

Take A Breath

An Integrative Review of Studies of Asthma Education in Hispanic Children
and Implications for Practice in the San Joaquin Valley

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Abstract

Asthma is a chronic pulmonary condition that commonly affects children and accounts for a large number of emergency department (ED) visits and hospitalizations. The air pollution in most of the counties of the San Joaquin Valley (SJV) accounts for the area having the highest prevalence of asthma in the nation. Prevalence of asthma in Hispanics/Latinos is higher than in non-Hispanic children, contributing to a greater number of asthma-related ED visits. Pediatric asthma education that is culturally and linguistically appropriate for the Hispanic population is needed in schools, communities, and healthcare settings but is sparsely available in the SJV. The purpose of this project was to determine the effectiveness of asthma education for Hispanic children and parents in reducing healthcare utilization (ED visits and/or hospitalizations) with the view to implementing educational programs in the SJV.

An integrative review of literature on asthma education for Hispanic children and parents/caregivers from the past 10 years was conducted. Studies were reviewed and appraised for their quality using the Critical Appraisal Skills Programme. A synthesis of the literature was conducted to identify themes and research gaps. The results showed that asthma education delivered in community, school, and/or healthcare settings, especially education with follow up, reduces healthcare utilization. Additionally, strategies for effective education were examined and implications for practice, schools, and policy discussed.

Keywords: healthcare utilizations, CASP tool, quality of life, San Joaquin Valley

INTRODUCTION

Asthma is a common chronic childhood disease that affects approximately 7 million children aged 0-17 years in the United States and continues to be a public health burden (Karnick et al., 2007). Asthma is a leading cause of emergency department visits, hospitalizations, and school absenteeism for children, especially for minority children (Rashid, Carcel, Morpew, Amaro, & Galant, 2015). Additionally, the morbidity and mortality associated with asthma in children disproportionately affects racial and ethnic minorities and people in lower-income families. Asthma is higher among Hispanic American children than non-Hispanics and particularly high for Puerto Ricans and Mexicans Americans, who have the highest prevalence of under-diagnosed asthma (Rashid et al., 2015). Hispanic children are 70% more likely to visit the emergency department (ED) for asthma and 40% more likely to die from asthma compared to non-Hispanic whites (Postma, Evans-Agnew, & Capouya, 2015). Among the different Hispanic groups, Puerto Ricans have the highest death rate (40.9 per million), followed by Cubans (15.8 per million), and Mexican Americans (9.2 per million) (Canino et al., 2006).

Asthma has a significant negative impact on the quality of life for both the children who have it and their parents or caregivers; it is associated with increased school absenteeism, increased medical costs, and increased loss in wages of family members (Karnick et al., 2007). Hispanic children from lower-income families in both inner-city and rural underserved areas also experience higher morbidity from asthma due to lack of adequate access to care, financial

resources, transportation to primary care clinics, and cultural and linguistic barriers between families and physicians that hinder continuity of care (Rashid et al., 2015).

These barriers, along with environmental factors such as air pollution, lead to inadequate diagnosis, treatment, and management of the disease among Hispanic children. Without proper management, childhood asthma among Hispanics will continue to rise and healthcare disparities for asthma management, treatment, and control will widen even further.

Clinical Practice Problem

In the San Joaquin Valley, the worsening air pollution in all counties contributes to a high prevalence of asthma, especially in children (American Lung Association, 2016). Tulare County cities such as Visalia rank number two in the United States for particle pollution and number three for ozone pollution (American Lung Association, 2016). Consequently, Tulare County has higher rates of asthma for adults than the California state average (15.5% vs. 13.9%) and an 11.6% rate for children ages 0-17 compared to 15.2% for California (Tulare County Health and Human Services Agency, 2017). In the San Joaquin Valley, Mexican American children between the ages of 2 and 17 have the highest prevalence of asthma at 18.4% compared to the state average of 13.1% (Schwartz & Pepper, 2009).

Hispanic residents in the San Joaquin Valley have disproportionately lower incomes, their children are more likely to have an ED visit due to asthma, they experience lower quality health services, and they have difficulty communicating with their physicians and understanding their instructions (Schwartz & Pepper, 2009). Additionally, the economic impact of asthma in the San Joaquin Valley is about \$159 million/year (Anderson, 2015). As the rate of asthma in

Hispanic children in the Valley continues to increase, healthcare providers must provide education to Hispanic families to promote awareness and help decrease the health disparity.

Asthma education offered by schools, community groups, and healthcare providers has been shown to be effective in helping both asthmatic children and their parents manage asthma in the home and reduce ED visits in urban areas (Archibald, Caine, Ali, Hartling, & Scott, 2015; Kintner et al., 2015). The delivery of asthma education from a community health worker such as a *promotora*, who is a lay Hispanic American community member trained to provide basic health education in the community, has been shown to result in significantly greater retention in an asthma clinic; children receiving such education remained in clinic programs longer than children without a home visit (Rashid et al., 2015). Kueny, Berg, Chowdhury, and Anderson (2013) found that although Hispanic parents in inner-city Los Angeles blamed financial barriers for their difficulty in creating a home environment for their children that would help reduce asthma, they recognized other barriers that contributed to their children's asthma and they were motivated to change their home environment by eating organic foods, installing flooring other than carpet, and buying higher quality clothes without allergens. The parents also actively sought and received education about how to reduce and eliminate asthma triggers in their homes.

Community-based education with case management provided by a nurse practitioner has been shown to decrease healthcare utilization such as ED visits, hospitalization, hospital days, and clinical visits (Karnick et al., 2007). Furthermore, the education produced considerable cost savings (Karnick et al., 2007). Everhart, Fedele, Miadich, and Koinis-Mitchell (2015) reported that providing education to parents or caregivers improved quality of life and decreased ED visits

by alleviating parental concerns about asthma medication and the burdens of managing their children's asthma. Additionally, management of asthma in primary care outpatient settings has been shown to prevent hospitalizations (Tulare County, 2017).

Research Questions

Although studies of the effectiveness of asthma education in school, community, and healthcare provider settings provide evidence that education can reduce healthcare utilization for Hispanic children in urban areas, there is little research that explores whether asthma education can be effective in rural settings such as those in the San Joaquin Valley. Even as Tulare County Health and Human Services Agency recognizes the need for more education to reduce healthcare utilization, very little education regarding asthma management for Hispanic children ages 0-18 years is actually being done in community, schools, and healthcare settings in the county.

Therefore, the clinical practice question for this research is: Do Hispanic children who receive asthma education have fewer healthcare utilizations? Guided by this question, this research study addressed the following research questions:

1. Is there a statistically significant reduction in healthcare utilization among Hispanic children who receive asthma education in either the community or schools compared to those who do not receive education?
2. Is there a statistically significant reduction in missed school days and missed parental work days among Hispanic children who receive asthma education compared to those who do not?

3. Are home visits using culturally and linguistically competent community health workers effective in educating Hispanic parents?
4. What educational topics do parents need the most and want to obtain information about from their healthcare providers?
5. What component of the educational program is most effective in reducing healthcare utilization?

Purpose and Objectives

This project consisted of an integrative literature review of the literature regarding asthma education to Hispanic children and parents and the effectiveness of the education in decreasing healthcare utilization. The goal of the project was to identify educational materials that provided practice implications for the communities, schools, and healthcare provider facilities such as primary care clinics throughout the San Joaquin Valley so Hispanic families and their children can effectively manage their asthma condition and have improved quality of life. The objective was to develop themes from the literature reviewed to determine what educational intervention and topics are needed. Another objective was to identify the best strategies for implementing the educational programs in the schools, community, and healthcare settings. Overall, the purpose of the study was to determine what asthma education topics should be discussed with parents and children and what elements in educational programs are helpful or important in reducing healthcare utilization so the program can be implemented in the schools and communities of the San Joaquin Valley.

REVIEW OF LITERATURE

This literature review examined six types of studies, categorized by the type of research design: integrative reviews, qualitative studies, randomized controlled trials, quasi-experimental studies, cohort studies, and cross-sectional studies. A matrix presenting the important features of all the studies is given at the end of this section as is a summary of the literature and an appraisal that synthesizes the main themes (See Table 1).

For the purpose of this research, the term “children” was considered to include those aged 0-18 years. The following definition from Merriam Webster’s online dictionary was used for the term Hispanic: “of or relating to the people, speech, or culture of Spain or of Spain and Portugal, or being a person of Latin American descent living in the U.S., *especially*: one of Cuban, Mexican, or Puerto Rican origin” (Hispanic, n.d.).

Literature Review Strategy

A literature search was conducted for all English-language studies on pediatric or childhood asthma education for Hispanics. The databases used for the search were Medline, PubMed, CINAHL, and Cochrane Library. The following keywords were used: “pediatric asthma education,” “childhood asthma education,” “Hispanics or Latinos or Chicano or Mexican American,” “ED visits,” “community,” “schools,” and “healthcare providers or nurses.” Date delimitations were set at 2007 to the present because educational programs can change over time. The search yielded 219 studies. After applying the inclusion criteria as outlined below and accounting for repeat studies between the databases, a total of 135 studies remained.

The inclusion criteria were as follows: original research study, systematic review and/or integrative review in peer-reviewed journals that examined asthma education in the Hispanic pediatric population (0-18 years old) in the United States. The setting of the asthma educational program, such as the community, healthcare provider or clinic setting, or school, was also included. Studies done in both rural and urban areas of the United States were reviewed as long as a large proportion of the participants were Hispanics or Latinos, and parental experiences were included in the analysis. Exclusion criteria were: date older than 2007, participants not Hispanic or Latino, location outside the United States, and inclusion of co-morbid conditions such as allergy and obesity.

The Literature

Of the 135 studies that remained after application of the exclusion criteria, 22 studies were selected for appraisal using the Critical Appraisal Skills Programme (CASP). Of the 22 studies, 1 was an integrative review, 2 were cross-sectional studies, 4 were randomized controlled trials, 2 had a quasi-experimental design, 7 were cohort studies, and 6 were qualitative studies.

Gray literature such as theses, dissertations, technical reports, and newspaper articles were used for information contained in this paper's Introduction section and to gather statistics regarding pediatric asthma among Hispanics in the San Joaquin Valley and pediatric asthma in the United States. The 22 articles reviewed and appraised are discussed below, organized by study type. A literature review matrix of the studies can be found in Table 1 at the end of this section.

Integrative Review

Davis, Gordon, and Burns (2011) conducted an integrative review of educational interventions for low-income and minority preschool children age 4 years and younger. The lack of an acceptable standard of care regarding asthma education and the paucity of studies that specifically examined preschool children warranted the study. A literature search in Medline, CINAHL, PsychInfo, and Cochrane Reviews databases was used to identify appropriate studies. The studies reviewed were diverse in their study designs, ranging from randomized controlled trials (RCT) to qualitative studies, but only one study specially addressed preschoolers.

The researchers used the CASP Systematic Review appraisal tool. They did not mention how they appraised the studies to determine rigor, but they described limitations of each study. The authors synthesized their findings by arranging them in easily understood subcategories. From the results of the review, they developed a new theoretical model for early childhood asthma intervention that incorporates a multi-level multidisciplinary intervention among child, parent, community resources, healthcare providers, and school personnel such as lay educators, teachers, child care workers, and school nurses. The model is an educational program that provides one-on-one individualized asthma education, self-care management, and medical action plans that lead to improved health and well-being for the children, decreased absenteeism, better achievement in school performance exams, and increased participation in extracurricular activities (Davis et al., 2011).

The results of the study suggest that asthma education for low-income and minority children requires a multi-level and multidisciplinary approach with parents, teachers, clinicians,

the child, and the community. The increased asthma education identified in the study led to heightened sensitivity regarding symptoms, which improved prevention and allowed for greater independence for parents and children. The increased education also resulted in greater awareness of asthma exacerbations and symptom management, which helped reduce ED visits, hospitalizations, and missed school days. Overall, although the study did not specify how many studies were reviewed, the research was well organized and the outcomes of the study answered the research question set forth by the authors.

