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The Effects of Self-Management Education for School-Age Children on Asthma Morbidity: A Systematic Review

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Abstract

The effects of asthma self-management education for school-age children on number of school days missed, emergency department visits and hospital admissions were evaluated through a systematic review of the published research. A total of 9 studies on asthma education programs that were conducted in schools by school nurses and health educators and targeted children 5–18 years of age were reviewed. The studies were all published between 1998 and 2009. The school-based asthma education programs delivered interventions in multiple sessions over short consecutive time periods of about a month to a month and a half. Follow-up data were collected in varying intervals from 1 month to 1 year postinterventions. Results indicated that a decrease in school days missed can be expected from such programs. The data regarding emergency department visits and hospital admissions was less definitive.

Keywords

asthma, chronic diseases, health education, elementary, high school, middle/junior/high school, coordinated school health program, program development/evaluation

Introduction

Asthma is one of the most prevalent chronic diseases of childhood and adolescence (Orell-Valente, Jarlsberg, Hill, & Cabana, 2008). Asthma exacerbation can lead to missed days of school, decrease involvement in physical activity and sports, increase time and money spent on medications, as well as, clinic and emergency department (ED) visits, hospitalizations, and even sometimes death. Of the top chronic diseases of children and adolescents, asthma is number one in days of school missed, ED visits, and hospitalizations (Lasserson & McDonald, 2010). Despite the negative consequences of poor asthma treatment and management, compliance is documented to be very poor for these patients and their families (Bokhour et al., 2008). Management of asthma requires a mastering of several tasks including identifying symptoms of an impending attack, identifying and avoiding triggers, proper and consistent peak flow technique, and correct usage of maintenance and rescue medications. Effective patient and family education is an important component in the mastery of these self-care skills (Mangan & Bailey, 2010).

School-based asthma education programs teach self-management knowledge and skills to children and adolescents with a diagnosis of asthma. While the majority of

pediatric health education is directed toward the parents and families of ill children, these programs uniquely focus on teaching the pediatric patient self-care without the presence of their parents or other family members. This health education also takes place in the school setting where children and adolescents are already in the mode to learn (Coffman, Cabana, & Yelin, 2009).

The purpose of this study is to examine if school-based asthma education programs are effective in decreasing the morbidity associated with this prevalent chronic disease. The following research question was addressed: What is the impact of school-based self-management asthma education programs on missed days from school, number of trips to the ED, and hospitalizations for school-age children 5–18-years-old within the first year of completion?

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Background And Significance

Asthma is a chronic inflammatory disease of the lungs that is characterized by repeated episodes of shortness of breath, wheezing and coughing, and chest tightness. Asthma can occur at any point across the life continuum and currently affects about 30 million Americans and 300 million people worldwide (Gelfand, 2009; Skrepnek & Skrepnek, 2004). Asthma can greatly affect a child's daily activities. Physical activity and sports are vital for children because they have a long term impact on children's social and psychological development as well as on their physical health. Children with uncontrolled asthma have been found to be less fit and participate in less physical activity than their peers without asthma (Vahlkvist & Pederson, 2009). Asthma symptoms of coughing and wheezing are especially prevalent at night which can lead to disruptions in sleep. Decreased sleep and school absences can ultimately lead to poor school performance. There are many psychological consequences of asthma as well. Children report anxiety and fear of sudden attacks and dying, peer rejection, and negative side effects from asthma medications particularly corticosteroids. In addition, asthma is known to cause sibling rivalry and family discord related to treatment demands and financial consequences (Sawicki & Dovey, 2010).

Asthma also brings significant economic costs and as asthma prevalence increases in the population so does the financial burden. The costs of asthma are direct and indirect. Direct expenditure consists of the cost of ED visits, hospitalizations, physician office visits, and medications and treatments. Indirect expenditure includes work and school absences and the loss of future potential earnings due to morbidity and mortality. Ultimately, it is the cost of significant healthcare utilization associated with asthma that causes it to be ranked as one of the most expensive chronic diseases (Bahadori et al., 2009).

