in the behavioral objectives for the asthma education program.

Null Hypothesis #7: Survey of Asthma Problems and Severity (SAPS)

The null hypothesis stated that there was no significant difference between the two groups of parents in their rating of selected asthma-related behaviors of their children as measured by the SAPS. The null hypothesis was accepted, based on the following analysis of data.
The SAPS gathered information about the severity of the child's asthma (i.e., duration and number of asthma episodes) and the extent of behavioral and lifestyle problems that the parents thought were related to the child's asthma (Reynolds, 1985). Three measures were obtained: the pretest score, the posttest score, and the change score. Score distribution and related statistics are presented in Table 12.

The range of pretest scores for all subjects was 30 to 57, with possible minimum and maximum scores of 12 and 60, respectively. Other sample statistics were 45.96 for the mean, and 6.49 for the standard deviation. The group means were 47.16 for the experimental and 44.76 for the control. A one-way analysis of variance calculated the $F$ ratio as 1.73. When compared to the critical $F$ (1, 48) value of 4.04, the null hypothesis was accepted. There was no significance between the two groups of parents, suggesting similarity between the groups in their rating of their children's asthma-related behaviors at baseline.

The posttest scores ranged from 30 to 58 with a mean 47.77 and a standard deviation of 7.41. Means for the experimental and control groups were 49.68 and 45.86, respectively. The change scores ranged from -16 to 10 with a mean of 1.77 and a standard deviation of 4.87. The experimental and control groups had means of 2.48 and 1.06.
Table 12

Descriptive Data and Analysis of Variance and Covariance for the Survey of Asthma Problems and Severity (SAPS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Range</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>30-57</td>
<td>45.96</td>
<td>6.49</td>
<td>47.16</td>
<td>1.11</td>
<td>44.76</td>
<td>7.21</td>
</tr>
<tr>
<td>Posttest</td>
<td>30-58</td>
<td>47.77</td>
<td>7.41</td>
<td>49.68</td>
<td>6.87</td>
<td>45.86</td>
<td>7.57</td>
</tr>
<tr>
<td>Change</td>
<td>-16-10</td>
<td>1.81</td>
<td>4.90</td>
<td>2.52</td>
<td>4.18</td>
<td>1.10</td>
<td>5.53</td>
</tr>
</tbody>
</table>

One-way Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>ss</th>
<th>ms</th>
<th>F*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td>72.00</td>
<td>72.00</td>
<td>1.73</td>
<td>0.19</td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>48</td>
<td>1993.92</td>
<td>41.54</td>
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</tr>
<tr>
<td>Total</td>
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<td>2065.92</td>
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Analysis of Covariance

<table>
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<th>ss</th>
<th>ms</th>
<th>F*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with Pre-test as Covariate</td>
<td>1</td>
<td>1417.60</td>
<td>1417.60</td>
<td>61.09</td>
<td>0.000</td>
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<tr>
<td>Regression</td>
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<td>38.75</td>
<td>38.75</td>
<td>1.67</td>
<td>0.203</td>
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<tr>
<td>Between Groups</td>
<td>1</td>
<td>1090.60</td>
<td>23.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>2546.95</td>
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Analysis of Covariance

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<tr>
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<th>ss</th>
<th>ms</th>
<th>F*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with Pre-test as Covariate</td>
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<td>47.80</td>
<td>47.80</td>
<td>2.06</td>
<td>0.158</td>
</tr>
<tr>
<td>Regression</td>
<td></td>
<td>38.75</td>
<td>38.75</td>
<td>1.67</td>
<td>0.203</td>
</tr>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>1090.60</td>
<td>23.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>1177.15</td>
<td></td>
<td></td>
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</tbody>
</table>

* The critical $F (1,48) = 4.04$ at alpha = .05.

b The critical $F (1,47) = 4.05$ at alpha = .05.
Analyses of covariance were used to adjust the pretest scores for initial group differences for both the posttest and change scores and to test the hypothesis at alpha = 0.05, with the pretest scores as the covariate. The calculated $F$ ratio was 1.67 ($p = .203$) for both the posttest and change scores. This was smaller than the critical $F (1,47)$ value of 4.05 so the null hypothesis was accepted. Thus, the posttest and the change scores for the experimental group who participated in the asthma education program were not significantly higher than those for the control group, when adjusted for pretest scores. There was no significant difference between the groups in the parents' rating of their children's asthma-related behaviors based on the actual SAPS change scores.

In summary, the parent's perception of asthma-related problems and the severity of the child's asthma did not change significantly for the experimental group ($p = .203$) for either the posttest or change scores, as measured by the SAPS which had a maximum possible score of 60. The degree of change in both the posttest and change scores in the experimental group, although not statistically significant, suggested that the asthma education program has the potential to influence significantly the parents' perceptions.
The Relationship Between Variables and Factors

The relationships between all pairs of the eight influencing factors and the seven dependent variables were examined through measures of association. The factors were the grade in school, previous participation in an asthma camp or support group, age at the onset of asthma, the primary source of health care, first action taken by the child or parent, and the presence of smokers or pets in the household. The dependent variables included hospitalizations, emergency health care visits, school absences, altered breathing episodes, and the posttest and change scores on the AKQ, AAS, and SAPS. The measures of association chosen depended on whether the data were nominal, ordinal, or interval. The results are summarized in Table 13.

The association for all 56 of the possible relationships was low, negligible, or none, except for five. There was a moderate relationship between: (a) school absences and the first action taken by the child or parent, (b) school absences and pets in the household, (c) the AKQ posttest scores and previous camp experience, (d) the AAS posttest scores and pets in the household, and (e) the SAPS posttest scores and pets in the household.

Almost half of the children in the sample missed no days of school and most of those same children used a prescribed medication as the first action and did not have fur-bearing or
Table 13: Measures of Association that Show the Relationship Between Eight Influencing Factors and Seven Dependent Variables

<table>
<thead>
<tr>
<th>Factors</th>
<th>Hospitalization (actual number)</th>
<th>Emergency Health Care Visits (category)</th>
<th>School Absences (category)</th>
<th>Altered Breathing Episodes (category)</th>
<th>AKQ Posttest Scores (category)</th>
<th>AAS Posttest Scores (category)</th>
<th>SAPS Posttest Scores (category)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge &amp; Attitude Factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade in School (category)</td>
<td>0.14 Kendall Tau C Low</td>
<td>0.06 Kendall Tau C Negligible</td>
<td>0.19 Kendall Tau C Low</td>
<td>-0.03 Kendall Tau C Negligible</td>
<td>0.13 Kendall Tau C Low</td>
<td>0.14 Kendall Tau C Low</td>
<td></td>
</tr>
<tr>
<td>Previous Camp (category)</td>
<td>-0.11 Pearson r Low</td>
<td>-0.14 Pearson r Low Negligible</td>
<td>0.06 Kendall Tau C Low</td>
<td>0.43 Cramer's V Low</td>
<td>0.12 Cramer's V Low</td>
<td>0.19 Cramer's V Low</td>
<td></td>
</tr>
<tr>
<td>Previous Support Group (category)</td>
<td>-0.27 Pearson r Low</td>
<td>0.09 Pearson r Low Negligible</td>
<td>0.15 Cramer's V Low</td>
<td>0.09 Cramer's V Negligible</td>
<td>0.16 Cramer's V Low</td>
<td>0.26 Cramer's V Low</td>
<td></td>
</tr>
<tr>
<td>Severity Factors</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of Onset (category)</td>
<td>0.06 Kendall Tau C Negligible</td>
<td>0.14 Kendall Tau C Negligible</td>
<td>0.09 Kendall Tau C Negligible</td>
<td>-0.01 Kendall Tau C Negligible</td>
<td>-0.01 Kendall Tau C Negligible</td>
<td>-0.02 Kendall Tau C Negligible</td>
<td></td>
</tr>
<tr>
<td>Source of Primary Health Care (category)</td>
<td>0.18 Pearson r Low</td>
<td>0.13 Pearson r Low Negligible</td>
<td>0.16 Cramer's V Low</td>
<td>-0.16 Kendall Tau B Low</td>
<td>-0.22 Kendall Tau B Low</td>
<td>-0.22 Kendall Tau B Low</td>
<td></td>
</tr>
<tr>
<td>First Action Taken by Parent/Child (category)</td>
<td>0.10 Pearson r Low</td>
<td>0.12 Pearson r Low Moderate</td>
<td>0.34 Cramer's V Low</td>
<td>-0.16 Kendall Tau C Low</td>
<td>0.08 Kendall Tau C Low</td>
<td>-0.15 Kendall Tau C Low</td>
<td></td>
</tr>
<tr>
<td>Trigger Factors</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking in Household (category)</td>
<td>0.03 Pearson r Negligible</td>
<td>0.03 Pearson r Negligible</td>
<td>0.25 Cramer's V Low</td>
<td>0.21 Cramer's V Low</td>
<td>0.14 Cramer's V Moderate</td>
<td>0.23 Cramer's V Moderate</td>
<td></td>
</tr>
<tr>
<td>Pets in Household (category)</td>
<td>0.11 Pearson r Negligible</td>
<td>0.05 Pearson r Negligible</td>
<td>0.31 Cramer's V Low</td>
<td>0.20 Cramer's V Low</td>
<td>0.31 Cramer's V Moderate</td>
<td>0.30 Cramer's V Moderate</td>
<td></td>
</tr>
</tbody>
</table>

feathered pets at home. This suggests that early intervention with medication and keeping pets out of the home may be effective approaches.

While few children had had prior asthma camp experience, those who had scored higher on the AKQ, suggesting retention of knowledge from a previous experience.

The significance of the relationship between higher AAS and SAPS posttest scores and pets in the household is unclear. Perhaps, it suggests a positive influence of pets on attitudes toward self-care. However, it may be a coincidental finding.