Qualitative Studies

The qualitative studies reviewed sought to understand how Hispanic parents of children with asthma perceived their children's asthma, management strategies, and needs for asthma education. Berg, Anderson, Tichacek, Tomizh, and Rachelefsky (2007) interviewed eight Hispanic families, primarily of Mexican descent, who had at least one child enrolled in a preschool in East Los Angeles. They used an explorative ethnographic qualitative study design to understand the family needs and issues in caring for a child with asthma. The families were recruited from Los Angeles Mobile Asthma Treatment Centers (MATC). Participants attended group meetings in three phases conducted in Spanish by a bilingual and bicultural Latino medical anthropologist. The meetings were audio recorded and transcribed for thematic content analysis. Four themes were identified from the interviews: fear, the acute-care experience, knowledge, and parent alternative strategies/strengths. Repeatedly, parents expressed a lack of knowledge regarding what to do during an asthma attack, a sense of helplessness when their children had an attack, and a lack of understanding about the disease process and treatment regimen.

Appraisal of the study using the CASP tool showed that the study was valid; the methodology chosen by the researchers was appropriate for the study. The researchers wanted to understand the issues and needs of Latinos families caring for a child with asthma. The purpose of the study and the theoretical framework were clearly stated by the researchers. Data analysis was rigorously performed; audiotapes were made and transcribed by multiple personnel to ensure content accuracy and eliminate biases. The results of the study indicate that education of parents by healthcare providers can reduce healthcare utilization such as ED visits. Parents expressed that a fear of not knowing what to do when their children had an asthma attack led them to take their children to the hospital (Berg et al., 2007). Parents labeled the care they received from their primary care providers (PCPs) as rude and lacking a personal approach (Berg et al., 2007).

Parents in the Berg et al. (2007) study expressed a desire to provide the best possible care for their children with asthma such as agreeing to remove carpet in the home and participating in the MATC program. The results of the study indicate a need for healthcare providers to provide further education about developing an asthma action plan for asthma exacerbations.

Additionally, culturally acceptable strategies using parent-to-parent support and/or *promotora* programs can help with clinician-to-parent interaction and eliminate or reduce cultural and linguistic barriers. Such strategies enable parents and healthcare providers to communicate better with each other and develop effective strategies for asthma management.

Coffey, Cloutier, Meadows-Oliver, and Terrazos (2012) investigated the experiences of Puerto Rican families who have children with asthma and their use of the ED for asthma care. The researchers noted that approximately 7 million children in the United States are affected

with asthma, 750,000 emergency department visits per year are attributed to the disease, and Hispanic children, especially Puerto Ricans, have higher rates of ED visits than non-Hispanic children. Puerto Rican children have also been found to have a higher prevalence of asthma than children in all other Hispanic subgroups and non-Hispanic Whites and Blacks (Coffey et al., 2012). The researchers interviewed Puerto Rican parents and caregivers. Although no specific theoretical framework was mentioned, Coffey et al. (2012) used a hermeneutic phenomenological approach coupled with the Puerto Rican folktale *Monsona Quintana's Purple Child* to explore the meaning of the experiences of the families and to better grasp the essential meaning of the experiences of the participants.

The CASP qualitative study tool assessed the study as valid; the authors used rigorous methods of data analysis. The study was relevant as the authors wanted to understand the experiences of Puerto Rican families caring for an asthmatic child and their use of the ED for care. The authors mentioned that using the hermeneutic phenomenological approach to gain understanding of the experiences and emotions of the families can lead to researcher bias, but it helped to connect the themes that were present during the interviews of the participants and the interpretation of the experiences of the families with the folktale.

The methodology of the study entailed use of a purposive sample to gather 10 women from the Easy Breathing program in Hartford, Connecticut. Inclusion criteria required that children be 6 months to 18 years of age, diagnosed with asthma, and Puerto Rican parents 18 years or older. The child had to have an ED visit for asthma care within the past year. A Spanish-speaking research assistant conducted the individual interviews, which were 45 minutes

in length and audiotaped. A second interview was conducted by telephone; it lasted about 30 minutes. Participants were asked to describe actions, feelings, sights, sounds, smells, and other experiences they recalled from when they took their children to the ED. The authors analyzed the data using van Manen's Hermeneutic Phenomenology method, using member checks and audit trails to provide rigor for the study (Coffey et al., 2012).

Observing that the qualitative method they used can create research bias, the authors explained their use of different methods of data analysis to reduce the possibility of bias (Coffey et al., 2012). However, even with the careful analysis, the themes gathered from the data might have been influenced by the folktale the author used to help understand the experiences of the participants. The authors did not describe how they would eliminate the bias from the artistic source, and they did not say whether they found any contradictory data that did not align with the folktale. The authors identified as limitations of the study the fact that participation was limited to women in Puerto Rican families living in urban areas. However, they did not mention how the small sample size could have affected the study, they did not discuss any ethical considerations other than informed consent, and they did not explain why they failed to use a secondary analyst who was not familiar with the folktale.

The authors clearly identified six themes: relationship of folklore to asthma, culture and medicine women, awe of asthma, praying to God, decision-time to go, and the ED environment (Coffey et al., 2012). However, they did not discuss limitations to the credibility of their findings, such as using only one analyst. There was no discussion of any evidence against the researchers' arguments; it seemed that most of the participants' experiences were similar to what

was in the folktale. One theme was the idea that the asthma ran in the family and women participants saw it as a fact of life. Another common theme was the use of folk medicine for adults with asthma but not for children. Many of the women interviewed were religious and only took their children to the ED when the children could not breathe or started wheezing. Most important was that the mothers felt the ED did not give them enough care or attention during their visit. The researchers mention implications of the study for future practice, especially for primary care physicians. They suggested collaboration between physicians and families to create a culturally and linguistically appropriate asthma action plan so that parents can recognize the signs and symptoms of an asthma exacerbation, know when to take children to the ED, and are able to lower their anxiety and stress (Coffey et al., 2012).

Bialostozky and Barkin (2012) interviewed Spanish-speaking recently immigrated Latino parents of Mexican descent with children between 2 and 18 years of age with asthma to ascertain their understanding of wheezing and asthma attack. From group interviews the researchers found that 64% (16/25) of parents with children with asthma and 80% (12/15) of parents without asthma did not understand the meaning of wheezing or whistling. Only two parents correctly translated the word “sibilancias” as wheezing. Furthermore, 16 parents of asthmatic children and 13 parents of non-asthmatic children described the general sound for asthma as “chiflido” and “silbido,” not “sibliancia,” the Spanish medical term for wheezing. Only a few parents properly described the sound as wheezing when listened to an audio recording. Only 4 of the 25 parents with asthmatic children understood “attacks” as severity of a specific episode instead of frequency.

Appraisal of the Bialostozky and Barkin (2012) study indicated that it was valid, relevant, and applicable to the understanding of how asthma education can reduce healthcare utilization. The purpose of the study was clearly stated, and the methodology, which used an exploratory approach with group interviews and a questionnaire, was appropriate. Although there was no mention of whether ethical considerations were taken, data analysis was sufficiently rigorous. Statistical analysis using *t*-tests and Fisher's exact test to examine differences in the demographic characteristic between the two parent groups added rigor to the study. The validation of the International Study of Asthma and Allergy in Childhood questionnaire provided additional rigor.

The findings of the study demonstrated that Latino parents and healthcare providers have very different terms for describing wheezing and attack. The parents had a poor understanding of the word "sibilancia," which is used by medical professionals. The lack of understanding could be due to insufficient exposure to the U.S. healthcare system, a language barrier between provider and parents that led to poor communication, and low health literacy. Latino parents might also be reluctant to label their children as asthmatic and instead describe asthma in terms of the symptoms, medical history, and medications (Bialostozky & Barkin, 2012). Therefore, the researchers recommended that when healthcare professionals offer asthma education they should provide audio and visual descriptions of wheezing and asthma attack so Latino parents are better able to understand and recognize an attack earlier. Earlier recognition might reduce trips to the ED.

In another study, Postma et al. (2015) used photo texts to explore Latino parents' perceptions about managing their children's asthma. Participants were Hispanic parents

involved in an asthma home visitation program. They took part in four 1.5-2 hour group sessions held 2 weeks apart. In the initial session participants were trained on how to take photographs of their home activities for managing their children's asthma in ways that ensured safety and privacy. In the second and third sessions, participants shared and discussed their photos with the other participants. In the final session, the participants selected up to three photographs and put captions to the photos. The photo texts were then exhibited in the school and at a local university.

The parents reported that controlling the home environment and comorbid conditions to identify asthma triggers and the need for physical activity were primary or secondary concerns. The women participants identified strategies for reducing indoor allergens such as removing shoes prior to entering the home, vacuuming the carpet, and changing furnace filters (Postma et al., 2015). Education at multiple points of care was also important for the parents, especially education between parent and healthcare providers. Parents indicated that it was important to communicate with their healthcare providers—for example, informing the doctor about a child's asthma prior to the child going in for surgery (Postma et al., 2015). Assessment and monitoring was important in five photo texts and medication management was a primary component in one photo text (Postma et al., 2015).

The Postma et al. (2015) study was valid and the results have implications for understanding what areas of education are important to parents. However, data analysis lacked rigor due to the use of photo texts. The methodology used was appropriate for the study as it was a participatory research that allowed participants to identify and share their photo texts that they

felt were important in helping to manage their children's asthma. The study was limited by the small sample size and the fact that participants had previous contact with an asthma outreach worker (Postma et al., 2015). Because the parents had been educated previously by an asthma outreach worker, the parents were already aware of the changes they needed to make in their homes and what additional educational information they needed. The results of the study could have been different if the participants had not received previous education. Ethical considerations were given for the study; the participants were taught how to take photographs and they were informed of how the photographs would be used to ensure safety and privacy.

One implication of the study was the value of photo texts in facilitating open communication between healthcare providers and families as they can reduce language barriers. The researchers recommended the use of photo texts be encouraged so parental concerns regarding their children's asthma can be addressed. Using photo texts can help create an active partnership between clinicians and caregivers through open communication, identifying and addressing concerns about asthma and asthma management, identifying treatment preferences and barriers to implementation, developing treatment goals, and encouraging active self-assessment and self-management (Postma et al., 2015).

Kueny et al. (2013) investigated barriers for Latino families in managing their children's asthma. Asthma education can introduce information regarding triggers for asthma and home management of asthma, but the education falls short of helping parents modify and improve their home environments. Latino families living in urban settings are usually in areas of lower air quality and in overcrowded housing conditions. Latino families also experience cultural and

language barriers to accessing healthcare services. Some rely on lay traditional healers within their community for medical advice, and many lack proper education in understanding how to effectively manage their children's asthma at home (Kueny, Berg, Chowdhury, & Anderson, 2013). The purpose of the Kueny et al. (2013) study was to identify cultural and environmental barriers in the homes of Latino families with children with asthma. The authors wanted to explore the difficulties faced by Latino families living in inner-city Los Angeles in implementing environmental modifications after a community-based intervention. The theoretical framework used was the vulnerable populations model, which considers the health status of a group of people as interdependent upon where they live and resource availability (Kueny et al., 2013). It purports that having few social, economic, and environmental resources available leads to poor health outcomes.

The CASP tool for qualitative study rated the study as valid. The authors clearly stated the purpose of the study and used descriptive qualitative techniques by interviewing a total of six families or eight participants, who were selected from the La Casa study, which was a randomized community-based asthma education program. Informed consent forms in both English and Spanish were collected prior to conducting the study. The participants were gathered in a group meeting by a Latino bilingual research staff person, who conducted the meeting in Spanish. The content of the meeting focused on experiences of the participants with having a child with asthma, asthma triggers at home, experiences with changing the home environment, need for further information, and suggestions for improving the home (Kueny et al., 2013). The group meeting lasted 90 minutes and was audio recorded. The content of the group meeting was

transcribed into English and entered into NVivo. The authors used a qualitative summative content analysis to identify the textual meaning of phrases from the meeting and to understand the underlying meaning of the phrases. The transcripts were read through at least two times and inductive coding was used. The principal investigator and a second reader looked over the data and the themes gathered. Inclusion and exclusion criteria for choosing participants was described. The authors did not mention any contradictory data or how they eliminated potential bias. Also, the participants attended only one group meeting and no follow up or one-on-one meeting was conducted.