Asthma and its treatment are taxing for patients, health-care systems, and society. Asthma affects over four million children in the United States, with almost 15 million missed school days, hundreds of thousands of ED visits, and hospitalizations. It is estimated that asthma cost the United States over \$10 billion in 1994 and will almost double to \$18 billion by 2020 (Bravata et al., 2009). Due to these high-cost factors and effects on quality-of-life for children with asthma and their families, it is important to look for ways to improve outpatient asthma management. Differences in the degree of asthma control are related largely to variations in adherence to medication and treatment plans and shortfalls in patient self-management. Compliance has been found to be only 55% for children who have been prescribed daily maintenance asthma medication (Bravata et al., 2009). Medication compliance and parental and patient knowledge of asthma and its management are greatly related to a patient's and parent's exposure to effective patient education (Bahadori et al., 2009).

The concept of asthma self-management education is not new. In the 1930s–1980s, some hospitals provided long-term inpatient programs called residential programs that were specific and solely for the care of children with asthma. The goals of these programs were to achieve control of patients' asthma symptoms, teach patient self-management of symptoms, provide psychological support, and increase the quality-of-life in asthma patients. Early in asthma research, it was recognized that asthma puts increased stress on the family and that psychosocial support and the development of effective coping skills were necessary to improve outcomes in children with asthma. Since these early programs, many educational and supportive interventions have followed such as asthma camps for children with or without parents, community support groups, school programs, and general public education programs (Blessing-Moore, Fritz, & Lewiston, 1985). Pediatric asthma self-management programs have ranged from home visits to technology-guided self-management programs (Horner, 2006; van der Meer et al., 2007). Some programs focus on interventions for children with asthma, some target the parents/caregivers only and others include education and support for both children and their parents/caregivers (Bravata et al., 2009).

In 2007, the asthma guidelines from the National Asthma Education and Prevention Program (NAEPP) recommended that all healthcare professionals in all settings educate patients on asthma self-management at every encounter (Jones, 2008). The guidelines emphasize that the goal of both expert care and self-management is to improve quality-of-life, while reducing the morbidity and mortality of asthma (Jones, 2008). Besides prescribing medications, all behaviors related to the treatment and control of asthma symptoms require patient involvement. Patients must be able to assess and respond to their own asthma symptoms. Essentially, there cannot be asthma disease management without the provision of education for asthma self-management.

Theoretical Framework

The Health Promotion Model (HPM) can be used as a theoretical framework to examine self-management education programs particularly school-based programs. The HPM is a guide to look at the psychosocial and cognitive processes that motivate people to engage in behaviors that enhance their own health. The main concepts of the HPM are individual characteristics and experiences, behavior-specific cognitions and affect, and behavior outcomes (McEwen & Wills, 2007). Individual characteristics and experiences, refer to a person's personality and general disposition as well as cultural, educational, and health background. Behavior-specific cognitions and affect depict an individual's own thought processes toward a suggested health action. This includes what a person thinks are the benefits and barriers to the action, as well as how successful the person feels he

or she can be with the action. Along with this is an individual's affect, either positive or negative, from trying the action. Also included in the concept, behavior-specific cognitions and affect, are interpersonal influences. The concept of interpersonal influences includes the support and opinion of well-regarded family, peers, and providers, which affects a person's likelihood to proceed with a health promotion behavior. Social norms and witnessing others model the behavior have an impact as well. Ease of performing the action and accessibility of the resources necessary to complete the action are also a part of the model. The next component in the HPM is behavioral outcome, how successful the person is with the health-promoting behavior. This is shaped by the previous two concepts individual characteristics and experiences and behavior-specific cognitions and affect which determine a person's commitment to the plan of action. Life demands and preferences will also impinge on the health-promoting behavior at this point (Pender, Murdaugh, & Parsons, 2002).

The HPM is a functional tool to reference when delivering health education. Healthcare professionals, especially nurses, can draw on it to help them empower and promote their patients' self-efficacy in health management. For the question for this research synthesis on the impact of school-based self-management asthma education programs on missed days from school, number of trips to the ED, and hospitalizations for school-age children 5–17-years-old the HPM can be used to explore the relationships between the variables. When asthma self-management education is provided to children in school, each child will bring their own individual personality traits, cultural and social beliefs, and past experiences. These will affect how each child perceives the information that is provided in the program as well as their likelihood to engage in the proposed behaviors. Based on the HPM healthcare providers must take into account these unique characteristics and experiences and use them to promote a person's self-efficacy.