Effects of Instructor and Location on Dependent Variables

Two additional factors within the experimental group, the instructor and the location of the asthma education program, could have influenced any of the dependent variables. The Asthma Education Program (AEP) for the experimental group was conducted by the nursing staff at Columbus Children’s Hospital (CCH), the investigator, or both. Eighteen (72%) children and parents were taught by the investigator. The nursing staff conducted the program for 5 (20%), and the teaching sessions for 2 (8%) of the children were divided between staff and investigator (see Table 14).
The children and parents in the experimental group were taught in the child's home, the child's hospital room, or the hospital cafeteria. Home, the most frequent location, was the setting for 16 (64%). Eight (32%) took part in the program in their hospital room, and 1 (4%) was in the hospital cafeteria. Analyses of covariance were used to determine the effects of instructor and location on each of the dependent variables when adjusted for prestudy data. As shown in Table 14, neither the instructor nor the location had a significant effect on any of the dependent variables. This suggests that the asthma education program will achieve similar results when conducted in either the hospital or home setting, and when it is taught by different nurses.
Table 14
Descriptive Data for the Instructor and Location of the Asthma Education Program and Effects on the Seven Dependent Variables

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigator Staff</td>
<td>Nursing Both Total</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
</tr>
<tr>
<td>$</td>
<td>72</td>
</tr>
</tbody>
</table>

Analysis of Covariance

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Instructor</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalizations</td>
<td>Calculated F</td>
<td>p</td>
</tr>
<tr>
<td>$</td>
<td>0.70</td>
<td>.508</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td>0.15</td>
<td>.858</td>
</tr>
<tr>
<td>Emergency Visits</td>
<td>0.96</td>
<td>.399</td>
</tr>
<tr>
<td>Emergency Visits</td>
<td>0.93</td>
<td>.410</td>
</tr>
<tr>
<td>School Absences</td>
<td>2.55</td>
<td>.108</td>
</tr>
<tr>
<td>Altered Breathing Episodes</td>
<td>0.03</td>
<td>.967</td>
</tr>
<tr>
<td>AKO Posttest</td>
<td>0.95</td>
<td>.402</td>
</tr>
<tr>
<td>Change</td>
<td>0.95</td>
<td>.402</td>
</tr>
<tr>
<td>AAS Posttest</td>
<td>1.56</td>
<td>.233</td>
</tr>
<tr>
<td>Change</td>
<td>1.56</td>
<td>.233</td>
</tr>
<tr>
<td>SAPS Posttest</td>
<td>0.64</td>
<td>.537</td>
</tr>
<tr>
<td>Change</td>
<td>0.64</td>
<td>.537</td>
</tr>
</tbody>
</table>

* The critical F (2,21) = 3.47 at alpha = .05.

b Adjusted for 12-week prestudy period (immediately before).

c Adjusted for 12-week prestudy period (same as study period).

d Adjusted for absences in previous school year.

* Not adjusted; no prestudy data were available.

f Posttest and change scores adjusted for pretest scores.
Summary

This chapter has presented the data related to the effects of the asthma education program on seven dependent variables. The experimental and control groups were examined regarding the demographic characteristics of the children, and the two groups were found to be highly similar. Eight factors that could have created differences between the study groups were reviewed. Of these eight, three factors -- the age at onset of asthma, the source of primary care for asthma, and the first action taken by the child or parents in an asthma episode -- were found to be moderately related to the assignment of subjects to the experimental or control group, using Cramer's V. However, the Mann-Whitney U Test showed that the effects of these three factors were minimal. A moderate relationship was found between the primary care provider and the assignment of the children to the study groups and between the first action taken by the child or parent and the study groups, suggesting possible group inequalities on these bases. The relationship between the study group assignment and each of the other six factors was low or negligible.

Each of the dependent variables was analyzed. The results are summarized in Table 15. The asthma education program had two significant effects on the experimental group: a significant reduction in the number of emergency health care
visits ($p = .036$), and a significant increase in the posttest scores for the AKQ ($p = .031$). These results were determined using analyses of covariance.

The relationships between all pairs of the eight factors and seven dependent variables were examined through measures of association. There was a moderate relationship between: (a) school absences and the first action taken by the child or parent, (b) school absences and pets in the household, (c) the AKQ posttest scores and previous camp experience, (d) the AAS posttest scores and pets in the household, and (e) the SAPS posttest scores and pets in the household. All other associations were low or negligible.

Since there were multiple instructors in the asthma education program and since it was taught in three different locations, the effects of instructor and location on the dependent variables were considered. There were no significant effects, when these variables were adjusted for prestudy data.
Table 15

A Summary of the Dependent Variables and their Significance in this Study

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Calculated F*</th>
<th>Significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalizations\textsuperscript{b}</td>
<td>2.19</td>
<td>( p = .145 )</td>
</tr>
<tr>
<td>Hospitalizations\textsuperscript{c}</td>
<td>2.15</td>
<td>( p = .149 )</td>
</tr>
<tr>
<td>Emergency Health Care Visits\textsuperscript{c}</td>
<td>2.26</td>
<td>( p = .139 )</td>
</tr>
<tr>
<td>Emergency Health Care Visits\textsuperscript{c}</td>
<td>4.67</td>
<td>( p = .036 )</td>
</tr>
<tr>
<td>School Absences\textsuperscript{d}</td>
<td>1.74</td>
<td>( p = .194 )</td>
</tr>
<tr>
<td>Altered Breathing Episodes\textsuperscript{d}</td>
<td>0.44</td>
<td>( p = .510 )</td>
</tr>
<tr>
<td>AKQ\textsuperscript{f} Posttest</td>
<td>4.94</td>
<td>( p = .031 )</td>
</tr>
<tr>
<td>AKQ\textsuperscript{f} Change</td>
<td>4.94</td>
<td>( p = .031 )</td>
</tr>
<tr>
<td>AAS\textsuperscript{f} Posttest</td>
<td>1.23</td>
<td>( p = .273 )</td>
</tr>
<tr>
<td>AAS\textsuperscript{f} Change</td>
<td>1.23</td>
<td>( p = .273 )</td>
</tr>
<tr>
<td>SAPS\textsuperscript{f} Posttest</td>
<td>1.67</td>
<td>( p = .203 )</td>
</tr>
<tr>
<td>SAPS\textsuperscript{f} Change</td>
<td>1.67</td>
<td>( p = .203 )</td>
</tr>
</tbody>
</table>

\* The critical \( F (1,47) = 4.05 \) at alpha = .05.
\textsuperscript{b} Adjusted for 12-week prestudy period (immediately before).
\textsuperscript{c} Adjusted for 12-week prestudy period (same as study period).
\textsuperscript{d} Adjusted for absences in previous school year.
\textsuperscript{e} Not adjusted; no prestudy data were available.
\textsuperscript{f} Posttest and change scores adjusted for pretest scores.
CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

This study evaluated the effects of an asthma education program on selected health behaviors of school-age children. Chapter V summarizes the study, presents conclusions from the findings, and makes recommendations for further research.

Summary of the Study

Asthma is the leading cause of school absenteeism and a major source of disability in children. The purpose of this study was to determine if an asthma education program for school-age children who had recently experienced an acute asthma episode, and their parents, would reduce the use of emergency and inpatient health care services, decrease school absences and altered breathing episodes, increase the child’s knowledge about asthma, and change the child’s and parent’s perceptions of the child’s asthma.

In this study, 50 children aged 8 to 12 years and their parents were assigned randomly to either an experimental or control group, using a blocking technique to control for the demographic variables of gender, race, and age. The sample was
obtained from the admission and emergency rosters of Columbus Children’s Hospital during the period of November 13, 1988 to April 13, 1990.

Asthma education, the independent variable, consisted of two 1-hour teaching sessions. The individualized discussion format and the selected printed materials and props focused on the specific needs of the child and parent. Parents in both the experimental and control groups kept a 3-month calendar diary to monitor the child’s medication use, hospital admissions, emergency health care visits, school absences, and altered breathing episodes. Two paper-and-pencil instruments measured the child’s knowledge about asthma and perceptions about responsibility for self health care. These were given at the point of entry into the study and after completion of the 3-month diary. At the same points in time, the parents completed a questionnaire to measure their perceptions of their child’s severity and frequency of asthma episodes and their child’s maturity and independence. During the 3-month period of keeping a diary, each parent received a reminder phone call every 2 weeks from a research assistant. Upon completion of the study each child received a specially designed T-shirt, and each child and parent in the control group were sent a packet of teaching materials.

This study examined hypotheses that tested the effects of an asthma education program on seven dependent variables: the
number of (a) hospitalizations, (b) emergency health care visits, (c) school absences, and (d) altered breathing episodes, as well as the posttest scores on (e) the Asthma Knowledge Questionnaire (AKQ), (f) the Asthma Attitude Survey (AAS), and (g) the Survey of Asthma Problems and Severity (SAPS).

The results indicated that the asthma education program made a significant difference in two areas: (a) fewer emergency health care visits when adjusted for visits during the 12-week prestudy period that corresponded to the same calendar segment at the study period \( p = .036 \); and (b) an increase in the child’s knowledge about asthma when adjusted for pretest and change scores \( p = .031 \). The changes in the other five dependent variables were positive but not statistically significant.

In addition, eight influencing factors that could have contributed to group differences were analyzed for their association with the experimental and control groups. A moderate relationship was found between the random assignment of the children to the groups and each of three factors: the primary health care provider, the first action taken by the child or parent, and age at the onset of asthma. However, nonparametric analysis of the categorical data for these three factors showed no significant differences between the groups.
Association measures, calculated for all 56 pairs of dependent variables and influencing factors, showed a moderate relationship between five of the pairs: (a) school absences and the first action taken by the child or parent, (b) school absences and pets in the household, (c) the AKQ posttest scores and previous camp experience, (d) the AAS posttest scores and pets in the household, and (e) the SAPS posttest scores and pets in the household. These relationships suggest that early intervention in an asthma episode with medication and keeping pets out of the home may reduce school absences and that the children who participated in a previous asthma education program were more knowledgeable about their asthma. The significance of the relationship between pets in the household and the increased AAS and SAPS posttest scores is unclear.

An analysis of covariance, used to analyze the effects of instructor and location on each of the dependent variables, indicated that there were no significant effects. This suggests that the asthma education program will achieve similar results, when conducted in the hospital or home by different nurses.

Conclusions

This study was designed to test the seven null hypotheses at the 0.05 level of significance between children and parents who participated in the Asthma Education Program (AEP) and
those who did not participate.

1. There was no significant difference between the two groups of children at the end of 12 weeks in the number of hospital admissions as identified in the Parent Diary and the child's medical record.

2. There was no significant difference between the two groups of children at the end of 12 weeks in the number of emergency health care visits as identified in the Parent Diary and the child's medical record.

3. There was no significant difference between the two groups of children at the end of 12 weeks in the number of school days missed as identified in the Parent Diary.

4. There was no significant difference between the two groups of children at the end of 12 weeks in the number of episodes of altered breathing as identified in the Parent Diary.

5. There was no significant difference between the two groups of children in their knowledge about asthma as measured by the Asthma Knowledge Questionnaire at the end of 12 weeks.

6. There was no significant difference between the two groups of children in their perceptions related to assuming responsibility for self health care as determined by the Asthma Attitude Survey at the end
of 12 weeks.

7. There was no significant difference between the two
groups of parents in their rating of selected
asthma-related behaviors of their children as
measured by the Survey of Asthma Problems and
Severity at the end of 12 weeks.