As for the results of the study, the authors identified several themes: (a) identifying barriers in the home such as cultural traditions that did not coincide with advice from healthcare providers, inability to move due to job, and lack of cooperation from the child; (b) taking small steps to change the home environment such as not smoking inside the house, removing carpets, and buying healthy foods; and (c) recognizing the triggers for their children's asthma and removing them from their homes, such as changing the drapes (Kueny et al., 2013). The themes gathered from the study answered the original research question regarding what barriers exist for Latino families of children with asthma. Additionally, the themes supported the theoretical framework used in the study; participating families lived in lower-income neighborhoods and the families stated they were unable to provide better housing conditions for their children due to minimal financial and community resources (Kueny et al., 2013). Most importantly, the findings of the study reiterated the need for healthcare practitioners to provide asthma education and incorporate both the child and the parent in the education.

To understand whether parents can be trained as community educators, Lobar et al. (2008) used a train-the-trainer model of asthma intervention in which the participants were trained to become Asthma Amigos for the community to spread the word about asthma pathophysiology, triggers of asthma, and asthma management in the home. The use of community trainers, cultural awareness, and bilingual training materials can help reduce ED visits (Lobar et al., 2008). The outcomes of the study indicate that use of community trainers familiar with the culture and community is helpful in educating and motivating the community to learn about asthma and act upon what they have learned.

Appraisal of the study indicated that it was valid but data analysis should have been more rigorous. The researchers clearly stated the goals and relevance of the study. The methodology used was appropriate for the research goal; it consisted of educational sessions for training and focus group for sharing what the Asthma Amigos had learned from the experience. Two educational sessions were conducted and follow-up telephone calls at 2 weeks and 4 weeks after completion of the training were made to offer aid to participants if they were having trouble (Lobar et al., 2008). The focus group data were semi-structured using a descriptive/exploratory design and a naturalistic approach. The study was limited by its small sample size of 13 participants. The data analysis could have been more rigorous. There was no mention of how biases were eliminated during the coding and transcription of the audiotapes from the focus group meeting. There was also no mention of ethical considerations. Statistical analysis should have been used such as a pre-and post-test evaluation of whether the educational session was effective.

However, there was a clear statement of the findings and their applicability in practice. Five themes emerged from this study: sense of importance in the community, value to participants and their families, value to the community, use of incentives to attract participants, and use of statistics about asthma helped to motivate the participants and those they taught to change their home and work environments. Overall, community-based asthma education that is delivered in a bilingual, culturally appropriate manner that uses members of the community is successful and helps the learner grasp the material.

Randomized Controlled Trials

All the randomized controlled trials (RCTs) that were reviewed were singly blinded. They consisted of community-based or school-based asthma education programs tested against a control that consisted of a basic asthma education program that was missing an element of the educational intervention tested. The outcomes measured in the studies were healthcare utilization, cost benefits, quality of life (QOL), missed school days, and parental missed work days.

Horner and Brown (2014) implemented a school-based education and home visit parental program in a rural area. The purpose of their study was to determine whether an education program in a rural area can help families make management decisions to control asthma symptoms and thereby decrease healthcare utilization such as ED visits and hospitalizations. School children age 7-12 years who reported being diagnosed with asthma on a school health form were randomly placed into either the asthma self-management intervention group or the attention-control group. Out of 541 students, 81 were in the intervention group and 72 in the

control group. Parents of those in the treatment group received a home asthma plan booklet coupled with a home visit 1 month post intervention; an asthma medication video; and information about strategies for daily care, emergency steps during exacerbations, and reducing asthma triggers. Parents of students in the attention-control group received 16 sessions, each 15 minutes in length with content focused on general health promotion without any strategies, home asthma management plan, or home visits after the final data collection visit. Follow-up data were collected at 1, 4, and 7 months.

Children in the intervention group had statistically significant improvement in activity QOL ($p = 0.035$), emotional functioning QOL ($p < 0.001$), and its related dimensions (Horner & Brown, 2014). Decreases in hospital stays and ED visits were observed when individual growth trajectories were considered, but no differences were found between the treatment and control groups (Horner & Brown, 2014). However, the children in the intervention group exhibited a significant increase in their inhaler skills. The researchers also observed that children who experienced the greatest asthma severity were more likely to assume more self-efficacy for managing their asthma symptoms. Parents of students in the treatment group reported significantly greater improvement in asthma knowledge, self-efficacy related to asthma, and home management than parents of students in the control group (Horner & Brown, 2014). Mexican American parents reported higher parent home management scores than White or African American parents (Horner & Brown, 2014).

Appraisal of the study indicated that it was valid. The trial clearly focused on a specific population of children and the randomization of the participants into the two groups was done by

a coin toss (Horner & Brown, 2014). The number of school age children in the two groups was similar, allowing for valid comparison of the two groups. The hypotheses were also clearly stated in the study. The study was single blinded to the participants but not to the researchers. This single blinding decreased the rigor of the methodology, but the statistical analysis was very thorough and appropriate for the study. The method of statistical analysis used was clearly stated by the researchers, permitting clear interpretation of the results. Although statistical significance was found for overall QOL and reported ED visits from the parents, a better measurement such as checking ED visit data rather than self-report would have been more appropriate for the study.

Another limitation of the study was the age of the students, which limited their ability to understand the questionnaire (Horner & Brown, 2014). The study demonstrated that an asthma intervention using home visits is an effective mode of delivery as it significantly improved parents' asthma home management and self-efficacy, thereby leading to decreased healthcare utilizations. Also, home visits reduce burdens on the family such as having to travel to another location to obtain the education; this is especially important for lower socioeconomic families. Costs can be reduced by having trained asthma educators or the primary healthcare provider provide education in primary care settings.

In another RTC study, Flores et al. (2009) explored use of parent mentors (PMs) in improving asthma outcomes such as ED visits, asthma exacerbations, and rapid-breathing episodes in Latino children ages 2 to 18. The PMs received training from a nurse asthma specialist and program coordinator for 2.5 days. Additionally, the PMs received training manuals describing insurance programs for uninsured children and providing medications and

equipment teaching sheets and locations of free clinics. Parents were randomly assigned to the PM intervention or the control group, which received the usual pediatric asthma care. PMs initially contacted families at a home visit within 3 days of an ED visit or hospitalization, met monthly for up to 12 times with families and children in a community setting, telephoned parents monthly until 1 year after the initial ED visit or hospitalization, and conducted a second home visit 6 months after the initial ED visit or hospitalization.

Children who were in the PM program showed significant reductions in rapid breathing episodes, asthma exacerbations, and ED visits (Flores et al., 2009). There were statistically significant reductions in the PM group in difficulty breathing, coughing episodes, and missed school days ($p < 0.01$) (Flores et al., 2009). Furthermore, children in the PM group classified as high participants had significantly greater reductions in wheezing, coughing, and difficulty breathing. High participants also experienced significant reductions in asthma exacerbations, missed school days, missed parental work days, and ED visits (Flores et al., 2009). The decreases in hospitalizations and ED visits for the PM group allowed for an average savings of \$361.48 for hospitalizations and \$50.33 for ED visits per patient (Flores et al., 2009). The PM group also reported a mean reduction of 1.26 asthma exacerbation days compared to 0.78 for the control group (Flores et al., 2009). The findings of the study reveal that the use of parental mentors for minority children and their parents in asthma education significantly reduced wheezing, asthma exacerbations, ED visits, and missed parental work days and improved parental recognition of asthma exacerbations at home. Using parental mentors can be an

effective way to deliver asthma education and parental mentors can be used in multiple settings from the clinic to the community.

Appraisal of the study indicated that the study was valid. The researchers clearly stated the focus of the study. Most importantly, the randomization was such that the intervention and the control groups were similar in sample size and characteristics. Control and intervention groups were treated equally. The total numbers of participants who completed the program in the PM and control groups were also similar. Data analysis was very rigorous and an alpha of 0.05 was indicated. The study was a single-blind study in which a research assistant was blinded to the different groups. The researchers in the study explained the limitations of using a single-blind study and how it could have led to biases. The findings support the use of asthma education for Hispanic children and their parents, demonstrating that it reduces healthcare utilization at a reasonable cost and produces net cost savings (Flores et al., 2009).

In another RCT, Karnick et al. (2007) investigated three different types of asthma education programs to determine which education intervention led to the greatest reduction in asthma severity symptoms, frequency of rescue medication use, healthcare utilization, and missed school days. The researchers also performed a cost benefit analysis of the three programs. Children between 1 and 16 years of age with asthma were recruited and a total of 165 completed the study. The students and their caregivers or parents were randomly assigned to three different groups. Those in Group 1 were given basic asthma education in 20 to 30-minute sessions and referred to their PCPs for further guidance and treatment options. Group 2 had reinforced education group similar to Group 1 but also had monthly telephone calls and an asthma educator

they could call and ask questions of as a resource. Group 3 had case management and reinforced education similar to Group 2, but also had a nurse practitioner/case manager and health educator with whom they could collaborate for assistance. Data were collected 1 year before the study and 9 months after intervention. A cost benefit analysis examined the cost of medication and the savings from decreased healthcare utilization. Statistical analyses used chi-square, ANOVA, and paired *t*-tests with a *p*-value set at less than 0.05.

The researchers found that healthcare utilization such as hospitalizations, ED visits, and clinic visits decreased significantly in all three study groups (Karnick et al., 2007). Group 3 reported a greater decrease in hospital visits compared to Groups 1 and 2. Participants in all 3 groups experienced substantial decreases in healthcare reimbursement, ranging from \$4,115/child/year to \$5,166/child/year (Karnick et al., 2007). Group 3 had the greatest cost savings at \$4,503/person (Karnick et al., 2007).

Appraisal of the Karnick et al. (2007) study indicated that it was valid and applicable to the current research question. The three groups were similar in size and characteristics and were treated equally. The study focused on a specific population of inner-city children, most of whom were Hispanic. The study was single-blinded; the participants did not know what group they were in but the researchers did. Although it was only single-blinded, the statistical analyses were detailed and thorough, allowing for the results to be interpreted easily. The outcomes study showed that even the most basic form of asthma education, without telephone or in-person case management, can substantially decrease healthcare utilization and increase costs savings. Additionally, it demonstrated that asthma education with or without case management services

improves quality of life and asthma care while reducing public expenditures and costs (Karnick et al., 2007).

According to Kintner et al. (2015), inadequate and ineffective asthma self-care behaviors contribute to lack of medication compliance, poor adherence to treatment regimes, and inability to accurately recognize symptoms, leading to increased morbidity and mortality for children ages 14-19 years with asthma. Kintner et al. (2015) sought to determine the effectiveness of a school- and community-based asthma educational program called Staying Healthy – Asthma Responsible & Prepared (SHARP) in promoting self-care behaviors in older school-aged students that helped them manage their asthma. The effectiveness of the educational program was measured by how well it promoted self-care behaviors such as episode management, risk reduction/prevention, and health promotion. The theoretical frameworks utilized by the authors were an ecological approach, a lifespan development perspective, and the acceptance of asthma model. The acceptance of asthma model posits that cognitive and psychosocial factors influence the effectiveness asthma self-care behaviors, the use of healthcare services, and quality of life outcomes (Kintner et al., 2015).

Kintner et al. (2015) examined 205 caregivers and 205 students with asthma from 23 different elementary schools, ages 9-12 years and in Grades 4 and 5. The school district was moderately sized and consisted of students from diverse and medically underserved populations who were primarily from minority, lower socioeconomic, and inner-city families. In a single-blind randomly controlled trial, the students and their caregivers were assigned to either the SHARP education program (intervention group, $n = 117$) or the Open Airways for School (OAS)

educational program (control group, $n = 88$). The SHARP educational intervention was given in both school and community settings. In the OAS educational program, students were educated in the classroom and no community education was given to the caregivers. Both educational programs were delivered by nurse-trained and nurse-supervised certified school teachers. The effectiveness of the educational program was assessed at 1, 12, and 24-months postintervention. The outcomes considered were the self-care behaviors of episode management, risk reduction/prevention, and health promotion.