Self-efficacy is an individual's belief about their ability to manage and control situations that affect them (Bandura, 1994). Bandura (1994) describes four sources of self-efficacy mastery experiences, vicarious experience or modeling, social persuasion and praise, and physiological and affective states. These four sources of self-efficacy are referred to in the HPM under prior related behavior, interpersonal influence, and activity related affect, respectively. Interpersonal influence in the HPM reflects both modeling and social persuasion (Srof & Velsor-Friedrich, 2006). While past individual experiences cannot be modified. School-based asthma education programs have an opportunity to impact the child's interpersonal influences and activity-related affect. In school-based asthma education children could have the opportunity to share experiences and outcomes with peers who also have asthma. Older children could mentor younger children to help demonstrate behaviors and positive results. Praise and positive reinforcement can be emphasized verbally from nurses, asthma educators,

teachers, and parents. By helping the child anticipate and plan for potential or real barriers to compliance with treatment, some negative stressors and failures may be avoided thus creating a more positive activity-related affect.

Self-efficacy is one of the strongest predictors of health promotion (Srof & Velsor-Friedrich, 2006). If the school-based asthma self-management education succeeds in increasing the self-efficacy of children 5–17-years-old, there should be an increase in compliance with asthma treatment plans thus increasing asthma disease control. Increasing asthma control should result in a decrease in the dependent variables, missed days from school, number of trips to the ED, and number of hospitalizations.

School interventions that incorporate concepts from the HPM will exhibit some of the following characteristics. School nurses or others implementing the interventions will recognize that students bring their individual characteristics and experiences with them. They will strive to educate the students on benefits of the desired health action and help to minimize perceived barriers for them. They will help the students set tangible and realistic goals and will assist them to incrementally achieve their goals, thus increasing the students' perception of their self-efficacy. Creating a positive experience and encouraging constructive peer interactions also will help to improve the motivation and success of the students. The school interventions should be analyzed for their influence on the behavior-specific cognitions and affect variable in order to have the best control on behavioral outcomes.

Method

Methods for the Literature Synthesis

The PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL) Plus databases were used to search for relevant studies. For PubMed the following Mesh terms and combinations were utilized: asthma AND self care AND Schools, asthma AND patient education as topic AND school health services, asthma AND patient education as topic AND schools, asthma AND self care AND school health services. Other limits that were applied are human studies published in English with child and adolescent subjects from 6- to 18-years-old. When searching the CINAHL Plus database the following search words and Boolean operators were employed: asthma AND patient education AND schools, asthma AND self care AND patient education, asthma AND self care AND schools. Again, only studies published in English with human child subjects were analyzed. For both PubMed and CINAHL publication dates were limited to 1995–2010. Reference lists of related systematic reviews and studies were also consulted to identify any additional studies that met the inclusion criteria.

Studies that were included are those that assessed interventions focused on self-care/self-management delivered to

students with a diagnosis of asthma. The interventions had to be administered at least partially at the school the students attend. Anyone could provide the educational interventions and any mode or combination of delivery methods, such as verbal, written material, computer programs, could be used. Eligible interventions included any one or mixture of the following: teaching and reinforcement of proper inhaler technique, instruction to expand and improve working knowledge of asthma, reinforcement and training on following written action (treatment plans) and/or maintenance therapies, emphasis and teaching on monitoring lung function. Included studies must have measured the impact of intervention on number of school days missed, ED visits and/or hospitalizations within 1 year of completion. Studies where parents or other caregivers were present for the interventions were excluded. Also excluded were studies that primarily aimed to screen students for asthma.