Two of the null hypotheses were significant
statistically: a) the reduction in the frequency of emergency
health care visits \( (p = .036) \) during the 12-week study period,
and b) the increase in the child's knowledge about asthma \( (p = .031) \) as measured by the posttest and change scores on the AKQ.
The AEP was the least effective in improving the attitudes of
the child toward assuming responsibility for self health care
\( (p = .273) \) and in decreasing the frequency of altered breathing
episodes \( (p = .510) \). Although the differences were not
statistically significant for the number of hospitalizations \( (p = .149) \), for reducing the number of school absences \( (p = .194) \),
or for the parents' perceptions of asthma-related problems and
severity \( (p = .203) \), the degree of change in the experimental
group suggested that the asthma education program has the
potential to have a positive impact in these areas.

The randomly assigned sample of 50 school-age children
with asthma and their parents was drawn from the population of
school-age children with asthma served by Columbus Children's
Hospital. However, random selection was not feasible. Thus,
the findings of this study may not be generalizable to the population, because the sample may not have been representative.

Recommendations for Further Research

Asthma is a complex health problem involving multiple issues of definition and diagnostic criteria, confounding variables, instrumentation, criteria for the effectiveness of asthma education programs, and conflicting findings about the effectiveness of asthma education. The following six recommendation need further research. They are ordered, beginning with the fundamental concepts of asthma and ending with specific references to this study.

1. **To examine the definition of asthma for conceptual clarity:**

   There needs to be consensus on the definition, terminology, and diagnostic criteria for asthma so that the results of research studies can be compared. At present the term "asthma" can include from one to seven different disease categories from the International Classification of Diseases. Thus, the criteria for asthma as a medical diagnosis vary considerably. None of the research reviewed for this study indicated which criteria were used to define asthma.
2. **To measure and analyze the effects of confounding variables:**

There are several factors which may influence the receptivity to and the effects of asthma education. Findings in this study suggest that further research is needed on the effects of: a) the severity of the asthma, b) the child’s age at onset of asthma, c) the first action taken during an asthma episode, d) the primary source of health care, e) the relationship between previous and present participation in asthma, and f) the effects of household pets on school absences.

3. **To refine the instruments used in asthma education programs:**

Based on the experience of this study, the instrument used to measure attitudes about asthma, the AAS, needs to be revised so that there is greater correspondence between the questions/items and the educational objectives. Also, the 5-point Likert scale may have offered too many choices for the school-age child.

The instrument used to measure parent perceptions about asthma problems and severity, the SAPS, also needs revision so that each set of answer choices has the same directionality. The instrument used to measure children’s knowledge of asthma, the AKQ, needs to be leveled with parallel questions for younger and older school-age children.
4. To establish criteria that can serve as valid measures of program effectiveness:

The three "traditional" criteria for the effectiveness of asthma education programs have been reductions in: a) hospital admissions, b) emergency room visits, and c) school absences. Specific criteria related to decreased breathing problems, increased knowledge, improved attitudes, and better self-management need to be identified and validated.

5. To continue to evaluate the effectiveness of asthma education programs on hospitalizations, emergency health care visits, school absences, altered breathing episodes, the child's knowledge and attitudes about asthma, and the parent's perception of the child's asthma:

The indepth literature review conducted for this study showed that the number citing statistical significance was low. Only three studies (Clark, 1986; Lewis, 1984; Whitman, 1985) reported statistically significant findings congruent with the outcomes of this study: a) decreased emergency health care visits, and b) increased child knowledge about asthma.

6. To study the relationship between patterns of medication usage and levels of severity:

The actual frequency of medication use may be an indicator of the child's functional severity and/or the child
and parent's perception of the child's severity. The prescribed frequency of medication use is accepted as an indicator of medical severity. The relationship between the functional and/or perceived severity and the medical severity needs to be examined. The degree of congruence may affect the co-manager relationship of parent, child, and health professional and thus impact the family's independent decision-making related to asthma self-management.

The proliferation of asthma education programs across the country and the increased priority being given to asthma education through the establishment of the National Asthma Education Program provide a clear mandate for ongoing research that is rigorous in design and analysis. In addition, there are exciting opportunities for collaborative work with other investigators to strengthen the existing knowledge base about this ubiquitous and increasing health concern.
APPENDIX A

The Randomized Block Technique

Purpose: To control for the demographic variables of gender, race, and age.

Procedure:
- **Even Cells**: Coin Toss - Heads, control group; Tails, experimental group
- **Uneven Cells**: Assign to cell with one less subject

Interpretation: Each number represents a different subject. The numbers were assigned in the order of entry into the study. Numbers are crossed out for subjects who did not complete the study. At that point they were subtracted from the cell total.

<table>
<thead>
<tr>
<th>AGE</th>
<th>8-10</th>
<th>11-12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXPERIMENTAL</td>
<td>CONTROL</td>
</tr>
<tr>
<td>F</td>
<td>white</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>black</td>
<td>34</td>
</tr>
<tr>
<td>E</td>
<td>white</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>black</td>
<td>24</td>
</tr>
<tr>
<td>M</td>
<td>44</td>
<td>39</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>26</td>
<td>33</td>
</tr>
</tbody>
</table>

Column Totals: 14 14 11 11

Total Experimental: 25 (50%) Total white: 31 (62%)
Total Control: 25 (50%) Total Black: 19 (38%)
Total Sample: 50 (100%)  Total 8-10 Yrs: 28 (56%)
Total Female: 20 (40%)  Total 11-12 Yrs: 22 (44%)

Total Male: 30 (60%)
## APPENDIX B

**NURSING ASSESSMENT: THE CHILD WITH ASTHMA AND THE FAMILY**  
To be completed by investigator or research assistant.

**Name of Child:** ________________________________

**Informant**  
Name/Relationship/Reliability: ________________________________

**Child’s Age/Birthdate/Grade:** ________________________________

**Primary Source of Health Care:** ________________________________

### HEALTH HISTORY

1. Why was your child brought to the hospital? ______________

2. How long has your child had asthma? ______________

3. What caused this episode? ______________

4. What medicines were used for this episode? (Prescribed, OTC) ______________
   
   How did they help? ______________

5. Does anyone else in the family have asthma? ______________
   
   What has their experience been? ______________

6. Has your child been hospitalized before? Why? Give date(s). ______________

7. Has your child been to an ER or doctor's office for an asthma episode in the last 12 months? Give dates, places. ______________

8. How many days of school has your child missed for an asthma episode since the beginning of the school year in Sept.?  
   __ no days missed until now  
   __ less than 1 day/month  
   __ more than 1 day/month, less than 1 day/week  
   __ more than 1 day/week
APPENDIX B (continued)

NURSING ASSESSMENT: THE CHILD WITH ASTHMA AND THE FAMILY

9. How is an asthma episode handled at school? _______________

10. Has your child gone to asthma camp? When and where? _______________ Dates Name of Camp(s)

11. Has your child ever taken part in an asthma education program or support group? When & what? _______________ Dates Name of Program(s)

12. When does your child have the most asthma episodes? March, April, May (spring) June, July, August (summer) September, October, November (fall) December, January, February (winter)

ASSESSMENT OF THE FAMILY’S KNOWLEDGE, BEHAVIORS, AND ATTITUDES RELATED TO ASTHMA

1. Who has told you and/or your child about asthma? When? _______________

2. What triggers are specific for your child?
   Name How It’s Controlled
   Foods: _____________________________
   Exercise: ___________________________
   Animals: ___________________________
   Insects: ___________________________
   Inhalants: _________________________
   Infections: _________________________
   Weather: __________________________
   Other: _____________________________

3. What are your child’s earliest signs of an asthma episode? ________________________________

4. What do you do first when your child has an asthma episode? ________________________________

5. Tell me about the asthma medicines your child takes, what they are for, how much. ________________________________

   Medications Reason Taken Dosage
APPENDIX B (continued)

NURSING ASSESSMENT: THE CHILD WITH ASTHMA AND THE FAMILY

6. Does your child take aerosols and/or inhalers? How are these taken? How is the aerosol unit cared for and cleaned?

7. At what point do you get medical help for your child’s asthma?

8. Does your child do breathing exercises? When? Do they help?

<table>
<thead>
<tr>
<th>INFORMATION GIVEN TO PARENTS AND CHILD</th>
<th>Info Given</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABOUT THIS ASTHMA EDUCATION STUDY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Explain purpose and schedule of teaching sessions (2 days, 2 classes, 1 hour each; optional 3rd class)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Explain that printed materials will be provided and that they can be taken home.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ask parent/child how they learn best (consider discussion, lecture, printed materials, games, other)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best way to learn: parent_______________ child_______________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Explain need for an adult family member (preferably a parent) to attend each teaching session</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Who:__________________________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days/times to come:____________________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Indicate that other team members may be talking with them (dietician, social worker)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Tell family about School Nurse referral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Comments (strengths, limitations, recommendations)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Signature on Completion of Assessment  Date/Time  Unit

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APPENDIX C

YOUR NAME

TODAY’S DATE

TELL US ABOUT YOUR ASTHMA (ANG)

Directions: Read each question carefully; then give the BEST answer. Please answer all questions without anybody’s help. Thank you.

1-5. This picture shows the parts of the body that you use for breathing. On each line, write the name of the body part shown on the line points. You can use the words in the box:

- Windpipe (trachea)
- Large airways (bronchi)
- Small airways (bronchioles)
- Air sacs (alveoli)
- Breathing muscle (diaphragm)

Copyright, 1972, Children's Hospital Inc., Columbus, Ohio

6. When you have an asthma episode, what happens inside of your lungs? (Circle the letter of the BEST answer.)

a. the muscles around your airways get tighter
b. there is less mucus inside your airways
c. your lungs stop working
d. your windpipe closes off
e. you can breathe more air in and out of your lungs

7. What does the word trigger mean when you are talking about asthma? (Circle the letter of the BEST answer.)

a. something that makes your asthma episode better
b. your asthma medicine
c. something that starts your asthma episode
d. your extra hard breathing

8. What are “early signs” when you are talking about asthma? (Circle the letter of the BEST answer.)

a. how your body feels when you start to have an asthma episode
b. how you breathe when you first wake up in the morning
c. how your body feels when your asthma episode is going away
APPENDIX C (continued)

TELL US ABOUT YOUR ASTHMA

9. Many children wheeze when they have an asthma episode. What causes wheezing? (Circle the letter of the BEST answer.)

a. fast breathing
b. airways that are tight
c. coughing
d. breathing exercises
e. asthma medicine

10. You are playing outside when you have some early signs of an asthma episode. What should you do first? (Circle the letter of the BEST answer.)

a. keep playing because the signs will go away if you ignore them
b. drink ice cold water
c. have someone call your doctor right away
d. stop and rest
e. take extra medicine

11. How does relaxation help with an asthma episode? (Circle the letter of the BEST answer.)

a. it can slow down your breathing
b. it is the same as falling asleep
c. it helps your muscles get tighter

12. How do breathing exercises help with an asthma episode? (Circle the letter of the BEST answer.)

a. they help you use your strongest breathing muscle
b. they help you breathe faster to get more air in your lungs
c. if you breathe this way, you move your shoulders up and down
d. they won't help you until your asthma episode gets really bad

13. You have only a little of your asthma medicine left. What should you do? (Circle the letter of the BEST answer.)

a. nothing because your doctor will remind you to get more
b. tell your parents right away so they can get more for you
c. nothing - when your medicine is gone you won't need it anymore
d. wait until your medicine runs out to be sure you need more

14. It's time for your doctor's appointment, but you are feeling fine. Your best friend has invited you to spend the afternoon at his/her house. What should you do? (Circle the letter of the BEST answer.)

a. cancel your doctor's appointment because you aren't sick
b. keep your appointment because you need to see your doctor regularly
c. ask to have your doctor's appointment changed to next week
d. call your doctor so he/she can check you out by phone

THANK-YOU FOR ANSWERING THIS QUESTIONNAIRE.