No significant effect was observed pretest and posttest for use of prescribed medications between the SHARP and OAS groups (Kintner et al., 2015). However, the SHARP group showed a significant increase in appropriate symptom management techniques at posttest ($p = 0.006$) (Kintner et al., 2015). For risk reduction/prevention, those in the SHARP group showed a significant pre/post interaction for use of a pillow protector ($p < 0.01$) (Kintner et al., 2015). For health promotion, no significant change was seen in either group in exercising without symptoms, but being prescribed an inhaled steroid showed a significant covariate with oral hygiene rinsing after use ($p < 0.01$) (Kintner et al., 2015). The results indicate that certain self-care behaviors for children with asthma can be taught to both children and their caregivers. Those in the SHARP group exhibited increased use of appropriate symptom management as well as increased use of techniques in the home such as a pillow protector to help with the symptoms (Kintner et al., 2015). The outcomes of the study also showed that given proper education older school-age students and their caregivers have the ability to perform self-care behaviors to help

manage their asthma. Results also demonstrated that a combination of school- and community-based education improves self-care behaviors.

Use of the CASP RCT tool found the study valid as it addressed the researchers' research question. Although group assignment was random, the distribution between groups was not equal. Also, the OAS group provided education to students and not caregivers (Kintner et al., 2015). The students in the OAS group received only six lessons, each 50 minutes in length, and bullet-point take-home handouts for teaching caregivers about asthma. The SHARP group had 10 sessions, each 50 minutes in length, conducted in the school and a community component—a 90-minute asthma health fair with a nurse specialist in pediatric asthma giving a presentation. The inequality in the distribution of the participants and delivery of the education could have affected the results of the study.

Quasi-experimental Studies

Results of the quasi-experimental studies reviewed also demonstrated that asthma education helps decrease healthcare utilization. The results also illustrate the need for greater collaboration between healthcare providers and families, demonstrating that collaboration enhances the education.

Bruzzese et al. (2011) sought to determine whether a school-based asthma educational program would lead high school students with undiagnosed asthma to consult their PCPs for help with their breathing problems, receive a diagnosis, and be prescribed asthma medications. Although the researchers randomized participants into two groups, this was not a true randomized controlled trial; rather, it was a pilot study. The intervention group, called ASMA-

Undx, received an 8-week psycho-educational program with three components: group workshops led by health educators, individual coaching sessions, and instructions to see a PCP for clinical evaluation. The PCPs were sent packets notifying them that the students potentially had asthma and asking them to follow up with the students. Additionally, a pediatric pulmonologist called the PCPs regarding questions they might have about the diagnosis and treatment.

The researchers found a statistically significant number of students in the ASMA-Undx group reported being diagnosed with asthma by their PCP ($p < 0.001$) compared to the control group (Bruzzese et al., 2011). Also, a greater number of students were prescribed medications, but that number was not statistically significant ($p < 0.01$) (Bruzzese et al., 2011). Many students had not sought treatment prior to the study because their parents lacked knowledge in recognizing symptoms consistent with asthma.

Since the Bruzzese et al. (2011) study was not a true RCT study, the CASP Cohort appraisal tool was used to evaluate the study. The study lacked rigor as it did not address confounding factors such as small sample size and the effect of bias. There was no discussion of the limitations of the study. The samples were representative of a defined population of high school students from Grades 9 through 11. The objective of the study was clearly stated. The numbers and characteristics of participants in the ASMA-Undx group and the control group were similar. Although the results show statistical significance in the number of students diagnosed with asthma, the researchers did not describe in-depth the statistical analysis they used. Therefore, the study was unable to demonstrate whether the results were truly statistically significant. The study also needed more follow-up to determine the effects of the intervention.

However, the findings of the study support the idea that asthma management education for children with asthma needs to be incorporated into the children's medical care in order for self-management to occur. Furthermore, both the children and parents need to be educated about asthma and communicate with the PCP regarding symptoms and medication to prevent delay in treatment.

In another pilot test study, Wyatt and Hauenstein (2008) used a program called *Okay with Asthma* to test asthma knowledge and improve attitudes towards asthma of school children between 8 and 11 years of age. The program was conducted for 10 weeks during or after school in computer labs in order to provide online access to the *Okay with Asthma* program. Asthma knowledge was measured using the Asthma Information Quiz (AIQ), and the Child Attitude Toward Illness Scale (CATIS) was used to measure participants' attitudes toward having asthma (Wyatt & Hauenstein, 2008). A pretest was given and posttests administered 1 and 2 weeks after program completion.

The researchers found a significant difference in knowledge 1 week posttest and significant increases in knowledge and attitude scores 2 weeks posttest ($p < 0.05$) (Wyatt & Hauenstein, 2008). Also, boys' scores were higher on the attitude measure than girls'. Children with severe asthma had significantly greater change in attitude scores from pretest to 1 week posttest compared to children with moderate asthma (Wyatt & Hauenstein, 2008). Children 8 years old and those with fewer computer skills scored better than older kids and those who had more computer skills (Wyatt & Hauenstein, 2008).

The CASP Cohort appraisal tool was used to evaluate the validity of the study. Although the outcomes of the Wyatt and Hauenstein (2008) study suggest the use of an interactive self-guided computer program in schools that incorporates story and psychosocial elements in asthma management strategies is effective in teaching students about asthma and how to manage their condition, the study lack a comparison control group and more follow-up time points were necessary. However, the statistical analysis such as the *t*-test and Wilcoxon-signed rank tests were appropriate for the study, and the researchers mentioned the *p*-value below 0.05 as their mark for significance. One confounding factor the authors did not address as a limitation was the age of the students being tested, which could have affected their data. Although many children are exposed to computers today, it cannot be assumed that the children in the study were well versed in utilizing a computer program. The researchers did mention that the knowledge tool was challenging for the students to comprehend, perhaps because of their age. The study addressed the present research as it was evident that a computer-based asthma educational program can be used to reach out to students and families.

Cohort Studies

The cohort studies reviewed were subcategorized by setting in which the education was conducted: community, school, and home. Education delivered in a community health center or at a healthcare provider's office was categorized as taking place in a community setting.

Community-based asthma education. In a community health fair setting, Riera et al. (2015) investigated whether asthma education delivered by bilingual healthcare professionals such as nurse practitioners, medical students, and an emergency physician would lead to decreased ED and clinic visits, fewer missed school days, and improved pediatric asthma caregiver quality of life (PACQLQ) scores. Latino caregivers with limited English skills caring for children 1-12 years old with asthma were targeted. The educational fair setting enabled participants to spend as much time as they needed on the three different skills presented: medication recognition and administration, peak flow use if child was older than 5 years, and action plan dissemination. Participants were followed up at 3 and 6 months.

The researchers found that mean PACQLQ scores were significantly improved at the 3-month follow up (51 vs. 72; $p < 0.01$) (Riera et al., 2015). However, medication recognition was consistently poor before and after the educational fair (22% vs. 39%) (Riera et al., 2015). At 6 months post education, a statistically significant reduction in mean school days missed was observed (4.1 vs. 0.4, $p < 0.01$) (Riera et al., 2015). The total number of asthma-related ED visits decreased from eight at 6 months prior to the education to three in the 6 months after the education, but this change was not statistically significant (Riera et al., 2015). Any difference in frequency of asthma-related office visits was not statistically significant.

Appraisal of the study indicated that it was valid. The researchers wanted to determine whether a clinician-led education event would be useful, feasible, and effective in improving health outcomes for an at-risk low-income minority population that spoke limited English (Riera et al., 2015). The cohort chosen was representative of the defined population and the recruitment

strategy allowed for members of the community to participate if they wanted to. Additionally, the researchers incorporated members of a community organization in planning the educational fair. Although the researchers did not mention how they minimized bias, the statistical analyses, specifically Wilcoxon signed-rank test and McNemar's test, were appropriate for measuring the effects of the educational fair. Confounding factors were considered; the researchers conducted several meetings with community organization members to develop the educational fair content and practical logistics prior to implementing the event. These meetings helped achieve consensus regarding what outcomes to measure: quality of life, healthcare utilization, and asthma skills. Although no confidence interval was given, it is assumed to be 95%; significance was set at $p < 0.05$.

The educational fair was shown to decrease the number of missed school days and improve caregiver quality of life. It was surprising to find that no differences in asthma knowledge, skills retention, asthma-related office visits, ED visits, or hospitalizations were observed after the educational fair even though the education was conducted by healthcare professionals. It might be that continued education was needed for the parents to retain the information. This could be the reason asthma skills were not improved at the 3-month follow-up. However, the education did improve mean PACQLQ, with some parents reporting being less "frightened," "frustrated," and "worried about being protective" (Riera et al., 2015). The increased PACQLQ led to improved emotional function (37 vs. 47, $p < 0.01$) and reduced activity limitations (16 vs. 25, $p < 0.01$) (Riera et al., 2015). Given that the educational fair required participation from healthcare providers and community members it would have been

good to mention the cost, time, and allocation of other resources required to undertake the study as other communities might want to hold a similar fair. Disclosure of costs would also help other communities determine if the study is feasible for their communities.

In several of the qualitative studies reviewed, parents identified lack of education and feelings of hopelessness as barriers to properly managing their children's asthma. Riera et al. (2015) confirmed that asthma education for parents, especially when presented in the community and led by healthcare professionals, enhances knowledge and gives confidence to parents in managing their children's asthma, improving asthma outcomes and decreasing healthcare utilization. Additionally, the Riera et al. study shows the educational areas healthcare providers need to emphasize for Latino caregivers with limited English proficiency.

Fisher-Owens, Boddupalli, and Thyne (2011) also conducted a community-based asthma education program. They used the *Yes We Can* asthma program with a telephone case management component. The *Yes We Can* Urban Asthma Partnership is a comprehensive pediatric asthma care model based in San Francisco since 2002 (Fisher-Owens, Boddupalli, & Thyne, 2011). Children with poorly controlled asthma were referred to the program by their PCP and/or school or daycare. The program provided clinic-based asthma care for children and a community health worker (CHW) matched to each client provided telephone-based case management. Children and their parents had scheduled clinic visits with an asthma clinician and a CHW. The CHW contacted caregivers by telephone within 2 weeks of each visit to provide education on medications, assistance with pharmacy problems, and help with an asthma emergency action plan.

The results of the study indicated that Latino parents were less likely than African American parents or non-Latino African American subgroups to be reached successfully for follow-up telephone calls ($p < 0.001$) but approximately 80% returned for follow-up visits (Fisher-Owens et al., 2011). Approximately 79% of caregivers stated that they were unclear about what steps to take if medication was not working during an asthma exacerbation (Fisher-Owens et al., 2011). Only 50.2% had successfully filled prescriptions (Fisher-Owens et al., 2011). Reasons for the failure to fill prescriptions were lack of transportation, clinician wrote for a non-formulary medication, and inactive Medicaid coverage. Incorporation of telephone case management revealed that disproportionately more Latino families were unreachable by telephone, indicating that education needed to be given at the clinic visit to encourage follow-up. Additionally, the study showed that many patients did not obtain prescriptions and had pharmacy-related problems, but telephone case management resolved the issues.

An appropriate CASP appraisal tool for the study was difficult to ascertain because the study lacked a control group and the researchers characterized it as a descriptive study in the Discussion section but a cohort study in the Abstract. The researchers noted the lack of control and mentioned potential response bias during the follow-up telephone calls; caregivers might not be completely honest in an attempt to please the CHWs (Fisher-Owens et al., 2011). The researchers did not mention how they would have eliminated the bias. Also, the researchers did not identify the confidence interval or level of significance for their data analysis using chi-square. The lack of a control group and baseline raises questions regarding the results of the study. Also, the researchers did not state whether the participants were newly referred to the

clinic or existing patients already in the program. The outcomes of the study were not clearly stated. Although the results of the study have implications for the current research question, the lack of a control and information as to whether participants were new or current patients limits the validity of the results. Further studies using a control group are needed to determine the effectiveness of telephone case management.