Results

Characteristics of the Studies

The included studies had one common purpose, which was to provide education to children with asthma in order to increase their knowledge of asthma and ultimately improve their self-care. The majority of the studies were randomized controlled experiments. All but three studies took place in the last 5 years. The data in Table 1 shows that the studies were quite heterogeneous in ages of children targeted and size of study populations. Target population sizes ranged from very small at 18 to very large at over 900 children. Some of the studies targeted just lower elementary students and others targeted just older adolescent high school students. The studies took place in a variety of locations in the United States and internationally in China, Australia, and Canada. Half of the studies used some variation of the Open Airways for Students asthma education program as their intervention. All of the studies delivered interventions in multiple sessions over short consecutive time periods of about a month to a month and a half. The reviewed studies universally analyzed differences in the students' preintervention and postintervention measurements. Baseline and postintervention data was often provided for both the control group as well as the experimental group. The data in Table 1 showed that most common interval for follow-up was 12 months. The shortest interval was 1 month postintervention. Most of the studies collected data at more than one interval with 12 months postintervention being the latest at which outcomes were measured.

Findings

Each of the studies (Table 1) considered the effect of the intervention on multiple indicators including the variables identified for this article. All evaluated number of days of school missed. Changes in the number of asthma-related ED visits were also commonly reported by the studies. Four

out of nine studies described a change in the number of asthma-related hospitalizations. All of the studies reported a decrease in absenteeism after the intervention. Six out of nine studies measured a statistically significant decrease in the number of days of school missed. Four out of eight studies showed a statistically significant decrease in number of ED visits postintervention. All but one study had a general decrease in asthma-related ED visits. Only two studies measured a statistically significant decrease in the number of hospitalizations for asthma-related morbidity.

Discussion

Discussion of the Results, that is, What do the Findings Mean?

The results of this research synthesis demonstrate that school-based asthma education programs substantially improve school attendance for students with asthma. However, it is unknown if this improvement is long-term beyond the 1 year after the intervention. Furthermore, it is unclear whether school-based asthma programs are able to decrease the frequency of ED visits and hospitalizations. Only the most severe asthma attacks will require hospitalization so this most likely would only apply to a small number of the students studied. The threshold for an ED visit will vary from family to family as some families utilize the ED in place of a primary care provider. Families with children with similar asthma symptoms often choose different methods of care, with some calling their primary medical provider and others going to the emergency department. This is important when looking at rates of ED visits for participants in asthma education programs, but severity upon presentation in the ED and the description of care required in the ED was not reported in any of the studies.

Strengths and Weaknesses of the Research

The studies that showed considerable decrease measured outcomes for the most part had medium size study populations with control and experimental groups that were homogeneous in age, age of onset of asthma, and asthma severity. Studies that did not account for similar ages, age of onset, and asthma severity between the control and experimental groups were unable to demonstrate significant change in the outcome variables.

Most of the studies used data recalled by the student and/or parent, which appeared more accurate than the couple of studies that used hospital and school records solely to collect data. School records did not discriminate the reason for absences and hospital records proved to be difficult to track with multiple modes of entry, and children admitted under a variety of names and social security numbers. The use of a diary or memory aide was utilized in a few of the studies to assist in memory recall of the desired data.

Table 1. Characteristics and Findings of Studies that Examined the Results of School-based Asthma Education Programs on Missed Days School, Number of ER Visits and Hospitalizations for School-age Children