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APPENDIX D

YOUR NAME_____________________
TODAY'S DATE__________________

MORE ABOUT YOUR ASTHMA (AAS Rev)

Directions: Read each question carefully so you can decide which is the BEST answer. Mark your answer by putting an X on the line under "False," "Mostly False" "Sometimes True and False," "Mostly True," or "True." Please fill this out without anybody's help. Thank-you.

<table>
<thead>
<tr>
<th>Question</th>
<th>False</th>
<th>Mostly False</th>
<th>Sometimes True and False</th>
<th>Mostly True</th>
<th>True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have good friends.</td>
<td></td>
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<tr>
<td>2. I can play hard.</td>
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<tr>
<td>3. My asthma never gets better, no matter what I do.</td>
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<tr>
<td>4. I can do just about everything I want to.</td>
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<tr>
<td>5. I do poorly in school because of my asthma.</td>
<td></td>
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<tr>
<td>6. I need someone to watch over me almost all of the time.</td>
<td></td>
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</tr>
<tr>
<td>7. I drink lots of water to help my asthma.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I like myself.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I really get scared when I have an asthma episode (attack).</td>
<td></td>
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</tr>
</tbody>
</table>

PLEASE TURN THIS PAGE OVER.
10. I make my asthma seem worse than it is.  

11. I am just like other kids, except that I have asthma.  

12. If I could just take more medicine, I'd be OK.  

13. People don't like me because I have asthma.  

14. I am a happy person.  

15. I help my asthma by not getting too tired.  

16. I feel OK asking for help with my asthma when I need it.  

17. I do things that I know will make me have an asthma episode (attack).  

18. There are a lot of times I can handle my asthma by myself.  

19. I worry a lot about my asthma.  

20. There are things I can do to help my asthma.  

**THANK-YOU FOR ANSWERING THESE QUESTIONS**

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APPENDIX E

CHILD'S NAME: ____________________________________________

PARENT'S NAME: __________________________________________

TODAY'S DATE: ____________________________________________

YOUR CHILD'S ASTHMA (SAPS Rev)

This questionnaire asks you about your impression of the seriousness of your child's asthma and how it affects his/her daily functioning.

For each question, circle the letter that YOU believe best describes your child's asthma and its effects. Do not be concerned about what some of the words, such as mild, moderate, or severe might mean to someone else. What is important is what these words mean to YOU.

Please choose ONLY ONE answer for each question.

1. On the average, how many asthma episodes has your child had during the last three months?
   a. Less than one a month.
   b. More than one a month but less than one a week.
   c. More than one a week but less than one a day.
   d. One a day.
   e. More than one a day.

2. On the average, how severe have the individual episodes been during the last three months?
   a. There have been no asthma episodes.
   b. Very minimal episodes.
   c. Mild episodes.
   d. Moderate episodes.
   e. Severe episodes.

3. On the average, how often has asthma interfered with your child's recreational and social activities?
   a. Less than once a month.
   b. More than once a month but less than once a week.
   c. More than once a week but less than once a day.
   d. Once a day.
   e. More than once a day.

4. On the average, how often during the last three months has discipline for your child been avoided or toned down because of his/her asthma?
   a. Less than 1/4 of the time.
   b. About 1/4 of the time.
   c. About 1/2 of the time.
   d. About 3/4 of the time.
   e. More than 3/4 of the time.
5. On the average, how often during the last three months has your child tried to use his/her asthma or any illness to gain something or to avoid responsibility?
   a. Less than once a month.
   b. More than once a month but less than once a week.
   c. More than once a week but less than once a day.
   d. Once a day.
   e. More than once a day.

6. On the average, how often during the last three months has your child kept his/her feelings inside, like anger or frustration, instead of expressing those feelings?
   a. Less than 1/4 of the time.
   b. About 1/4 of the time.
   c. About 1/2 of the time.
   d. About 3/4 of the time.
   e. More than 3/4 of the time.

7. On the average, to what extent has your child had problems accepting or taking his/her medication during the last three months?
   a. Has had no problems.
   b. Has had very minimal problems.
   c. Has had mild problems.
   d. Has had moderate problems.
   e. Has had severe problems.

8. On the average, how often has your child shown the amount of self-reliance in caring for his/her own asthma that you would expect for his/her age during the last three months?
   a. Less than 1/4 of the time.
   b. About 1/4 of the time.
   c. About 1/2 of the time.
   d. About 3/4 of the time.
   e. More than 3/4 of the time.

9. On the average, how much concern has your child expressed, in words or actions, about being different because of his/her asthma during the last three months?
   a. Has never shown concern.
   b. Has shown very little concern.
   c. Has shown mild concern.
   d. Has shown moderate concern.
   e. Has shown a great deal of concern.
10. **On the average, how often has your child shown the level of emotional maturity that you expect for his/her age during the last three months?**
   a. Less than 1/4 of the time.
   b. About 1/4 of the time.
   c. About 1/2 of the time.
   d. About 3/4 of the time.
   e. More than 3/4 of the time.

11. **On the average, how often has your child shown self-reliance during the last three months in managing his/her own care in cleanliness, grooming, and dress, compared with what you expect for his/her age?**
   a. Less than 1/4 of the time.
   b. About 1/4 of the time.
   c. About 1/2 of the time.
   d. About 3/4 of the time.
   e. More than 3/4 of the time.

12. **On the average, how often has your child shown self-reliance during the last three months doing assigned tasks around your home, compared with what you expect for his/her age?**
   a. Less than 1/4 of the time.
   b. About 1/4 of the time.
   c. About 1/2 of the time.
   d. About 3/4 of the time.
   e. More than 3/4 of the time.

**THANK-YOU FOR ANSWERING THIS QUESTIONNAIRE**

APPENDIX F

CHILD’S NAME ____________________________

(attach business card)

YOUR NAME ____________________________

DATE OF HOSPITAL DISCHARGE __________

DATE OF STUDY COMPLETION ________

PARENT DIARY

Directions: Attached are 3 or 4 calendar sheets for the time period from your child’s hospital discharge until 3 months later. These sheets are for you to record your child’s daily asthma experiences during this 3 month period.

These are the specific experiences that you need to write down each day:

IF YOUR CHILD HAS THIS EXPERIENCE: WRITE THIS ON THE CALENDAR:

1. Takes medicines because of asthma. Name of each medicine, how it was taken (by mouth, aerosol, inhaler, injection), number of times taken. Examples: Ventolin, inhaler, 3 times. Slo-bid, by mouth, 2 times. Intal, aerosol, 1 time.

2. Wheezing (a musical or whistling sound when you put your ear on your child’s chest; it usually goes along with other early warning signs.) Wheezing (if your child has more than 1 wheezing episode a day, record each episode.)

3. Misses school because of asthma Missed school

4. Unscheduled (no appointment) visit to doctor’s office, clinic, or urgent care center because of asthma Visit to doctor [or clinic] [or urgent care center]

5. Goes to a hospital emergency room because of asthma Emergency room

6. Is admitted to a hospital because of asthma In hospital

7. Has none of these experiences LEAVE THE CALENDAR SQUARE FOR THE DAY BLANK

At the end of each day, please make your entry by the correct date on your calendar sheet. I suggest you keep these calendar sheets on the refrigerator or in some other place where they will be easy to see. Daily entries are very important to be sure that the information is accurate.

Either myself or another nurse will phone you at home every 2 weeks during the 3 months you are taking part in this study. Or you may call me at home (237-1171) any evening. This will give you a chance to ask any questions you might have.

THANK-YOU FOR COLLECTING THIS IMPORTANT INFORMATION FOR US IT WILL HELP US LEARN MORE ABOUT Caring FOR CHILDREN WITH ASTHMA.

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184
APPENDIX G

PHONE LOG

Child’s Name_________________________ Parent’s Name_________________________

Hospital Admission Date_______ Hospital Discharge Date________

Phone(work):_______(mother)_______(father) Phone(home):________

Best days/times to call:__________________________________________

Dates of Post-hospitalization Phone Calls:

Week Two____________ Week Four_________ Week Six____________

Week Eight___________ Week Ten___________ Week Twelve__________

DATE TIME CODE FOR LENGTH PERSON YOU COMMENTS/INITIALS**
CALLS* OF CALL SPOKE WITH

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

* Abbreviations: NA = no answer IC = interaction completed
NH = not home PIC = partially completed
WN = wrong number WR = will return call
REF = refused DIS = disconnect

** Each entry to be initialed by person making the call.
### PHONE LOG

(ADDITIONAL PAGE)

<table>
<thead>
<tr>
<th>Child's Name</th>
<th>Parent's Name</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>CODE FOR LENGTH</th>
<th>PERSON YOU SPOKE WITH</th>
<th>COMMENTS/INITIALS **</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

* Abbreviations:  
  NA = no answer  
  NH = not home  
  WN = wrong number  
  REF= refused  
  IC = interaction completed  
  PIC= partially completed  
  WR = will return call  
  DIS= disconnect

** Each entry to be initialed by person making the call.
APPENDIX H

506 Hindi-Alexander and Cropp

TABLE I. Medication score

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Possible score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score</td>
<td>1</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Oral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>eral</td>
<td>12 treatments/</td>
</tr>
<tr>
<td></td>
<td>year*</td>
<td>year</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhaled</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>intermittently</td>
<td></td>
</tr>
<tr>
<td></td>
<td>all year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cromolyn</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>intermittently</td>
<td></td>
</tr>
<tr>
<td></td>
<td>all year</td>
<td></td>
</tr>
<tr>
<td>Dronedilators</td>
<td>Injected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(adenaline/terbutaline)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 to 12 injections/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>year*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhaled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 days/month</td>
<td></td>
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<tr>
<td></td>
<td>or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A course of steroids lasting 3 to 5 days.