Bhaumik et al. (2013) explored the cost effectiveness of a community-based asthma educational program. Participants were children ages 2-18 years from low-income, primarily Hispanic homes hospitalized at Boston Children's Hospital due to asthma or asthma-related ED visits between January 1 and December 31, 2006. The treatment group ($n = 102$) consisted of children in the Community Asthma Initiative (CAI) program that served children in the surrounding Boston area. CAI incorporates individual nurse case management, community education, outreach to PCPs, and family advocacy. Participants in the comparison group ($n = 559$) had similar age, gender, race, and socioeconomic characteristics as the treatment group.

Costs of program and cost savings from ED visits and hospitalizations 1 year before intervention and 1, 2, and 3 years post-intervention were calculated. Return of investment (ROI) was calculated to represent the incurred costs and the costs savings of the program (Bhaumik et al., 2013). Quality of Life (QOL) was measured in reduction of missed school days for children and missed workdays for parents/caregivers based on self-reported data recorded by CAI case managers at intake and 6 months and 1 year post-intervention. Statistical analysis was performed using paired t -tests to compare costs, ED visits, and hospital stays at 1 year before intervention and 1, 2, and 3 years post-intervention.

A statistically significant reduction in per-patient cost from ED visits and hospitalizations was found for CAI patients, with the average reduction being almost \$2,000 at Year 3 post-intervention compared to baseline (Bhaumik et al., 2013). The percentage of patients hospitalized decreased from 51% at 1 year before intervention to 14% in Year 1 and 8% in Years 2 and 3 years post-intervention (Bhaumik et al., 2013). The ROI for CAI patients was 2.04, or adjusted net value of \$266,316 over the 3 years of intervention (Bhaumik et al., 2013). The monthly savings per person in the CAI group was an average of almost \$11,000 during the 3 years after intervention (Bhaumik et al., 2013). The cost savings for 3 years of the CAI group from reduction in missed school days was \$69,259, and savings from reduced caregiver missed work days was \$61,978 (Bhaumik et al., 2013). There was significant reduction in missed school days, with an average of about 3 days, and missed work days for parents/caregivers, with an average of about 1.2 days. The net societal gain from the CAI program was \$215,000 over the 3-year period (Bhaumik et al., 2013).

As the study was not randomized but had a control group, the CASP Case Control tool was utilized and indicated that the study was valid. The CAI and non-CAI groups were treated with the same outcomes measured. However, the group sizes were markedly different; CAI group had 102 patients and the control group had 559. The demographics of the two groups, including insurance type and socioeconomics, were very similar. The study addressed a clearly focused issue: determining the cost benefit of a community-based asthma education program. The researchers clearly stated that they recruited samples for the control group comparable in demographic characteristics such as age, gender, race, and socioeconomic background to

participants in the CAI group (Bhaumik et al., 2013). They also mentioned that the control group differed from the CAI group in having no case management services, home visits, or clinical follow-up.

The utilization of cost data from ED visits and hospitalizations of both groups added validity to the results. Objective measurements were used for cost analysis; cost data were obtained from the hospital database, number of ED visits and hospitalizations were from administrative data, and number of missed school days and missed parental work days were from self-reported data recorded by CAI case managers (Bhaumik et al., 2013). The researchers used the data to compute the cost-benefit analysis, which was appropriate and easily understood. However, there was no mention of confounding factors such as how the socioeconomic and environmental factors could have impacted ED visits. The cost analysis was not stratified based on the socioeconomic classes of the participants, but it was conglomerated between the four zip codes around Boston. A stratification between the race and socioeconomic groups would have helped determine whether Hispanics utilized ED visits and hospitalizations more or less before, during, and after involvement in the CAI program.

Although the authors did not mention the confidence interval, the size of the *p*-value of <0.05 was an adequate level of significance. The calculations used to determine the cost benefit of the CAI program helped to provide rigor to the results. However, there was no mention of the typical average cost of ED visits and hospitalizations for the participants in the CAI or control group. It would have been beneficial to know the average cost of ED visits and hospitalizations to determine whether the reduction seen in the study was sufficient to incur net savings.

Nevertheless, the authors did provide a comparison of the cost savings between the CAI and control groups that showed that the savings for the CAI group was larger than the comparison group. There was no mention of whether all the participants completed the study and how the researchers accounted for participants who dropped out of the study or were lost in follow-up. However, the statistical analysis using both parametric and non-parametric measures was appropriate for the study.

Although the Bhaumik et al. (2013) study was conducted in an urban area, the results are still applicable to the current research. Firstly, they suggest that a community asthma case management program can lead to cost savings due to reduced ED visits and hospitalizations. Secondly, they indicate a return of investment and societal savings over time from the program. Thirdly, the large return in cost savings for the hospitals also contributes to increased QOL for parents and children, which leads to additional improvement in asthma control, reduced school absenteeism, and decreased parental missed work days. Lastly, community-based asthma education, such as the CAI with incorporation of case management and care coordination, can be effective in preventing costly hospitalizations and creating substantial net benefits to society.

School-based asthma education. Magzamen, Patel, Davis, Edelstein, and Tager (2008) evaluated the effectiveness of the *Kickin' Asthma* program, a school-based asthma educational program for middle schools and high schools in Oakland, California, in reducing asthma symptoms, acute care utilizations, and school absenteeism. The researchers delivered the curriculum to 900 students via an asthma nurse in four 50-minute sessions. The program included information about lung physiology and asthma basics; triggers, symptoms, and warning signs of asthma; asthma medications; and emergencies and problem solving. Students were measured at baseline and in a 3-month follow-up survey.

Students who participated in the *Kickin' Asthma* program had significant reductions in average number of missed school days by 0.5 day during the first year of the 3-year study (Magzamen et al., 2008). The average number of nights of sleep disruption decreased for every year in the program. Regarding healthcare utilizations, there were significant reductions in ED visits and hospitalizations from baseline for all 3 years, and physician visits decreased during first 2 years (Magzamen et al., 2008). Asthma symptoms improved significantly during both daytime and nighttime, accounting for a decrease in activity limitation and an increase in mean nights of sleep during the first 2 years (Magzamen et al., 2008). The use of asthma devices such as spacers and peak flow meters significantly improved from baseline (Magzamen et al., 2008).

Magzamen et al. (2008) showed that a school-based asthma curriculum led by a nurse or other healthcare provider was effective in reducing ED visits, hospitalizations, asthma exacerbations, activity limitations, and missed school days. The method of recruitment of the students, which allowed for voluntary participation, was appropriate to the study. The statistical

analysis was appropriate for determining the results, helped to minimize biases, and took into account confounding factors such as the group-level means and proportions. Although there was no control group, the 3-year follow up allowed for demonstration of the effectiveness of the educational intervention in reducing ED visits as compared to other studies reviewed that had a one-time follow-up. The *Kickin' Asthma* program can be adopted by schools in the San Joaquin Valley as it can help reduce asthma exacerbations and ED visits. Also, the educational sessions can be divided into different segments and provided by school nurses. School teachers can incorporate the program as part of their lesson plans and ask the school nurse to lead the teaching session. The *Kickin' Asthma* program can encourage students to take an active role in their asthma self-management. The study was valid and applicable to the current research.

Home-based asthma education. To evaluate the feasibility and acceptability of a home visitation program using CHWs for rural Latino families, Postma, Smalley, Ybarra, and Kieckhefer (2011) performed a cohort study using retrospective data gathered from the Yakima Valley Farm Worker's Clinic in Washington. The clinic is a migrant community health center that serves farmworkers and other underserved populations. It offers a Childhood Asthma Project (CAP), a home visitation program using CHWs trained to perform environmental assessments in the home, educate families about strategies to for reducing environmental home triggers, and reinforce asthma plans and medical management. The researchers reviewed the charts of participants in the CAP program and used data from 12 months prior to intervention as a baseline, during the 12 months of the intervention, and at 12 and 24 months post-intervention. The intervention consisted of a total of 8 home visits.

After intervention, more caregivers reported using rescue medications correctly as prescribed, storing the medications in safe and accessible areas, and devices such as nebulizers were used effectively (Postma et al., 2011). Behaviors to reduce triggers in the home, such as washing bedding in hot water, using dust covers on pillows and mattresses, reducing smoking inside the home, use indoor chemicals minimally, removing mold, and keeping pets outside, improved (Postma et al., 2011). Most importantly, ED visits and hospital admissions decreased significantly after intervention ($p < 0.0005$) (Postma et al., 2011). A greater number of participants followed an asthma management plan and a statistically significant increase in children 6 months and older receiving flu shots was reported ($p < 0.0005$) (Postma et al., 2011).

For a retrospective study using chart review, the Postma et al. (2011) study methodology was appropriate; it examined a clearly focused study population of Latino farmworkers living in rural areas who were representative of a defined population. Unlike participants in other studies reviewed, the study population consisted of Latino farmworkers living in a rural area. Because many of the residents in the San Joaquin Valley are Latino farmworkers, this study is applicable to the current research. Recruitment of the study participants was conducted thoroughly with clear inclusion and exclusion criteria that minimized biases. Data analysis used McNemar's test, Wilcoxon signed-rank test, and logistic regression; these tools helped minimize bias and correct for confounding factors. Although follow-up of the subjects was conducted, the length of time for follow-up may have been too long; a shorter duration such as 5 months would have sufficed.

The results of the study suggest that home visits are helpful in reducing ED visits and hospitalizations among rural Latino families with children with asthma. The results support

those of other studies that show that asthma education is effective in decreasing healthcare utilization. The researchers pointed out that six visits over a period of 10 months allows for good participation and cooperation. Home visits from CHWs for rural Latino families helped to reduce environmental triggers for asthma in the home, decrease ED visits, and improve medication management (Postma et al., 2011). Overall, the study was valid and applicable to the current study in addressing the research question.

In another home visit study utilizing CHWs, Woods et al. (2012) examined the feasibility of a Community Asthma Initiative (CAI) program in reducing asthma ED visits, hospitalizations, limitation of physical activity, school absenteeism, and parental missed work. The 562 children ages 2-18 years and 283 parents were primarily Black and Hispanic. They resided in underserved communities neighboring a major pediatric urban hospital and the hospital's community health center in the Boston area. The CAI program entailed nurse case management and coordination of care with PCPs and referral services, home visits by bilingual nurses or nurse-supervised CHWs, and referral to Integrated Pest Management (Woods et al., 2012). The home visits provided asthma education, environmental assessment, remediation materials, and connection to community resources (Woods et al., 2012). Interviews were conducted at baseline and at 6 and 12 months. Cost analysis was also conducted.

The researchers found statistically significant reductions in ED visits: 66.5% at 6 months, 68.0% at 12 months, and 56.0% with any follow-up ($p < 0.001$) (Woods et al., 2012). They also reported statistically significant reduction in hospitalizations, days of limitation of physical activity, patient-missed school days, parent-missed work days, and number of exacerbations ($p <$

0.001) (Woods et al., 2012). In fiscal year 2006, cost analysis showed that CAI patients had a higher average cost per patient in the year prior to entering the program (Woods et al., 2012). However, at 1 year cost per patient was similar for CAI and non-CAI patients but CAI patients had a greater decline from baseline. CAI patients showed greater reduction in costs than non-CAI participants at 2 years, a difference that was statistically significant ($p < 0.001$) (Woods et al., 2012). Even though the annual cost of the program was \$2529/child, the net savings for the CAI group was \$3827/child over 2 years with a return on investment of 1.46; that is, for every dollar spent on the program, 1.46 dollars were saved due to reduced ED visits and hospitalizations (Woods et al., 2012).

Appraisal of the study indicated that it was valid. The selection of the study participants was very thorough, the sample size was good, and participant selection was based on the number of hospitalizations or ED visit in the year prior to the start of the study. The outcomes were clearly stated. Recruitment of the participants included a thorough review by a nurse case manager of admissions and ED logs for patients diagnosed with asthma (Woods et al., 2012). Although there was no control for comparison of the effects of CAI in reducing healthcare utilizations, costs for admissions, ED visits, and overall hospital costs were compared with those of a neighboring community with similar patient demographics. Statistical analysis for determining cost effectiveness and ROI of the educational intervention was thorough. The authors described how they eliminated biases in the cost analysis. However, the authors did not consider confounding factors such as the lack of a control group for comparison. They did not include participants who were not involved in the CAI program or those with another asthma

home visit program. However, the length of follow-up was sufficient to determine the effects of the CAI program.