First Author, Date	Purpose of Study	Design/Sample/Setting	Description of Intervention	Measurement of Outcomes	Findings
Brasler, M., 2006	Provide adolescents with the knowledge and skills to take control of their asthma; enhance the knowledge and skills of school staff, health professionals, and parents to assist adolescents with asthma.	Pre-posttest/ 108 students, 11-15 years old with asthma/ Middle Schools in Anchorage, Alaska and Kansas City suburbs	Classroom facilitators provided three 90-minute or six 45-minute sessions of lecture, discussion, group work, demonstration, and problem solving; Content: pathophysiology, asthma triggers, social and emotional issues of asthma management, medications, and peak flow monitoring. Also included: peer support, bimonthly teen newsletter, a web-based forum where teens and parents can submit questions to physicians and review archived answers; peak flow meters (PFMs), spacers, and nebulizers for all students with asthma.	Students completed self-report questionnaires pre-intervention, immediately post and at 6 months post-intervention. Number of school days missed and ED visits were measured.	Pretest 17% had absences or tardiness due to asthma more than 1 time a month 46% had 1 or more asthma episodes a year requiring an ED or urgent MD visit Posttest 8% had absences or tardiness due to asthma more than 1 time a month 34% had 1 or more asthma episodes a year requiring an ED or urgent MD visit Differences Showed substantial improvement after intervention. Experimental ED visits: 14% of students Mean Days of school missed: 3.0 +/- 4.4 Control ED visits: 19% of students Mean Days of school missed: 4.3 +/- 5.7 Differences Statistically significant change in intervention group. p value for change in days of school missed was < 0.05, P value for ED visits was <0.01.
Cicutto, L., 2005	Provide children with asthma access to care and education in their schools as an alternative to a formal asthma clinic.	RCT of Schools/ E = 132 students; C = 124; both groups-grades 2-5, 6-11 years old with asthma/ Elementary schools in Toronto, Canada	School-based asthma education program - the "Roaring Adventures of Puff" (RAP), consisting of six, 50 to 60 min. sessions held once a week for six consecutive weeks. Content: (1) goal setting, use of a peak flowmeter, and diary monitoring; (2) trigger identification, control, and avoidance, and pathophysiology; (3) medications and the proper use of inhalers; (4) symptom recognition and action plan; (5) lifestyle, exercise, and managing an asthma episode; and (6) sharing information with teachers and parents.	Telephone interviews with parents to collect data occurred at baseline, 3, 6, 9 and 12 months post-intervention. Data: number of ED visits and number of days absent from school. Tracking sheets were given to parents to assist with data collection	ED visits: 14% of students Mean Days of school missed: 3.0 +/- 4.4 Control ED visits: 19% of students Mean Days of school missed: 4.3 +/- 5.7 Differences Statistically significant change in intervention group. p value for change in days of school missed was < 0.05, P value for ED visits was <0.01.

(Continued)

Table 1. (continued)

First Author, Date	Purpose of Study	Design/Sample/Setting	Description of Intervention	Measurement of Outcomes	Findings
Clark, N., 2005.	Test the efficacy of a US school-based asthma education program in Chinese schools.	RCT/639 7-11 year old children with a diagnosis of asthma /21 elementary schools in Beijing, China	The Open Airways for School program manual and teaching materials were translated into Chinese. Children met after school once a week for 5 weeks. Topics: feelings about asthma, recognizing and managing asthma symptoms, solving medicine problems, deciding severity of symptoms, finding and controlling asthma triggers, keeping one's battery charged (i.e. how to stay healthy), and doing well at school	Data was collected from parents through a questionnaire at baseline and 12 months later. Data: number of missed days of school, ED visits and number of hospitalizations for asthma-related care.	Experimental Adjusted mean of school absences: (-)0.5524 Control Adjusted mean of School absences: 0.3232 Differences Decrease in days of school missed, p value 0.04. Decrease in hospitalizations and ED visits was not significant with p values of 0.36 and 0.98 respectively. Experimental Mean Absences: baseline 3.81 vs. post intervention 3.88 Mean ED visits: 0.09 vs 0.09 Mean Hospitalizations: 0.01 vs 0.04 Control Mean Absences: baseline 3.29 vs. post intervention 3.21 Mean ED visits: baseline 0.13 vs post intervention 0.10 Mean Hospitalizations: 0.03 vs 0.02 Differences None reported
Gerald, L.B., 2006	Evaluate the effect of a comprehensive school-based asthma management program in an inner-city, largely African-American school system	RCT; Schools randomly assigned to cohorts, which were randomized to immediate and delayed intervention programs/736 children in 54 elementary schools in grades 1-4 with/urban minority school system in Alabama.	The Open Airways for Schools program was administered in six 30 minute sessions. Children were provided a medical consultation with 1 of 2 study physicians (board-certified pediatric allergists) at no cost. The physician confirmed the diagnosis of asthma, determined proper treatment and also provided asthma education. All asthma medications, including rescue medications for school, as well as peak flow meters, were provided for the child during the study.	Number of school absences was collected through school records. Number of ED visits and hospitalizations were collected through medical records at the Children's Hospital of Alabama. Follow-up time was 1 year for each cohort.	Experimental Mean Absences: baseline 3.81 vs. post intervention 3.88 Mean ED visits: 0.09 vs 0.09 Mean Hospitalizations: 0.01 vs 0.04 Control Mean Absences: baseline 3.29 vs. post intervention 3.21 Mean ED visits: baseline 0.13 vs post intervention 0.10 Mean Hospitalizations: 0.03 vs 0.02 Differences None reported