TABLE II. Asthma severity score*

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication score</td>
<td>&lt;20</td>
<td></td>
<td></td>
<td>&gt;351</td>
</tr>
<tr>
<td>Wheezing episodes</td>
<td>1 to 5/month</td>
<td></td>
<td>6 to 10/month</td>
<td>&gt;10/month</td>
</tr>
<tr>
<td>Hospitalisations</td>
<td>0</td>
<td></td>
<td></td>
<td>&gt;2/year</td>
</tr>
<tr>
<td>Emergency room/physician emergency treatment</td>
<td>0</td>
<td></td>
<td>1 to 6/year</td>
<td>&gt;6/year</td>
</tr>
<tr>
<td>School absences (days)</td>
<td>0</td>
<td></td>
<td>6 to 10/year</td>
<td>&gt;10/year</td>
</tr>
</tbody>
</table>

*Each of the five variables had three levels (weight) allowing the overall score to range from a low of 5 to a high of 15. An arbitrary decision was made to define the severity levels according to the following scores: mild, 5 to 7; moderate, 8 to 10; severe 11 to 15. Although theoretically medication scores could range between 3 and 136, these represent actual observed values in this particular group.
## APPENDIX I

**CHILDREN'S HOSPITAL, COLUMBUS, OHIO**

**PATIENT/FAMILY TEACHING RECORD**

**INSTRUCTORS:**

<table>
<thead>
<tr>
<th>Name/Title</th>
<th>( )</th>
</tr>
</thead>
</table>

**PATIENT/FAMILY TO BE TAUGHT:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Relationship</th>
</tr>
</thead>
</table>

For each date in column three and five, indicate to whom information was given and by whom the objective was met.

<table>
<thead>
<tr>
<th>Teaching Need</th>
<th>Teaching Objectives</th>
<th>Information Given or Reinforced Date/Time</th>
<th>Progress Comments</th>
<th>Objective Met</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature of Asthma</strong></td>
<td>Describes basic anatomy and physiology of respiratory system</td>
<td>States effects of asthma on bronchi: a. bronchospasm b. edema</td>
<td>States appropriate management measures for each trigger (see related Helping Hand)</td>
<td>Discusses wide variety of possible triggers and importance of detecting additional ones.</td>
<td></td>
</tr>
<tr>
<td><strong>Triggers and their Management</strong></td>
<td>Identifies triggers specific to child: a. b. c. d.</td>
<td>States appropriate management measures for each trigger (see related Helping Hand)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Management of Signs of Asthma Episode</strong></td>
<td>Identifies earliest signs specific to child: a. b. c. d.</td>
<td>States actions to take for an episode: a. rest and relax b. drink fluids c. take medications d. breathing exercises.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

189
<table>
<thead>
<tr>
<th>Teaching Need</th>
<th>Teaching Objectives</th>
<th>Information Given or Reinforced Date/H/H*</th>
<th>Progress &amp; Comments</th>
<th>Objective Met</th>
<th>Date/H/H*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of Signs of Asthma Episode</td>
<td>States how to assess levels of distress of child: a. counts respirations b. describes inspiratory/expiratory ratios c. listens for and evaluates wheezing d. defines retractions, locate and describe their significance Recognizes importance of seeking early medical advice. Knows when and how to seek it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breathing Exercises and Relaxation Techniques (for children 6 years &amp; up)</td>
<td>States purpose and demonstrates procedure for doing diaphragmatic breathing and relaxation exercises may lessen symptoms during early stages of episode. Recognizes that diaphragmatic breathing and relaxation exercises may lessen symptoms during early stages of episode.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medications</td>
<td>Knows medications specific to child: a. b. c. d. States purpose, dosage and side effects of each medication (see appropriate Helping Hand) Describes schedule for medication administration at home Describes arrangements for medication during school hours Recognizes importance of refilling prescriptions before running out of medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Management</td>
<td>Discusses plans for child to assume or maintain level of responsibility appropriate for age and maturity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotions</td>
<td>Expresses feelings about having a child with asthma in a healthy manner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### APPENDIX I (continued)

<table>
<thead>
<tr>
<th>Teaching Need</th>
<th>Teaching Objectives</th>
<th>Information Given or Reinforced Date/Init.*</th>
<th>Progress &amp; Comments</th>
<th>Objective Met Date/Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up and Community Resources</td>
<td>Recognizes importance of consistent, regular medical follow-up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>States time and place of next appointment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knows where to get phone number for physician and/or clinic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knows where to get phone number for local lung association and resources available through association and support groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knows how to approach school personnel, including school nurse, teachers, coaches</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Resources Used or Given to Patient/Family:

- Asthma (HH-I-11)
- Respiratory System Outline (HH-V-54)
- Mold Allergies (HH-I-5)
- Dust Allergies (HH-I-2)
- Respiratory Infection (HH-I-30)
- Asthma Breathing Exercises (HH-I-33)
- Theophylline (HH-V-51)
- Decongestants (HH-V-10)
- Bronchodilators (HH-V-39)
- Prednisone (HH-V-32)
- Medications - How to Give by Mouth (HH-V-28)
- Allergic Rhinitis (HH-I-89)
- Aerosol Therapy (HH-V-3)
- Pulse and Respiration (HH-I-28)
- Other
  - The Asthma Handbook
  - School Nurse Letter
  - American Lung Resources
  - COLA Resources
  - Support Group Information
  - Medication Reminder Card
  - Asthma Test
  - Coloring Page of Lungs
  - Seek-A-Word
  - Progressive Relaxation

SUMMARY COMMENTS: 

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Have received instruction in all areas listed above and my questions have been answered.

Patient/Family Signatures
APPENDIX J

ASTHMA COURSE
Developed by B. Glandon, R.N., B.S.N.

CLASS I

Prior to Class: Do Nursing Assessment of the child with asthma. Begin Patient/Family Teaching Record. Explain asthma classes and set up times. Assign to read prior to first class Helping Hands:

1. Asthma
2. Theophylline
3. Prednisone

Materials for Class

1. Normal lung poster
2. Asthma poster
3. Coloring page of lungs
4. Box of triggers
5. Stethoscope
6. Pinwheel materials
7. "Asthma: Breathing Exercises" Helping Hand to hand out at end of class
8. "Pulse and Respirations" Helping Hand
9. COLA Bear and tapes

Class Content:

Statement of Purpose:

Asthma affects 9 million Americans, 3 million are children. It is the leading cause of school absences and admissions to children's hospitals. Our goal is to reduce the number of hospitalizations your child will have as well as to reduce the number of episodes and the severity of each episode. We hope to do this through education in the following areas: what asthma is, what causes it, what can be done to prevent some episodes and lessen the severity of others, how to manage an asthma episode and how you and your child can be in control of and confident about his/her asthma.

1. Normal lung anatomy and physiology (use poster).

2. Three changes that occur in an asthma episode (use poster and coloring sheet):
   a. Smooth muscles around airways spasm
   b. Increase in mucus production
   c. Swelling of cells lining airways
APPENDIX J (continued)

3. Medications:

A. Theophylline

1. Various names and forms
2. Action: Relaxes smooth muscles
3. Side effects - See Helping Hand
4. When to call doctor - See Helping Hand
5. Take with meals or light snack to prevent nausea
7. Explain blood levels: Therapeutic range, check levels every 6 months, not effective at low levels. Slow build up of levels takes hours or days to relieve spasms. Importance of renewing prescription and taking medication as prescribed.
8. Missed and vomited doses - See Helping Hand
9. Effects of other medications:
   - May lower Theophylline level:
     Phenobarbital, Dilantin, Nicotine (cigarette)
   - May raise Theophylline level:
     Tagamet, Influenza Virus Vaccine, Inderal, Erythromycin

   The body turns caffeine (tea, cola drinks, coffee, chocolate) into Theophylline

B. Prednisone

1. Explain purpose of drug: Decreases swelling of cells and mucus production.
2. Explain nature of drug: A steroid. Emphasize never stop taking drug or change dosage without doctor's knowledge and why - see Helping Hand.
3. Side effects: Rarely any problems when treatment is less than two weeks; two to four weeks - may see increase in appetite, weight gain and feeling of well being. Additional problems with long term use - see Helping Hand "Medic Alert". Goal is to use the lowest dose possible to control the symptoms. Every other day schedule is helpful.
4. Diet: take with meals - see Helping Hand
5. When to call doctor - see Helping Hand
C. Aerosols

1. Purpose is to explain the aerosols they are receiving in the hospital. (If they are to go home on home aerosols, call Glasrock and arrange for them to bring equipment to the hospital. They will teach the patient/parent to use the aerosol equipment. Give Helping Hand on "Home Aerosols". Review with patient/parent. Arrange for them to give an actual aerosol using their equipment before discharge. Instruct on aerosol medications - see Class III Outline.)

Aerosols: Delivers medications directly into the lungs - quicker results, safer with fewer side effects.

2. Teach about medication used in aerosol that child is on in hospital

a. Albuterol (Proventil, Ventolin)
   Metaproterenal (Alupent, Metaprel)
   Desired effect: Relaxes smooth muscles around airways
   Side effects: Shakiness, rapid heart rate, nervousness, nausea, vomiting, pallor, cough

b. Cromolyn Sodium (Intal)
   Preventive medication: Prevents release of histamine from the mast cells that line airways.
   It takes 4-8 weeks of treatment for full effect.
   The lungs continually manufacture new mast cells, so effects wear off when stop using Intal.
   Side effects: Rare - throat irritation, bad taste in mouth, rare allergic reaction, wheezing.

3. Triggers

a. Environment: Dust, mold, smoke, strong odors, aerosol sprays, grass, trees, pollen, pollution

b. Animals: Cat and dog dander, horse and horse hair products, feathers (pillows), wool

c. Food Allergies: Milk, wheat, eggs, fish, corn, chocolate

d. Medicines: PCN, Sulfa, ASA
APPENDIX J (continued)

-4-

e. Weather: Each season has its own problem - see Class II under Triggers

f. Infections: Viral #1 cause of asthma episodes in young children

g. Exercise Induced Some sports/exercises may be a trigger

h. Emotions: Hard laughing, crying, yelling, strong emotional upset

4. Early Warnings

a. Scared look
b. Unusual paleness, sweating
c. Restlessness during sleep
d. Vomiting
e. Hunched body posture - cannot stand or sit straight or relax

f. Cough/sneeze
g. Fatigue - not related to play or exercise
h. Tightness in chest or chest pain
i. Feeling funny/strange
j. Skin itching - chin/nose
k. Runny nose/eyes
l. Irritable

5. How to measure level of distress

a. Instruct how to count respirations, give normals for age, practice counting normals. "Pulse and Respiration" Helping Hand available.