The implication of the study show that case management and home visits helped to control patients' asthma symptoms, reduced ED visits and hospitalizations, and provided a cost-effective way to reduce hospital costs and improve QOL for families. Additionally, programs such as CAI incorporate home visits and care coordination with a nurse case manager who is culturally sensitive, family-centered, and cost-effective. These programs can be implemented in accountable care organizations or in a patient-centered care home model at primary-care clinics to target families of children with uncontrolled and mild to severe asthma.

Rashid et al. (2015) investigated the effectiveness of home visits as part of a community asthma education program. Retention rates of children receiving healthcare services in a Breathmobile™ were compared to those with an additional *promotora*-based home visit. Number of days in the program and percentage of patients remaining in the program 6 or more months were measured. The participants were chosen for the home visit program based on recommendations of their provider. The home visit was conducted by a *promotora*, a CHW who is a lay Hispanic-American community member who has received specialized training to educate the community.

An initial home visit was conducted along with a 3-hour interactive education describing the basics of asthma and environmental needs of people with asthma. The program consisted of a specific environmental allergen assessment and standardized asthma education using pictures and device demonstrations. Results were reported to the physician and nurse caring for the child

and families were encouraged to keep scheduled Breathmobile™ visits (Rashid et al., 2015). A follow-up visit 1 month later was conducted to assess changes in the home environment, understanding of the educational material, and compliance with Breathmobile™ appointments (Rashid et al., 2015).

Children in the Breathmobile™ and home visit program had statistically significantly greater retention compared to those without home visits for median number of visits (5 vs. 3), more than 3 Breathmobile™ visits (86% vs. 38.8%), greater median number of days in the program (299 vs. 63), and greater percentage of patients in the program for 6 months or more (67.8% vs. 31.3%; $p < 0.001$) (Rashid et al., 2015). Children with one or more home visits had statistically greater odds of remaining in the program for 6 months or longer ($p = 0.001$) (Rashid et al., 2015). Other factors that led to increased retention in the program were moderate to severe persistent baseline disease, and age of 6-10 years versus younger (Rashid et al., 2015). The study showed that the addition of a *promotora* to a home visit program led to greater retention, which can result in reduced healthcare utilization such as ED visits and hospitalizations.

Appraisal of the study using the CASP Cohort appraisal tool shows that although the study has implications for current practice, it was conducted only once with one-time follow-up. The study lacked rigor even though a chi-square test statistic was used for the statistical analysis. The control group consisted of 871 children and the intervention group had 136. The large size disparity between treatment and control groups could have affected the results. The demographics of the two groups were also very different. However, the authors noted that it was a retrospective observational study in which there was no randomization involved that could

have led to selection bias (Rashid et al., 2015). More than one follow-up should have been conducted to determine whether the home visits using the *promotora* really did lead to significant changes in the homes of the children. Another important aspect the study could have measured in addition to retention was healthcare utilization. Although the authors mentioned they could not measure this outcome due to lack of randomization, it would still have been beneficial to conduct surveys for the families during the home visits to determine if the children had decreased ED visits, clinic visits, or hospitalizations. Overall, the study helps provide evidence of the importance of a culturally linguistic CHW in providing education to children and parents; such a person could help in retention in asthma educational programs.

Cross-sectional Studies

The two cross sectional studies reviewed and appraised investigated the effectiveness of asthma education in clinical settings. These studies helped to identify ways healthcare providers can best educate parents and children by identifying practice gaps in asthma education.

The effects of asthma education delivered by healthcare providers were investigated by Peterson-Sweeney et al. (2007) in a cross-sectional study. The researchers interviewed 228 parents with school-age children age 5-12 years diagnosed with asthma and with two or more asthma-related visits to their healthcare provider. The interviews were conducted over a 16-month period by pediatric nurses trained in asthma care and interviewing. They were held in urban clinics and community private practice settings in upstate New York. Each interview lasted 1-1.5 hours. Parents were asked to report the quality of education they received from their healthcare provider (HCP) using the Parent Report of Asthma Education Received tool

(Peterson-Sweeney et al., 2007). Additionally, parental beliefs about asthma were determined using the Asthma Illness Representation Scale. A parent/healthcare provider interaction instrument was used to assess the relationship between parent and healthcare provider and beliefs about when to contact the provider.

A significant relationship was found between reported asthma education received from HCP and parental illness representations in treatment expectations at $p < 0.05$ (Peterson-Sweeney et al., 2007). A significant relationship was also found between asthma education received from HCP and parent/HCP relationship ($p < 0.001$); participants who reported more education had a better relationship with their HCP (Peterson-Sweeney et al., 2007). The researchers concluded that a good parent/HCP relationship can lead to enhanced adherence to therapies such as the use of anti-inflammatory medications and improved health outcomes such as reduced ED visits.

The CASP Cohort appraisal tool found the study valid and applicable to the current research question. The study clearly addressed a focused issue, which was to understand how HCP education affects parental beliefs toward medication use and adherence as well as their understanding of asthma (Peterson-Sweeney et al., 2007). The method used to address the question was appropriate and relevant to the current research as half of the samples were from minority groups, specifically African American and Hispanic, and half lived in poverty. The recruitment of the participants was also acceptable; they were chosen based on diagnosis codes (ICD9) of having asthma and had asthma-related visits in the year prior to the start of the study. The participants were not coerced into the study; letters were sent informing them about the

study and their option to refuse further contact if they did not want to participate. The questionnaires used were validated by the National Asthma Education and Prevention Program expert panel and tested in prior studies (Peterson-Sweeney et al., 2007). The 16-month length of the study allowed for multiple interviews. SPSS was used for a simple and hierarchical multiple regression for data analysis. The sample size of 228 and the long study period gave the results validity. However, confounding factors the authors did not mention were the absence of a control and a failure to say how they minimized biases. Also, the asthma education provided by the HCP was not specified or standardized among the patients. Another confounding factor to consider was the length of education provided by the HCP; some participants may have had more time with their HCPs and may have therefore had better outcomes. There was no standardization in length of time the education was provided by the HCP.

The study does provide evidence that the more education caregivers reported receiving, the closer illness representations were to the professional model of care and the better the relationship with the HCP (Peterson-Sweeney et al., 2007). Also, the results suggest HCPs need to spend more time with children and parents in giving information, reinforcing asthma teaching, establishing realistic goals, and identifying areas of misunderstanding or misconceptions. Increased education from HCP appears to be related to an increase in the use of the asthma medications, which helps reduce ED visits and hospitalizations.

In another cross-sectional study using chart review, Fox et al. (2007) evaluated a clinic-based asthma education program that incorporated continuous quality improvement and community health workers. They examined whether the education led to improvements in

patient-centered care processes, increased confidence in asthma self-management, and direct clinical outcomes such as ED visits and hospitalizations. The asthma education was a demonstration project conducted in seven community clinics across California with two from Fresno and Madera counties. Participants were children 5-18 years of age with asthma and their parents. Many of the children were Hispanic, low-income, and had Medi-Cal health insurance. A cross-sectional chart review was performed of 560 children enrolled in the California Asthma Among the School Aged (CAASA) from 2001 to 2007 at the community clinics. The charts were randomly selected and reviewed at baseline and 24 months. Of the 560 children, 405 with moderate or severe persistent or poorly controlled asthma were also followed longitudinally and interviews with their families were conducted at baseline and at 12 or 24-months post-intervention.

The demonstration project was a team-based continuous quality improvement (CQI) process with CHWs and support provided by a central technical assistance team. The CQI team was multidisciplinary with either a physician or nurse practitioner, a CHW, a project coordinator, and other clinical and nonclinical staff. The CHW provided asthma education to families and patients in homes and schools, and issued community referrals. The technical assistance team was also multidisciplinary with responsibilities to make sure the education was within the National Asthma Education and Prevention Program guidelines, the CQI model was applied in the clinics, guidance and assistance was provided to the CHWs, and reporting was done properly (Fox et al., 2007).

The results of the study showed that the intervention decreased hospitalizations (8.6% pre-intervention vs. 1.7% post-intervention), acute care visits with asthma exacerbations (48.1% vs. 17.3%), ED visits (26.9% vs. 8.6%), missed school days (37.8% vs. 11.8%), frequency of daytime symptoms (51.6% vs. 16.0%), frequency of night-time symptoms (47.2% vs. 18.0%), and frequent use of rescue medications (42.3% vs. 11.8%) (Fox et al., 2007). Also, quality of care stated by parents as excellent or very good increased from pre to post-intervention (57.0% vs. 78.8%) and confidence in being able to manage their asthma increased (64.9% vs. 88.1%) ($p < 0.001$) (Fox et al., 2007). A direct proportional relationship was found between improved patient outcomes and compliance with demonstration components ($R^2 = 0.61$; $p = 0.037$) (Fox et al., 2007). A direct proportional relationship was found between intervention and decreases in symptoms, improvements in clinical outcomes such as use of rescue medication and symptoms (day and night), and action plan use ($R^2 > 0.60$) (Fox et al., 2007).

The CASP appraisal tool for cohort studies found the results of the study valid. The sample size was large enough for valid statistical analysis. Also, the study population was clearly defined by the researchers, randomized, and representative of a defined population. The statistical analysis performed was very detailed and thorough so that it was easy to understand the calculations and the statistical tests. The researchers identified the p -value and confidence interval used. Most importantly, the researchers accounted for loss of study subjects, biases that could have occurred in the study, and lack of a control. They utilized a stepwise regression analysis and odds ratio to both with and without baseline asthma severity. The regression analysis helped to account for confounding factors. Although the method of statistical analysis

was rigorous, follow up of the subjects was not long enough and needed more time points. Only a 12- or 24-month follow-up period was used. It would have been good if there were 6-month, 18-month, and 36-month follow ups for both groups of participants.

The results of the study indicated a strong direct proportional relationship between the use of the intervention and compliance as well as decrease in symptoms and use of rescue medications. The regression analysis results gave an R^2 of greater than 0.60, and the methods used to calculate the regression was rigorous, allowing the results to be valid. Also, the statistical significance in the decreases in healthcare utilization, missed school days, day and night-time symptoms, and asthma exacerbations was strong with $p < 0.001$ and CI 95% (Fox et al., 2007). The researchers tried to eliminate biases such as patients giving answers to the interview questions to please the interviewer.

The outcomes of the Fox et al. (2007) research agrees with those of other studies in which asthma education, whether in the community or healthcare settings, helps to reduce healthcare utilization and improves asthma management. Also, this study examined two clinics from the San Joaquin Valley, the location of the current research. The outcomes of the study show that clinics serving primarily underserved and disadvantaged children can utilize an asthma education program effectively. Although it may require substantial use of resources from multidisciplinary teams, home visits from CHW, and administrative participation, the benefits of the education program for the children and their families outweigh the costs.

Discussion

The findings in the literature review clearly indicate the need for education for Latino families and their children who have asthma. Latino families expressed a desire for increased asthma education in the community and, most importantly, from healthcare providers.

Interviews with Latino families regarding asthma management in the home showed that parents lacked the understanding of the words “wheezing” and “attack” (Bialostozky & Barkin, 2012).

A deficient understanding of asthma as a chronic condition and the severity of asthma attacks contributed to excessive ED visits and inpatient stays as parents reported taking their children only when the wheezing worsened or when they felt a sense of helplessness during the attack.

Parents reported they believed the ED had more resources to help their children during an attack (Berg et al., 2007; Coffey et al., 2012).

School-, home-, and community-based education were shown to be associated with statistically significant reductions in healthcare utilization, school absenteeism, and missed parental work days. In a randomized control trial, Flores et al. (2009) found that use of an asthma education with parent mentors in both home and community settings showed statistically significant reductions in ED visits, missed school days, and missed parental work days. Cohort and cross-sectional studies using asthma education in both school and community settings also showed significant reductions in healthcare utilization and improved parental quality of life.