(Continued)

Table 1. (continued)

First Author, Date	Purpose of Study	Design/Sample/Setting	Description of Intervention	Measurement of Outcomes	Findings
Joseph, C.L., 2007	Develop and evaluate a multimedia, web-based tailored asthma management program to specifically target urban high school students.	RCT/9 th -11 th grade students with a physician diagnosis of asthma or suspected asthma were randomized. E=314; C = 855/6 public high-schools in Detroit, MI	The intervention group accessed Puff City (the web program) using computers at school. There were four sessions that the students completed over 180 days. The control group was directed to existing generic asthma websites during four sessions. Both groups had 30 minutes to complete the sessions.	All students completed a baseline questionnaire and a follow-up survey at 12 months post baseline. Data: school days missed in the last 30 days and asthma-related ED visits and number of hospitalizations in the last 3 months	Experimental Absences: 0.4 (SD= 1.2) Mean ED visits: 0.5 (2.0) Mean Hosp: 0.2 (0.6) Control Absences: 1.2 (SD= 3.3) Mean ED visits: 0.8 (SD= 1.9) Mean Hospitalizations: 0.6 (SD= 2.0) Differences School absences and number of hospitalizations was significantly lower in the Exp. group, $p = 0.009$ and 0.01 respectively. ED visits were lower in the Exp. group but not significant ($p = 0.08$) Pretest Absences: 1.01 ED/Hosp. visits: 32.6 Posttest Absences: 0.72 ED/Hosp. visits: 17.7 Differences Significant decrease in number of school absences (p values < 0.033, 0.0103, 0.438), for first two years of the study. Significant decrease in ED visits and hospitalizations post intervention
Magzamen, S., 2008	Evaluate the Kickin' Asthma, a school-based asthma curriculum designed by health educators and local students.	Pre-posttest design/990 students with asthma from 15 middle schools and 3 high schools/Oakland, CA	The curriculum was delivered to 10-15 students at a time by an asthma nurse in a series of four 50-minute sessions. Content: asthma physiology and asthma self-management techniques	Students completed a baseline and a 3-month follow-up survey. Data: missed days of school for the previous 4 weeks. ED visits and number of hospitalizations for the previous 3 months.	

(Continued)

Table 1. (continued)

First Author, Date	Purpose of Study	Design/Sample/Setting	Description of Intervention	Measurement of Outcomes	Findings
Persaud, D.I., 1996	Evaluate a school nurse-instructed intervention of children with asthma.	RCT/36 students, 8-12 years old with asthma. E= 18 C=18/ Elementary schools in Galveston, TX	School nurses taught 20 min individual sessions over an 8-week period. Content: peak flow monitoring and proper use of inhaled medications. The children also used a workbook to learn about symptom identification and management. The control group received no teaching sessions.	Number of school days missed for the 20-week period following the intervention was obtained from school records. Number of ED visits for the same 20-week period was assessed by hospital chart review.	Experimental Absences: 6.4 days ED visits: 22% of students Control Absences: 7.6 days ED visits: 50% of students Differences Decrease in days of school missed was not statistically significant with $p > 0.05$. Decrease in number of ED visits was statistically significant p value < 0.05 . When age of onset was controlled the significance disappeared Experimental Median # of school days missed: Grade 10= 8 days pre intervention vs 5 days post intervention Control Median # of school days missed: Grade 10= 5.5 pre intervention vs 1 day post intervention Differences Significant decrease in the intervention group for Grade 10, $p < 0.05$. No significant decrease in grade 7 students.
Shah, S., 2001	Determine the effect of a peer led program for asthma education on quality of life and related morbidity in adolescents with asthma.	Clustered RCT/251 students in grades 7 to 10 who reported recent wheezing/ Six high school in rural New South Wales, Australia randomized to intervention or control	The study used the Triple A program at the intervention schools. Year 11 students were taught to educate the Year 10 students on asthma. The Year 10 students developed and presented key messages to the year 7 students. The goal of the messages was to increase asthma knowledge in the participating students. The intervention took place over about 6 months.	A questionnaire was administered to all students at baseline and 3 months after the intervention was completed. Data: number of days absent from school	Experimental Median # of school days missed: Grade 10= 8 days pre intervention vs 5 days post intervention Control Median # of school days missed: Grade 10= 5.5 pre intervention vs 1 day post intervention Differences Significant decrease in the intervention group for Grade 10, $p < 0.05$. No significant decrease in grade 7 students.