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>35</td>
</tr>
<tr>
<td>1-11 months</td>
<td>30</td>
</tr>
<tr>
<td>2 year</td>
<td>25</td>
</tr>
<tr>
<td>4 year</td>
<td>23</td>
</tr>
<tr>
<td>6 year</td>
<td>21</td>
</tr>
<tr>
<td>8 year</td>
<td>20</td>
</tr>
<tr>
<td>10 year</td>
<td>19</td>
</tr>
<tr>
<td>12 year</td>
<td>19</td>
</tr>
<tr>
<td>14 year</td>
<td>18</td>
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<tr>
<td>16 year</td>
<td>17</td>
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<tr>
<td>18 year-18</td>
<td></td>
</tr>
<tr>
<td>18 year-20</td>
<td></td>
</tr>
</tbody>
</table>

Normals taken from "Nursing Care of Infants and Children" by Whaley and Wong.

b. Instruct what the I:E ratio is. What is normal (1.5 to 1). Moderate distress (1:1) and severe distress (less than 1:1).
c. Instruct how to listen for wheezing. Stethoscope or putting ear to back of chest. Forceful expiration. Use pinwheel. Instruct what is mild, moderate and severe. See chart below:

Chart Taken from Children with Asthma: A Manual for Parents

<table>
<thead>
<tr>
<th>Severity</th>
<th>I:E Ratio</th>
<th>Wheezing</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>1.5:1</td>
<td>Mild expiratory</td>
<td>None</td>
</tr>
<tr>
<td>Moderate</td>
<td>1:1</td>
<td>Full expiratory</td>
<td>Sternal and Clavicular</td>
</tr>
<tr>
<td>Severe</td>
<td>Less than 1:1</td>
<td>Inspiratory with</td>
<td>Above plus intercostal</td>
</tr>
</tbody>
</table>

**End of Class**

1. Instruct parents and/or patient to think about and mark triggers specific to their child in "Asthma" Helping Hand.

2. Instruct them to mark early warning signs in "Asthma" Helping Hand.

3. Hand out "Asthma: Breathing Exercises" Helping Hand, if age appropriate, to read for next class.

4. Make available COLA Bear and tapes to school age children. Instructor to review tape outline and be available to discuss tape content after child listens to each tape. Allow child to tell you what was on each one first, then guide discussion on anything they omit. Help them to apply information to themselves.
APPENDIX J (continued)

CLASS II

Preparation for Class

1. Instructor to read Pages 97-100 of "Children with Asthma: A Manual for Parents" for section on emotions.

2. Read "House Dust Allergy" and "Mold Spore Allergy" articles.

Materials for Class

1. Other medication Helping Hands appropriate for their child. Available are "Bronchodilators" (Alupent Ventolin, Proventil Quibron); "Decongestants" (Actifed, Sudafed, Dimetapp, Triaminic Rondec). Note the "Cromolyn Sodium" (Intal) Helping Hand is for the the spin inhaler form only. This is seldom used in this form anymore. There is a Helping Hand "Albuterol" (Proventil, Ventolin) for inhaler form but the directions for usage are incorrect.


4. Teacher card.

5. American Lung Association of Mid-Ohio and Central Ohio Lung Association information.

6. Information on support group third Wednesday, 7:00 p.m., Conference Room C across from cafeteria, September-July.

7. Camp information.


9. Medication reminder card

10. Asthma test.

11. Practice inhaler and inhaler aids (Inspirease) if applicable.

Class Content

1. Discuss their triggers and how to handle them. This is child specific:

   a. The Bedroom - to be dust, smoke and pet free for all children with asthma. Explain how allergies develop.

   b. Dust - Refer to "Allergy to Dust" Helping Hand and "House Dust Allergy" article.

   c. Mold - Refer to "Allergy to Mold" Helping Hand and "Mold Spore Allergy" article. Discuss Christmas trees.
APPENDIX J (continued)

-2-

d. Food Allergies - consult dietician.

e. Weather - seasonal problems.

1. Fall - Everything dying, dampness, molds very bad, high pollen counts. Dust with furnace on.

2. Winter - Molds, improve with frozen ground and snow cover; house closed up - pollution from aerosol sprays, paints, kerosene heaters, fireplaces, animals indoors, cigarettes, Christmas trees and decorations, cold air.

3. Spring - Everything blooms, windy, quick barometric changes, deep low pressures, frequent grass cutting.

4. Summer - Hot, humid air

f. Exercise - discuss with all parents and children.

1. Need to encourage physical fitness, strengthens respiratory muscles and increases lung capacity. Also good for self-esteem.

2. Educate teachers, physical education teachers, coaches expecting too much versus overprotection. Role of inhalers and allowing periods for rest when requested.

3. Swimming best. Develops lung capacity, moist warm air. Other good sports - golf, gymnastics, diving, tennis, baseball, football, downhill skiing. These are short burst of energy sports. More difficult but possible for some - country skiing, basketball, lacrosse, hockey, long distance running. These all require sustained physical activity.

g. Deal with other allergies as they are recognized. Help family develop ways to minimize contact with allergies. Be strict about smoking in the house. Encourage families to become aware of more triggers by keeping records if necessary.

2. Discuss child's early warning signs - help them identify additional ones.

3. Discuss what to do when an episode occurs and the importance of acting, not waiting and why. Easier to prevent than treat. Easier to reverse early spasms than to spend days clearing up mucus and swelling.

a. Remain calm - important for child.
b. Remove trigger if possible.

c. Begin medications - review Theophylline, go over other medications specific to this patient, use Helping Hand for bronchodilators and decongestants listed above. If they already use a home aerosol, review actions and side effects of the medications used. If Cromolyn Sodium (Intal) is used in aerosol or inhaler, see notes on Intal from Class I. If inhaler is to be used, instruct on proper use. Have child practice. Use inhaler aids if under 8 years or having difficulty. Give medication reminder card.

d. Give liquids:

   - 30 lbs - 22 oz/day       60 lbs - 54 oz/day
   - 30 lbs - 36 oz/day       80 lbs - 64 oz/day
   - 40 lbs - 46 oz/day       150 lbs - 80 oz/day

e. Do abdominal breathing. Use "Asthma: Breathing Exercises" Helping Hand. Make available information on progressive relaxation if age appropriate.

4. When to call the doctor:

   a. Does not improve in 24 hours.
   b. Becomes worse even though above actions taken.
   c. Goes from mild to moderate - review levels of distress.
   d. You are unsure how he/she is or what he/she is doing.
   e. Feel uncomfortable with way child is doing.
   f. Shortness of breath - gasping for air.
   g. Nailbeds or lips appear blue.
   h. Neck muscles tighten, nose flared.
   i. Patient unable to speak or only 1-2 word sentences.

5. Allergy testing:

   a. When to Test - Your doctor feels it is necessary, asthma is severe, history of allergic reactions to specific allergens, family history of allergies and asthma, displays allergic symptoms - allergic shiners, nose breather, hayfever, eczema.

   b. Types of testing:

      1. RAST a blood test for allergic antibodies in blood.

      2. Skin Tests - quicker, more specific, less expensive, more accurate. Results significant if correlate with history.

      3. Beware of other expensive and useless types of testing, i.e., Leucocytoxic and Sublingual provocation.
c. Testing can be done at any age. Takes awhile to develop allergies. Must be exposed. Remember in very young children, asthma is usually caused by a virus. Can develop new allergies at any time in life.

6. Emotions:

Instructor has already read Pages 97-100 in "Children with Asthma: A Manual for Parents" as a background. Using active listening skills, feel out parent and child's feelings at this point. Be supportive. Stress normalcy if reaction is negative. Acknowledge aspects of asthma are frightening, frustrating, an inconvenience, disruptive to family plans and schooling, and expensive. Acknowledge behavior difficulties with asthma highs. Help parents to develop realistic expectations for behavior and appropriate actions. Stress asthma is not contagious, most of the time the child is not "sick." Avoid making the child feel different, resist being overprotective, encourage participation in normal childhood activities, including sports.

7. Future:

a. Rarely fatal - 1 in 25,000.

b. 3 million children have asthma, 50% outgrow it, sometimes lessen in severity as child grows, sometimes re-occur in severity as child grows, sometimes re-occurs in adulthood.

c. Asthma support groups available.

d. American Lung Association of Mid-Ohio and Central Ohio Lung Association available for information and support. Hand out pamphlets.

e. Give parents "The Asthma Handbook".

8. Dealing with school - teachers, physical education, school nurse, use teacher card.

9. Post Test - grade and review with parent and child before discharge.

10. Schedule third class if going home on home aerosols.


12. Do school and public health referrals as needed.
APPENDIX K

CONTENTS OF ASTHMA TEACHING MATERIALS PACKET

CLASS I

1. Body System: Respiratory Helping Hand (HH-IV-54)
2. Asthma Helping Hand (HH-I-11)
3. Coloring Sheet of Lungs from COLA
4. Theophylline Helping Hand (HH-V-41)
5. Prednisone and Prednisolone (HH-V-32)
6. Pulse and Respirations Helping Hand (HH-II-28)
7. Asthma: Breathing Exercises Helping Hand (HH-I-83)
8. COLA Bear Tape Outline
9. Asthma Seek-a-Word
10. *The Asthma Handbook*

CLASS II

1. House Dust Allergy
2. Allergy to Dust Helping Hand (HH-I-2)
3. Mold Spore Allergy
4. Allergy to Mold Helping Hand (HH-I-5)
5. Bronchodilators Helping Hand (HH-V-49)
6. Body Relaxation
7. Asthma - Facts Teachers Should Know
8. Asthma Alerts for School Personnel
9. Lung Associations’ Cards (ALA of Mid-Ohio and COLA)
10. Information on Asthma Camps
11. Current Support Group Flyer
12. Refill Reminder for Medications
13. Order Form for *Children with Asthma: A Manual for Parents*
APPENDIX L

CHILDREN'S HOSPITAL RESEARCH FOUNDATION
Columbus, Ohio 43205
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

II. A. GENERAL INFORMATION:

1. ____________________ (Legal Name of Subject) ____________________
   (Birthdate of Subject)

2. Full title of study: The Effects of an Inpatient Asthma Education
   Program at Columbus Children's Hospital on Selected Health
   Behaviors of School-aged Children Hospitalized with a Primary
   Medical Diagnosis of Asthma.