Furthermore, community-based asthma education was shown to be cost effective and incur net savings from decreased utilization of healthcare resources (Bhaumik et al., 2013; Woods et al., 2012). Overall, asthma education to Hispanic children is effective in reducing healthcare

utilization.

The findings indicate that effective education requires collaborative effort between the child, parents or caregivers, healthcare providers, schools, and community. Common themes throughout the literature include the importance of increased parental awareness of and sensitivity to symptoms, correct usage of asthma medications, use of culturally competent asthma educators such as *promotoras*, and multiple modes of education delivery including home visits and audiovisual. Little recent research has looked at the asthma education conducted in the San Joaquin Valley. Only one study reviewed was conducted in a rural setting, in Texas, and one was conducted in two clinics in the San Joaquin Valley. More research needs to be done to understand what type of asthma education is needed and the effectiveness of the education to Hispanic parents and children in the San Joaquin Valley. The purpose of this study was to conduct an integrative review of the literature describing asthma education to Hispanic parents and children to determine what educational strategies can be implemented in the San Joaquin that will help to reduce healthcare utilization.

Table 1. Literature Review Matrix of the 22 studies reviewed and appraised using the CASP tool.

Author, Year Published	Study Objectives	Participants	Design and Methods	Results	Level of Evidence and Level of Quality
Davis, Gordon, & Burns, 2011	N/A	N/A	Integrated review of articles about asthma education for preschoolers from low-income families	Including parents in asthma interventions enhances the effectiveness of education	I Thorough integrative review
Berg, Anderson, Tichacek, Tomizh, & Rachelefsky, 2007	N/A	Immigrant Latino parents between 28-51 y/o	Qualitative. Group meetings in Spanish, audio recorded and transcribed for thematic content analysis	Parents expressed lack of knowledge on what to do, sense of helplessness, and lack of understanding about disease process and treatment regimen	VII Sample size too small to generalize results
Coffey, Cloutier, Meadows-Oliver, & Terrazos, 2012	N/A	Puerto Rican women caregivers	Qualitative. Audiotaped and transcribed interviews with parents about their ED experiences	6 themes identified: folklore to asthma, culture and medicine women, awe of asthma, praying to God, decision-time to go, and the ED environment	VII Small sample size, possible researcher bias

Bialostozky & Barkin, 2012	N/A	Spanish- speaking Latino parents of Mexican descent and children 2-18 years	Qualitative. Face-to-face interviews by trained MA bilingual personnel	Majority of the parents did not understand what wheezing or whistling was	VII Good sample size and statistical analysis was used.
Postma, Evans-Agnew, & Capouya, 2015	N/A	11 mothers of at least 1 child with asthma and born in Mexico	Qualitative. Participants took and shared photographs of home asthma management practices	Home management activities were primary or secondary concerns for the mothers.	VII Small sample size, one-time sessions and no f/u indicated.
Kueny, Berg, Chowdhury, & Anderson, 2013	N/A	6 families from the Community Intervention Project on Asthma: The La Casa Study	Qualitative. Group meetings conducted in Spanish focusing on experience of having a child with asthma and home management of asthma	3 themes: barriers to changing or managing asthma symptoms, families working little by little to improve their homes, families' achievements in reducing asthma triggers and managing symptoms	VII Small sample size. Results of study helps in understanding the willingness of families to change their homes for their children's health.
Lobar et al., 2008	N/A	Adults over 21, fluent in Spanish, some bilingual	Qualitative. Participants educated about asthma intervention and then sent to educate	3 themes: sense of community, value to the families and community, and motivation from the	VII Small sample size and need more rigorous analysis of audiotapes

			others in the community.	statistics about asthma to change their home to reduce asthma triggers.	
Horner & Brown, 2014	Evaluate home-visit intervention for QOL, ED visits, hospital stays, and asthma self-management	183 children in grades 2-5	RCT. Educational sessions for 5.5 weeks with home visits	No differences between treatment and control group for ED visits	II Good sample size, thorough methods, limited by children’s ability to understand surveys
Flores et al., 2009	Use of parental mentors in reducing asthma outcomes	131 parents completed the final 12-month follow-up	RCT. Parent monitors had monthly home visits and telephone f/u	Significant reductions in rapid breathing episodes, asthma exacerbations, and ED visits	II Intervention and control group sizes very similar. Results showed statistical significance.
Karnick et al., 2007	Comparing 3 different types of asthma education	212 participated and 165 completed	RCT. Patients randomized into 3 different asthma education groups	Significant decreases in healthcare utilization in all three study groups	II Good sample size and statistical analyses
Kintner et al., 2015	Comparison between SHARP and OAS asthma education	205 students and 205 caregivers	RCT. Pre/post test	SHARP group had better symptom management techniques, symptom monitoring, greater number of undisturbed nights of	II Good sample size. Comparison not even as SHARP program had more elements than OAS.

				sleep, proper use of medications	
Bruzzese et al., 2011	Determine effectiveness of school-based intervention for students with undiagnosed asthma	30 students, Grades 9-11	Quasi-experimental. 8-week psycho-educational program with 3 components	Program resulted in significantly greater proportion of students being diagnosed and prescribed medication	III Sample size between comparison groups evenly distributed but need more f/u study to determine the effects of the intervention
Wyatt & Hauenstein, 2008	Evaluate <i>Okay with Asthma</i> online tool for increasing asthma knowledge and improving attitude toward asthma	35 students ages 8 and 11 years	Quasi-experimental. Pre/posttest using Asthma Information Quiz and Child Attitude Toward Illness Scale	Significant increase in knowledge and attitude scores	III Good sample size and good methodology
Riera et al., 2015	Effects of community health fair education for Latino caregivers with limited English proficiency	18 caregivers with limited English proficiency	Cohort study. Education by professionals at community fair with 3- and 6-month followup	No differences in asthma-related office visits, ED visits, or hospitalizations; sig. reduction in missed school days and improved mean PACQLQ	IV Adequate sample size
Fisher-Owens, Boddupalli, & Thyne, 2011	<i>Yes We Can</i> asthma program with telephone case management	364 caregivers of children in the program	Cohort study. Telephone f/u after visits with education on medications,	Latino parents less likely to be reached successfully for f/u telephone but more	IV Good sample size but lacking control group

			pharmacy assistance, and asthma ER action plan	likely to later return for f/u visits.	
Bhaumik et al., 2013	Cost analysis and effects of Community Asthma Initiative (CAI) on healthcare utilization	661 children ages 2-18 years	Cohort study. Cost analysis for CAI program and comparison group from ED visits and hospitalizations.	Statistically significant reduction in costs of ED visits and increased net value with CAI.	IV Good sample size and very thorough formulas and statistical analysis to determine ROI
Magzamen, Patel, Davis, Edelstein, & Tager, 2008	Evaluate effectiveness of <i>Kickin Asthma</i> curriculum in reducing asthma symptoms and healthcare utilization	990 students in 6th - 10th grades	Cohort study. 3-year study measuring students at baseline and 3-month f/u survey	Significant reduction in healthcare utilizations and average missed school days with improvement of asthma symptoms, and use of spacers and peak flow meters.	IV Good sample size and methods of educational intervention adoptable for other schools.
Postma, Smalley, Ybarra, & Kieckhefer, 2011	Evaluate home visitation program for behavior outcomes	866 children and caregivers	Cohort study. Chart review of participants to and 12-24 months after intervention	Stat sig. decreases in ED visits and hospital admissions after intervention. Improvement in home management of asthma.	IV Large sample size and longitudinal f/u of the effects of the intervention
Woods et al., 2012	Effects of Community Asthma	562 children (2-18 y/o) and 283 parents	Cohort study.	CAI program had ROI of 1.46 from	IV

	Initiative (CAI) on QOL, costs, and return on investment (ROI)		Interviews of participants in the CAI program and cost analysis	reduced ED visits and hospitalizations. Stat. significant reductions in healthcare utilization	Good sample size and very thorough statistical analysis.
Rashid, Carcel, Morpew, Amaro, & Galant, 2015	Compare retention rates between Breathmobile with home visit vs. Breathmobile alone	1007 parents and children	Cohort study. Initial visit with 3-hr interactive education about asthma basics and environmental needs with follow-up visit 1 month later.	Children in Breathmobile + home visit had significantly greater retention	IV Good sample size but not even distribution of sample between groups
Peterson-Sweeney et al., 2007	Representation of child’s asthma and relationship with provider	228 parents and children	Cross-sectional. Interviews with parents and child by pediatric nurses lasting 1-1.5 hrs.	Stat. significant relationship between reported asthma education received from HCP and parental illness representations and parent/HCP relationship	VI Good sample size and statistical analysis very thorough
Fox et al., 2007	Evaluation of asthma education project using CQI and CHWs	560 children aged 5-18 years, 405 followed longitudinally	Cross-sectional. Chart reviews of children enrolled in California Asthma Among the School Aged project from 2001-2007 and interviews	Stat sig. decreases in hospitalizations, acute care visits, ED visits, missed school days, night time symptoms, and use of rescue medications	VI Good statistical analysis used to eliminate biases and confounding factors

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METHODS

The proposed study incorporated an integrative review approach to synthesizing qualitative, quantitative, and mixed-methods evidence as outlined by Whitemore and Kanfl (2005). The approach was chosen because it allowed for a combination of diverse methodologies to be evaluated, analyzed, and synthesized so that patterns, themes, relationships, and conclusions from the various studies can be drawn. Using four different databases, primary and secondary sources were gathered. Research studies were retrieved and critically appraised. An ancestry search was also utilized. The articles were then sub-grouped based on their study design, such as quantitative or qualitative. Afterwards, the articles were screened further to gather themes or patterns. The findings were then synthesized to help answer the research question. As this was an integrative review, no ethical approval was necessary.

Eligibility Criteria

Studies were included in the review if they focused on the Hispanic population (parents or families or caregivers, and school-age children and adolescents) and in either rural or urban settings. The outcomes of included studies needed to report on healthcare utilization (ED visits, clinic or physician visits, hospital or inpatient stays). Other outcomes that were reported included quality of life, missed school days or absenteeism, missed work days, and cost effectiveness. Research studies that generated all levels of evidence were included: systematic reviews, integrative reviews, randomized controlled trials or quantitative studies, prospective cohort studies, case-control studies, cross-sectional studies, qualitative studies, and expert opinions or case reports.

Information Sources and Search Strategy

The following databases were searched for all English-language studies on pediatric or childhood asthma education among Hispanics/Latinos: Cochrane Library, PubMed, MEDLINE, and CINAHL. Gray literature such as theses, dissertations, and newspaper articles were also included in the review (See Figure 1). An ancestry search was adopted to retrieve additional research studies. The MESH search terms for PubMed included “pediatric asthma,” “asthma in children,” “asthma education,” “asthma management,” “ED visits,” “asthma education in schools,” “asthma education in the community,” “asthma education in healthcare settings,” and “Hispanic or Latinos.” For the other databases, search terms included “pediatric asthma education,” “childhood asthma education,” “Hispanics or Latinos or Chicano or Mexican American,” and “ED visits.” To retrieve more articles, search terms such as “pediatric asthma management,” “Hispanics or Latinos,” and “community” or “school” or “healthcare providers or nurses” were used for MEDLINE and CINAHL.

The inclusion criteria included papers that consisted of original research studies, systematic reviews, and/or integrative reviews in peer-reviewed journals that examined asthma education in the Hispanic pediatric population (0-18 years of age) in the United States from January 2007 to December 2017. The studies included research conducted in either urban or rural areas in the United States. The setting of the asthma educational program, such as community, healthcare provider or clinic, or school, was also included. Studies that surveyed different ethnicities in which the largest sample consisted of Hispanics or Latinos or the results described findings about the Hispanic or Latino population were included. Additionally, parental

experiences in caring for a child with asthma were included to gain a better understanding of the educational topics that need to be addressed. Exclusion criteria included studies older than 2007, participants or subjects not Hispanic or Latino, studies that took place outside the United States, and studies with co-morbid conditions such as allergy and obesity.