(Continued)

Table 1. (continued)

First Author, Date	Purpose of Study	Design/Sample/Setting	Description of Intervention	Measurement of Outcomes	Findings
Velsor-Friedrich, B., 2004	Examine the effect of a school-based intervention program on the self-care abilities, self-care practices, and health outcomes of 8 to 13 year old minority children with asthma.	Quasi-experimental/102 African-American students 8-13 years old from 8 inner-city elementary schools in a major Midwestern city; schools assigned either to the treatment or comparison group.	The Open Airways program was delivered to the students in the treatment schools. The program consists of six, 45-minute sessions offered once per week. The session topics include (a) basic information about asthma; (b) how to recognize and respond to asthma symptoms; (c) using asthma medication and deciding when to seek help; (d) how to keep physically active; (e) identifying and controlling triggers to minimize asthma symptoms; and (f) handling problems related to asthma and school.	Asthma screening survey, five instruments, and an asthma health diary were used to collect data at baseline, 2-week, and 5-month post program completion from the children and parents/caregivers. Number of school absences and asthma-related ED visits were reported.	Experimental Mean days absent: pre intervention 13.5 days vs 9.03 post intervention ED visits: Posttest 1 = mean 0.12; Posttest 2 = mean 0.07 Control Mean days absent: pre intervention 15.5 vs 14.4 post intervention ED visits: Posttest 1 = mean 0.02; Posttest 2 = mean 0.00 Differences No significant decrease in number of days of school missed over time. Number of ED visits had a significant increase in the treatment group compared to the control group, $p = 0.01$.

Note: RCT = Randomized Controlled Trial; ED = Emergency Department; E = Experimental group; C = Control group

One of the biggest weaknesses of the studies is that asthma severity of the children was not accounted for in the studies. Asthma severity dictates a child's treatment course and also frequency of attacks. Asthma severity largely impacts health-care utilization and interference with daily activities. It is impossible to compare a child who occasionally needs a rescue inhaler when physically exerted or ill to a child who takes three maintenance medications and still has several nighttime and/or exercise-induced attacks a month.

Implication for School Nursing Practice

Despite the weaknesses of the studies, in general, a decrease in the number of days of school missed, ED visits, and hospitalizations was shown. This is a sufficiently strong finding to urge that nurses emphasize asthma education for children. Asthma education and treatment should always include the child if developmentally appropriate. Even young lower elementary students are capable of knowing what asthma is, what makes it better or worse and the importance of medication compliance. The research encourages that more school asthma programs should be offered as this provides a convenient location and mode for healthcare educators to reach children that may otherwise not be accessed. Repetition is also needed and important as the knowledge gained will fade if not reinforced frequently. School nurses are in a unique position to reinforce self-management principles to students with asthma because they have the opportunity to see students on a regular basis.

Implications for Research

Since asthma severity is difficult to account for in school-based asthma programs, medication compliance would be a good indicator of success to measure in future research. School-based asthma education programs do teach children about proper use of their medications. A couple of the studies briefly looked at one or two components of medication use but did not analyze the impact of the educational intervention on change in medication and treatment compliance. A detailed look at the effect school-based asthma education has on a child taking their medications properly would help to assess the value of such programs. If a child is compliant with his/her prescribed medication and treatment regimen, then despite the severity of the illness there will be a decrease in healthcare utilization and daily activity inference. However, it would be a decrease that is appropriately expected for the specific degree of asthma.

Conclusions

Asthma self-management education is a fundamental part of caring for children with asthma. Given the disparity that exists in access and quality of healthcare available to children the public school system is uniformly present and accessible in the United States and most have access to school nurses. The

importance of school-based asthma programs should not be overlooked. Schools have often provided for healthcare needs of children from providing fluoride rinses to children in rural areas, scoliosis checks, to safety and injury prevention education. Any programs schools can offer regarding asthma education and care should be considered a benefit.

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