3. Expected duration of subject's participation in the study:
   15 to 20 minutes to hear study explanation, give written consent
   30 to 60 minutes to complete questionnaires
   2 hours minimum during hospitalization to complete the Asthma
   Education Program
   3 months after hospital discharge during which a Parent Diary
   will be maintained
   30 to 60 minutes at the end of this three month period to
   complete questionnaires

4. Principal Investigator of study: Laurel P. Talabere, M.S., RN,C.

5. If applicable, FDA Investigational New Drug (IND)/Investigational
   Device (IDE) number: not applicable.

6. a. EXPERIMENTAL PRODUCT(S)/PROCEDURE(S) to be used that are NOT part
   of standard practice:
   1) Two questionnaires for your child and one for you to
      complete at the beginning and end of participation in
      this study. These questionnaires are designed to measure
      your child's knowledge of asthma and to identify you and
      your child's feelings about his/her asthma.
   2) Two one-hour asthma education sessions for both you and
      your child.
   3) A Parent Diary requiring you to make regular entries about
      your child's asthma experiences during the three months
      after your child's discharge from the hospital.
   4) A telephone call to you, the parent, by a nurse every two
      weeks during the three months after hospitalization.

   b. How they are to be used:
   1) The questionnaires will give information to help evaluate
      the effect of the Asthma Education Program.
   2) The two Asthma Education Program sessions will teach you
      and your child about asthma, its triggers, and how to
      manage it. The teaching will be done by a nurse who takes
      care of your child during hospitalization.
   3) You will use the Parent Diary to record the dates of all
      of hospitalizations, emergency room or emergency
      (unscheduled) physician visits, and school absences due to
      asthma. You will also record the dates of all wheezing
      episodes and write down all medicines given for asthma.
   4) The purpose of the telephone calls is to monitor/encourage
      your ongoing completion of the Parent Diary.
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

II. A. GENERAL INFORMATION:

7. APPROVED OR ACCEPTED PRODUCTS to be used which entail some risk to the subject: None known.

II. B. SPECIFIC INFORMATION:

1. Purpose of Study: To see if this Asthma Education Program makes a difference for your child in the number of hospitalizations, emergency room or emergency (unscheduled) physician visits, school absences, or wheezing episodes. Also to see if this program makes a difference in your child’s knowledge about asthma or in you or your child’s feelings about his/her asthma.

This Asthma Education Program is a test program at Children’s Hospital and is in addition to the current procedures for teaching children and parents about asthma. These current procedures include the opportunity for you to discuss your concerns about your child’s asthma with your physician and/or your nurse as well as printed materials that may be given to you.

If you agree to participate in this study, you will be assigned by chance to one of two groups:

a. CONTROL GROUP: In addition to participating in the current procedures described above, you and your child will be asked to participate in all of the procedures described under II.A.8.a. except the two one-hour Asthma Education Program sessions.

b. EXPERIMENTAL GROUP: In addition to participating in the current procedures described above, you and your child will be asked to participate in all of the procedures described under II.A.8.a. including the two one-hour Asthma Education Program sessions.

If you decline to participate in this study, you may participate in the Asthma Education Program the next time your child is admitted to Children’s Hospital because of his/her asthma.


3. Possible risks: In both the EXPERIMENTAL AND CONTROL GROUPS, there may be no change in the frequency of your child’s hospitalizations, emergency room or emergency (unscheduled) physician visits, school absences, or wheezing episodes; also there may be no change in your child’s knowledge about asthma or in your feelings or your child’s feelings about his/her asthma.
APPENDIX L (continued)

CHILDREN'S HOSPITAL RESEARCH FOUNDATION
Columbus, Ohio 43205
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

FULL TITLE OF STUDY: The Effects of an Inpatient Asthma Education Program at Columbus Children's Hospital on Selected Health Behaviors of School-aged Children Hospitalized with a Primary Medical Diagnosis of Asthma.

II. B. SPECIFIC INFORMATION (continued):

4. Possible benefits: There is a possible benefit of reducing the frequency of your child's hospitalizations, emergency room or emergency (unscheduled) physician visits, school absences, or wheezing episodes; also there may be an increase in your child's knowledge about asthma or a positive change in your feelings or your child's feelings about his/her asthma. If you and your child are in the CONTROL GROUP, this Asthma Education Program will be available to you and your child, should your child be hospitalized after the three months period required to complete this study.

5. Methods used to maintain confidentiality: All information obtained about you and your child, both from medical records and from the questionnaires will be coded so that only the principal investigator and the nurse making the telephone calls will be able to identify specific children and their parents. Results of the study will be reported by groups only and not by individual child or parent.

6. Possible additional costs to you, your child, or your insurance company or other third party payer that might result from participation in this study: None known.
APPENDIX L (continued)

CHILDREN'S HOSPITAL RESEARCH FOUNDATION
Columbus, Ohio 43205
CONSENT TO RESEARCH TREATMENT OR PROCEDURES

FULL TITLE OF STUDY: The Effects of an Inpatient Asthma Education Program at Columbus Children's Hospital on Selected Health Behaviors of School-aged Children Hospitalized with a Primary Medical Diagnosis of Asthma.

III. INFORMATIVE STATEMENTS AND SIGNATURES:

POSSIBLE UNFORESEEABLE RISKS IN PREGNANCY STATEMENT: None known.

STATEMENT OF CONFIDENTIALITY: I understand that all records will be maintained in a confidential manner. The records will be available only to the investigators and, when appropriate to the U.S. Food and Drug Administration (FDA). They will be revealed to other people only if personal identifiers have been removed.

COMPENSATION STATEMENT: In the event of physical injury resulting from participating in this study, I understand that immediate medical treatment is available at Children's Hospital. I also understand that the costs of such treatment will be at my expense and that financial compensation is not available. For further explanations and for any questions concerning your rights or possible research-related injuries, please contact the Director of Risk Management at (614) 461-2557.

The information has been explained to me and my child and I understand it. Any further questions I have in regard to this study will be answered by

Laurel R. Talabere, W.S., Ph.C. (Principal Investigator) (614) 330-630 (work) (614) 330-1371 (home) (Phone Numbers)

Was initial consent obtained by phone? ___ Yes ___ No

Finally, I understand that I am free to withdraw my child (myself) from the project at any time without prejudice to on-going or future care. My consent does not prevent me from exercising my legal rights. I consent to enroll my child (myself).

(Patient) (Signature of Principal Investigator - Written Consent)

(Witness - Written Consent) ___________ Date ____________

I certify that I explained the research and its purposes and procedures to the subject or his/her representative or both before requesting the subject or representative to sign it.

(Signature of Principal Investigator - Written Consent)
Jul 29, 1988

Vincent V. Hamparian, Ph.D., Chairman
Human Subjects Committee
Children's Hospital Research Foundation

Dear Dr. Hamparian:

I am writing this letter in support of the dissertation proposal of Laurel R. Talabere, M.S., RN.C, PNP, a doctoral candidate in health education at the Ohio State University. This proposal is entitled "The Effects of an Inpatient Asthma Education Program at Columbus Children's Hospital on Selected Health Behaviors of School-aged Children Hospitalized with a Primary Medical Diagnosis of Asthma". Ms. Talabere has an extensive background in the nursing care of children and in working with children with asthma. She is an Associate Professor at Capital University School of Nursing where she coordinates Nursing of Children, which includes the clinical instruction of students at Children's Hospital. She also directs a SUPERKids asthma camp for which she developed an educational curriculum that emphasizes self-management skills. Previously, Ms. Talabere was the Pulmonary Clinical Nurse Specialist at Children's Hospital. In addition, she has been involved in family asthma education programs and in research projects evaluating the effects of asthma education programs. She has also published book chapters and journal articles on pulmonary problems in children and on patient education.

The major components of her dissertation proposal are as follows:

1. This is a low risk study evaluating the presence or absence of benefits of receiving an Asthma Education Program (for inpatient asthmatics) and their parents (or guardians).

2. The study is a randomized, stratified clinical trial evaluating study subjects (aged 8-12) and controls.
Page 2
Vincent V. Hamparian, Ph.D.
July 29, 1988

3. The trial will involve three paper-and-pencil instruments (two child, one parent) to be given pre-and post-intervention. These instruments are currently being piloted for reliability. In addition, parents will keep a Parent Diary for three months after the child’s discharge.

The time frame for this study is September 1, 1988 - June 1, 1989.

I feel that it is appropriate to support this study in our population.

Sincerely,

Karen S. McCoy, M.D., Chief
Section of Pulmonary Medicine

bjg
APPENDIX M (continued)

CHILDREN'S HOSPITAL RESEARCH FOUNDATION
APPLICATION FOR REVIEW BY
HUMAN SUBJECTS RESEARCH COMMITTEE

Protocol No. 88HS033

TITLE OF PROTOCOL: The Effects of an Inpatient Asthma Education Program at Columbus Children's Hospital on Selected Health Behaviors of School-aged Children Hospitalized with a Primary Medical Diagnosis of Asthma.

INVESTIGATOR(S): Laurel E. Talsaere

RESEARCH PLAN: Complete protocol must be assembled, stapled and submitted according to the following outline:

A. These application sheets
B. Abstract of Proposed Study (RF-3)
C. Consent Form (RF-2)
D. Introduction and Background
E. Specific Aims
F. Significance
G. Methods and Design
H. Dates of Entire Proposed Project Period
I. Site of Research Project

PROJECT INVOLVES (If Applicable):

/ / NEW DRUG (IND): Indicate IND Number_______ Issued To_________ (Sponsor)
Generic Name_______

/ / ACKNOWLEDGEMENT BY PHARMACY: Details concerning dispensing and administration of drug have been addressed and conform to Hospital policies and procedures and the Laws of Ohio.

(Pharmacist/Representatives Signature)

/ / RADIOACTIVE DRUGS OR UNUSUAL EXPOSURE TO EXTERNAL RADIATION: Approval by the Radiation Safety Committee is required prior to submission to the Human Subjects Research Committee.

(Approval Date)

/ / INVESTIGATIONAL DEVICE: IDE Number_______ Issued To_________

REVIEW REQUESTED BY:

/ / FULL COMMITTEE: Submit 8 complete copies of the protocol and 14 assembled copies of both the Abstract Summary (RF-3) and Consent Form (RF-2).

/ / EXPEDITED REVIEW (Waiver): Submit 2 assembled copies each of the Application Sheet, Consent Form and a memo justifying a waiver and describing confidentiality procedures.

DEPARTMENT HEAD, SECTION CHIEF OR DIRECTOR'S ENDORSEMENT:

Joy Edwards-Beckett, Ph.D., D.N., RN

(Typed Name) (Signature)

The Appropriate Director must sign this form if the Section Chief or Department Head is the Investigator.

RFl (rev.3/22/89) page 1 of 2
APPENDIX M (continued)

CHILDREN'S HOSPITAL RESEARCH FOUNDATION
APPLICATION FOR REVIEW BY
HUMAN SUBJECTS RESEARCH COMMITTEE

SIGNATURE PAGE

Title of the Study: The Effects of an Inpatient Asthma Education Program at Columbus Children's Hospital on Selected Health Behaviors of School-aged Children Hospitalized with a Primary Medical Diagnosis of Asthma.

SIGNATURES OF PRINCIPAL INVESTIGATOR/COINVESTIGATOR

[Signature of Principal Investigator]  [May 22, 1987.]
[Date]

[Department]  [Phone Number]

[Signature of Coinvestigator]  [Date]

[Department]  [Phone Number]

[Signature of Coinvestigator]  [Date]

[Department]  [Phone Number]

Your signature also confirms acceptance of the following procedure. a) any changes in approved research may not be initiated without Human Subjects Research Committee review and approval except where necessary to eliminate immediate hazards to human subjects, b) if at any time during the conduct of the protocol, any unanticipated hazards or untoward reactions are encountered, even if they are not apparently associated with the research, the project must be stopped immediately and the Chairperson of the Human Subjects Research Committee must be notified of the circumstances in writing.

OTHER REQUIRED SIGNATURES - Consult with the heads of all units that will be affected by this protocol and obtain their signatures. Include Departments providing important support services e.g., Nursing (Head Nurse), Psychology, Dietetics, Laboratory, etc. If an investigational device is involved, the signature of the Chairperson of the New Product Evaluation (new devices & products) Committee also is required.

By signing below, the signator(s) acknowledge that they have reviewed this protocol and have had an opportunity to discuss it with the principal investigator. The signator(s) further acknowledge that issues relative to providing the necessary support for the project have been, or will be, worked out prior to the start of the project.

Send application to: Human Subjects Office, Attn: Barb Sauer, Wexner, Ext. 8081
APPENDIX N

BEHAVIORAL AND SOCIAL SCIENCES
HUMAN SUBJECTS REVIEW COMMITTEE
THE OHIO STATE UNIVERSITY

Research Involving Human Subjects

ACTION OF THE REVIEW COMMITTEE

With regard to the employment of human subjects in the proposed research protocol:

6880121 THE EFFECTS OF AN INPATIENT ASTHMA EDUCATION PROGRAM AT COLUMBUS CHILDREN'S HOSPITAL ON SELECTED HEALTH BEHAVIORS OF SCHOOL-AGED CHILDREN HOSPITALIZED WITH A PRIMARY MEDICAL DIAGNOSIS OF ASTHMA, Moon S. Chen, Laurel R. Talabere, Health, Physical Education and Recreation

THE BEHAVIORAL AND SOCIAL SCIENCES REVIEW COMMITTEE HAS TAKEN THE FOLLOWING ACTION:

X APPROVED

* Conditions stated by the Committee have been met by the Investigator and, therefore, the protocol is APPROVED.

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least four (4) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the University, signed consent forms are to be transferred to the Human Subjects Review Committee for the required retention period. This application has been approved for the period of one year. You are reminded that you must promptly report any problems to the Review Committee, and that no procedural changes may be made without prior review and approval. You are also reminded that the identity of the research participants must be kept confidential.

Date: August 12, 1988
Signed: [Signature]

Chairperson

HS-025B (Rev. 3/85)
MEMORANDUM

From: Vincent V. Hamparian, Ph.D.
Chairman, Human Subjects Research Committee

To: Laurel Talabere, M.S., R.N.

Protocol #: 88HS033

Your protocol entitled: The Effects of an Inpatient Asthma Education Program at Columbus Children's Hospital on Selected Health Behaviors of School-Aged Children Hospitalized with a Primary Medical Diagnosis of Asthma has been reviewed and approved by the Human Subjects Research Committee on September 20, 1988 - CONTINGENCIES SATISFIED.

NOTE: It is the responsibility of the principal investigator to retain a copy of each signed consent form indefinitely beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the Children's Hospital, signed consent forms are to be transferred to the Human Subjects Research Committee for the required retention period.

hsc\88hs033.hsc
MEMORANDUM

TO: Laurel Talabere, MS, RNC  
FROM: William B. Zipf, Chair  
CSC Protocol & Advisory Committee  
SUBJECT: Project: Effects of Inpatient Asthma Education Program  
DATE: 9-30-88

Your project was reviewed by the CSC P&A committee on 9-15-88 and the following action was taken:

1. approved pending IRB approval  
2. CSC nursing time (50 hrs x $17.00/hr) = 850.00 (in Kind)  
3. CHRP account for T shirts = 450.00  
4. postage & xeroxing = 208.00 (in Kind)  

TOTAL GRANT AMOUNT 1508.00

Please contact Belinda Pinyerd, RNC, MS (CSC Head Nurse) at x2341 regarding how to proceed with your project.

In all future publications and presentations, please include an acknowledgment of Children's Hospital Clinical Study Center for support of this project.

We ask that within 6 months before you have completed your project you submit to us the following:

1. Number of subjects seen in the course of the study.  
2. Copy of all manuscripts published (or listing of those in progress or submitted).  
3. List of all presentations related to project.

Do not hesitate to contact me if you have any further question.
APPENDIX O

AEP FOR NURSES
Day One

LAUREL TALARRE, M.S., R.N.C.
BONNIE GLANDON, B.S.N., R.N.

OBJECTIVES:

1. To demonstrate accurate and individualized child and family assessment, using the Nursing Assessment of the Child with Asthma and the Family.

2. To demonstrate a knowledge base about asthma and its management that is sufficiently broad to provide accurate and practical responses to questions posed in selected "case studies."

3. To individualize the Asthma Education Program Classes, based on assessment data, without sacrificing content as specified in the class outlines.

4. To demonstrate effective teaching of the child with asthma and the family, following the Asthma Education Program course content outlines for Classes I and II (required) and III (optional).

CONTENT:

1. Nursing Assessment of the Child with Asthma & Family
   a. Purpose of Nursing Assessment Instrument
   b. Use
      1) Accuracy: reinforcing vs. conflicting data
   2) Parent attendance at AEP classes

2. Your knowledge about asthma & asthma management
   a. A brief review
      1) Pathophysiology
   2) Management
      a) Environmental: home, school, outdoors
      b) Pharmacological
      c) Specific self-management strategies
   3) Psychosocial aspects
   b. Application: selected "case study" situations

3. AEP course content
   a. Structuring the teaching environment for success
   b. Class content outlines
      1) What's on paper vs. what's between the lines
   2) Balancing class content & individual needs
   c. Determining need for Class III (optional)
   d. Indicators of effectiveness in client teaching

214
THE FOLLOWING GUIDELINES APPLY TO ALL CHILDREN TAKING PART IN LAUREL TALABERE’S DOCTORAL DISSERTATION STUDY. INCLUDED ARE ALL CHILDREN:

- 8 TO 12 YEARS OF AGE
- ADMITTED INITIALLY TO 5TH OR 6TH GRADE

THESE CHILDREN WILL BE RANDOMLY ASSIGNED BY L. TALABERE TO EITHER:

- AN EXPERIMENTAL GROUP TO RECEIVE THE ASTHMA EDUCATION PROGRAM
- A CONTROL GROUP AND NOT RECEIVE THE ASTHMA EDUCATION PROGRAM

1. Call L. Talabere within 24 hours after the admission of an 8 to 12 year old child with asthma. She will:
   - Randomly assign the child to either the experimental or control group
   - Secure consent from the child/parent to participate in the study

2. Before beginning AEP instruction for any 8 to 12 year old child, please be sure they have been designated for the experimental group. The front of their chart will be flagged.

3. Before beginning AEP instruction for a child in the EXPERIMENTAL GROUP:
   - Be sure the Nursing Assessment of the Child with Asthma and the Family has been completed
   - Give the child two questionnaires:
     - TELL US ABOUT YOUR ASTHMA (Asthma Knowledge Questionnaire)
     - MORE ABOUT YOUR ASTHMA (Asthma Self-Control Inventory)
   - Be sure at least one adult member in the child’s immediate family is present (ideally it should be the same person for both sessions)
   - Give the parent (or other adult family member) one questionnaire:
     - YOUR CHILD’S ASTHMA (Survey of Asthma Problems and Severity)
   - If two or more parents are present, give one questionnaire to each one rather than having them fill out one questionnaire jointly.

4. After completion of the two AEP sessions, DO NOT give any further tests to either the child or the parent(s).
   - L. Talabere will give the Asthma Knowledge Questionnaire to selected children in each group before discharge.
   - All tests will be given again 3 months after discharge by L. Talabere to both groups.
APPENDIX O (continued)

AEP FOR NURSES
Day Two

LAUREL TALABERE, M.S., RN.C.
BONNIE GLANDON, B.S.N., RN

OBJECTIVES:

5. To select teaching method(s), appropriate for the child and family's stated learning preferences.

6. To utilize Helping Hands and other printed materials appropriately, given the child and family's individual knowledge base and teaching needs.

7. To describe accurate documentation of teaching the Asthma Education Program.

8. To make an accurate, complete, concise School Health Nurse Referral on the child with asthma.

9. To administer the following instruments to each child after completion of the Asthma Education Program without "cuing": the Asthma Test and a measure of the child's perceptions related to self health care.

CONTENT:

5. Teaching-learning methods
   a. Learning styles: a basis for selection
   b. Pros and cons of selected methods
   c. Matching content and method

6. Printed materials
   a. Timing: when to give out
   b. Quantity: is more better?
   c. Integration with class content

7. Documentation
   a. Patient/Family Teaching Record: Reactive Airway Disease (Asthma)
   b. Other

8. School Health Nurse Referral
   a. Importance of sending for every schoolager
   b. Completing the referral
   c. Calling in the referral

9. Pre- & Post-AEP Instruments
   a. Purpose
   b. Review of format and content
   c. Avoid cueing
   d. Giving feedback: Child's Asthma Knowledge Questionnaire as a teaching-learning tool
   e. Importance of completion for research purposes
Teaching about Inhalers


1. Put mouthpiece on cannister of inhaler.
2. Stand up; shake inhaler for two seconds.
3. Hold inhaler so cannister is upside down and mouthpiece is pointing toward mouth.
4. Hold the mouthpiece one inch from your lips.
5. Take a normal breath; then breathe in; now breathe out as much as possible.
6. Open your mouth wide and begin to breathe in.
7. Just as you begin to breathe in, squeeze the cannister once and continue to breathe in as deeply as you can.
8. Hold your breath for at least five seconds.
9. Keep your mouth open. If medicine floats out of your mouth, it didn't get deep enough. It is safe to repeat this first dose without counting it.
10. Wait two minutes.
11. Repeat steps 2 through 8.

- You should feel better within five minutes after using your inhaler.
- The effect of the inhaler medicine lasts about four hours.
- Don't use more than 5 double whiffs a day unless you check with your doctor.

Child using inhaler containing steroid medication (i.e. Vanceril, Amevacort) should rinse out his/her mouth after the second inhalation.

Child having difficulty coordinating this procedure should use a spacer.
REFERENCES


Davis, D.J. (1972). National Institute of Allergy and Infectious Disease initiatives in allergy research. *Journal of Allergy and Clinical Immunology, 49*, 323.


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