Assessment of Methodological Quality

The Critical Appraisal Skills Programme (CASP) was used as the appraisal tool to ensure a rigorous, systematic, and organized review. This tool allowed the researcher to critically evaluate and appraise the studies. For cross-sectional and quasi-experimental studies, the CASP Cohort Study or Case-Control Study appraisal tool was utilized depending on the study design. For cohort studies, the CASP Cohort Study appraisal tool was used. For RCTs, the CASP Randomized Controlled Trial tool was used. For qualitative studies, the CASP Qualitative Study tool was used to evaluate the studies. For integrative and systematic reviews, the CASP Systematic Review tool was used.

Data Extraction

Data extraction consisted of four steps. First, each study that met the selection criteria was inputted into an evidence table or literature review matrix (Table 1). For each study, the methodology, sample size and characteristics, results, and conclusions were extracted and listed in the evidence table.

Second, the level of evidence per the study design utilized was determined for each study. The classification of the levels of evidence was adopted from Polit and Beck (2017) as follows:

I - indicates evidence derived from systematic reviews, meta-analysis of the systematic reviews, or integrative reviews.

II- indicates the evidence came from single RCT that was well-delineated.

III- indicates evidence obtained from single well-designed trials without randomization such as quasi-experimental trials.

IV- indicates evidence that came from well-delineated single prospective or cohort studies.

V-indicates evidence derived from well-delineated single case-control studies

VI- indicates evidence from well-designed single cross-sectional studies such as surveys.

VII- indicates evidence derived from single in-depth descriptive or qualitative studies.

VIII- indicates evidence from expert opinions, case reports, and/or reports of expert committees.

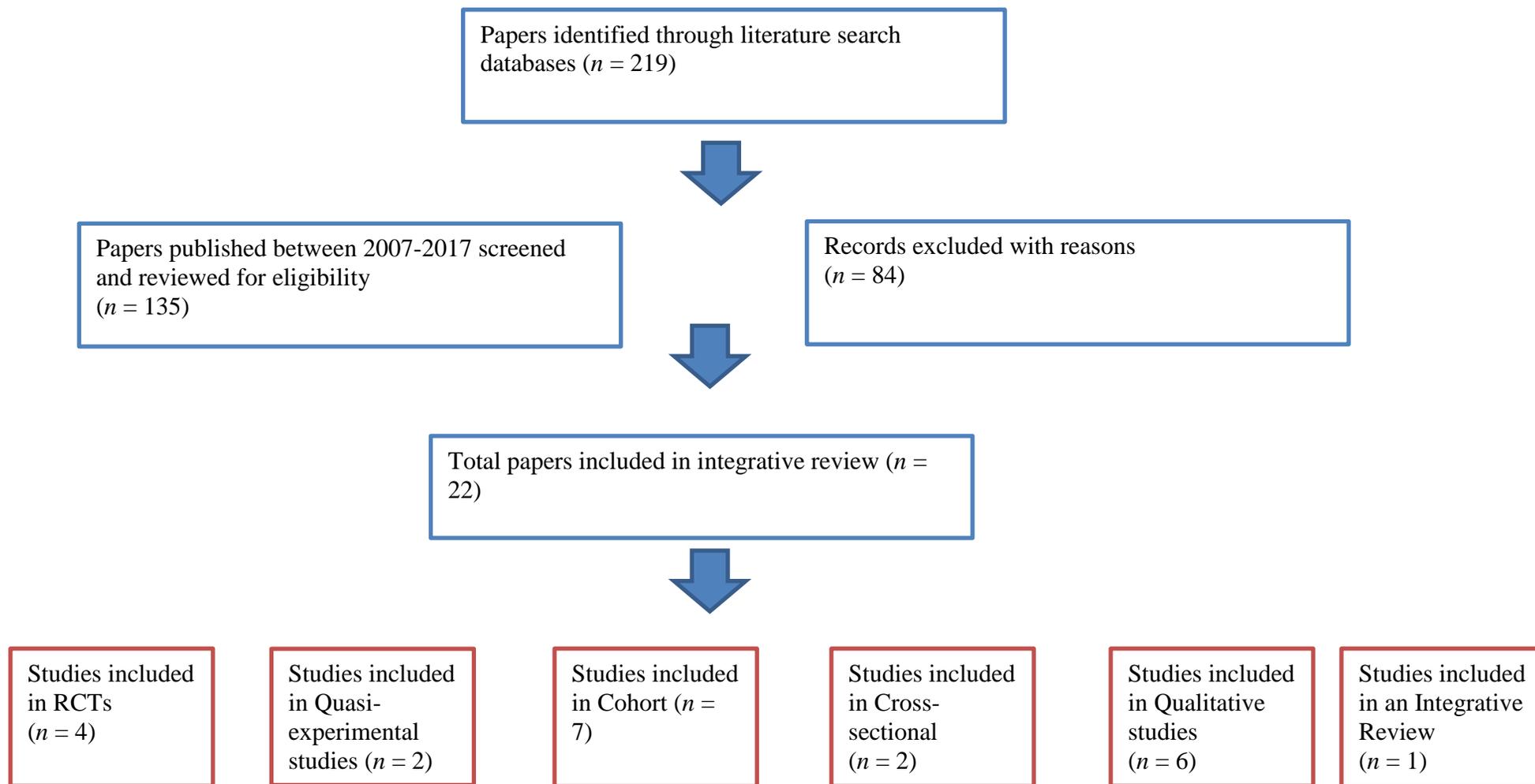
Third, the findings to be extracted from the qualitative studies were themes, conclusions, and experiences gathered from the study by the researchers. For quantitative, cohort, quasi-experimental, and cross-sectional studies, findings to be extracted were whether the educational intervention was effective in achieving the outcomes measured such as ED visits compared to the control. Finally, the themes gathered from the studies were synthesized to determine the overall effectiveness of asthma education in reducing healthcare utilization.

Data Analysis

The articles were screened repeatedly and readings of the extracted data in the literature review matrix was performed to enhance the process of developing sub-categories and to also

ensure rigor for the study. After reorganization of the studies into their study types, data from each type of study were compared to identify patterns, themes, or relationships. For example, results from qualitative studies were compared to arrive at common themes. After several themes were identified, a synthesis of the important elements or conclusions from each subgroup was performed. The synthesis allowed for a comprehensive understanding of the primary sources and helped the researcher draw conclusion regarding the research topic. The common themes that emerged were verified with the primary source data to ensure accuracy and rigor of the review process.

Figure 1. Literature search flow diagram



RESULTS

The literature reviewed examined asthma education in the community and schools directed towards Hispanic children and their parents or caregivers in both urban and rural areas. However, only one study addressed the issue in the San Joaquin Valley. The programs in the literature varied in the type of educational session conducted (community-based, school-based, home visits, or telephone calls), the length of the education (hours, days, or years), the type of personnel providing the education (nurses, CHWs, physicians, or lay persons), follow ups, and outcome measures. Some of the qualitative studies did not focus on education about managing asthma but were geared towards parental understanding of asthma.

The evidence indicates that asthma education delivered at multiple settings demonstrates a positive impact that is statistically significant in decreasing healthcare utilization and reducing asthma morbidity (Davis, Gordon, & Burns, 2011; Flores et al., 2009; Fox et al., 2007; Magzamen, Patel, Davis, Edelstein, & Tager, 2008; Postma, Smalley, Ybarra, & Kieckhefer, 2011; Woods et al., 2012). Educational programs that incorporated community health workers or *promotoras* helped to reduce asthma exacerbations and ED visits, and improve medication management (Flores et al., 2009; Martin, Mosnaim, Rojas, Hernandez, & Sadowski, 2011). Furthermore, parents expressed their interest in learning more about managing their children's asthma, medication administration, and reductions of triggers at home (Kueny et al., 2013; Lobar et al., 2008; Postma, Evans-Agnew, & Capouya, 2015). The articles appraised had multiple outcome indicators such as health care utilization, quality of life, missed school days, missed

parental work days, asthma symptoms, medication management and administration, and home environmental remediation.

Health Care Utilization

Most studies reviewed found that asthma education, delivered either in the community or in schools, led to significant reductions in health care utilization for Hispanic children. Flores et al. (2009) found that parents randomly assigned to asthma education with parental mentors showed significant reductions in rapid-breathing episodes, asthma exacerbations, and emergency department visits. High participants showed significant reduction in wheezing, asthma exacerbation, ED visits, and missed parental work days.

Furthermore, children who received basic asthma education even without the addition of telephone calls or case management experienced a statistically significant reduction in healthcare utilization. There were declines in hospitalizations (81%), hospital days (69%), emergency department visits (64%), and clinic visits (58%) (Karnick et al., 2007).

Community-based education was shown to reduce healthcare utilization. Children who were involved in the community-based education program Community Asthma Initiative showed significantly higher reduction in hospitalizations than similar children not in the program, from 51% before the intervention to 14% in the 1st year of the program and 8% in the 2nd and 3rd years (Bhaumik et al., 2013). Woods et al. (2012) also showed that the Community Asthma Initiative program led to significant reductions in asthma ED visits and hospitalizations.

The addition of home visits to community-based asthma education programs that used CHWs also led to significant decreases in ED visits and hospitalizations. Hispanic caregivers

from rural areas who were given asthma education through home visits showed statistically significant decreases in ED visits and hospitalizations after the intervention (Postma et al., 2011). The caregivers also demonstrated statistically significant improvement in their ability to manage the asthma medications and manage children's asthma at home by taking measures to reduce asthma triggers such as washing bedding in hot water and using dust covers on pillows and mattresses.

Education within community clinics was also shown to produce statistically significant decreases in healthcare utilization. Children from low-income rural areas in Fresno and Madera Counties of California who were enrolled in a community-based program conducted at community clinics had statistically significant reductions in hospitalizations, acute care visits for asthma exacerbations, ED visits, missed school days, frequent night time symptoms, and frequent use of rescue medications (Fox et al., 2007). The program demonstrated a direct proportional relationship between improvement in patient outcomes and compliance with demonstration components (Fox et al., 2007).

School-based asthma education was also linked to significant reduction in ED visits and hospitalizations if taught by a nurse who specialized in asthma management and education (Magzamen et al., 2008). Middle and high school students from an urban area who participated in the school-based asthma education program *Kickin' Asthma* experienced fewer activity limitations, nights of sleep disturbance, and emergency department visits or hospitalizations (Magzamen et al., 2008).

Economic Impact

Three studies examined the economic impact of community-based asthma education. Individualized asthma education of Hispanic children led to \$4,021/child/year cost savings whereas asthma education reinforced with case management led to \$4,503/child/year (Karnick et al., 2007).

Community-based education led to statistically significant reductions in per patient cost from ED visits and hospitalizations of \$1780 during Year 1, \$2305 during Year 2, and \$1873 during Year 3 compared to the nontreatment group; cost savings of the nontreatment group were \$436 in the 1st year, \$746 in the 2nd year, and \$1003 in the 3rd year (Bhaumik et al., 2013). Furthermore, the cost saving for the program for the 3 years studied were \$171,072, \$201,731, and \$148,385 (Bhaumik et al., 2013). The return on investment from decreased ED visits and hospitalizations was \$266,316 and the societal net gain was \$215,000 over the 3- year intervention period (Bhaumik et al., 2013).

Woods et al. (2012) showed that a community-based program led to savings of \$3827 per child over 2 years with a 1.46 return on investment due to reduced ED visits and hospitalizations. As these figures illustrate, asthma education not only decreases ED visits and hospitalizations, but also can lead to substantial cost savings.

Quality of Life

Asthma education, whether community-based or school-based, also led to reductions in the numbers of missed school days and missed parental work days, thereby improving quality of life. An asthma education through health fair geared towards Latino caregivers of children with

asthma showed that after 6 months of education, a statistically significant reduction in mean missed school days was seen (4.1 vs, 0.4, $p < 0.01$) (Riera et al., 2015). Other community-based asthma education also showed statistically significant reductions in missed school days and missed parental work days (Fox et al., 2007; Woods et al., 2012). School-based education targeted towards middle school and high school students in which the education was taught by a nurse specializing in asthma showed significant reductions in average number of missed school days during the course of a 3-year study (Magzamen et al., 2008).

Community Health Workers/Educational Partners

The incorporation into an asthma education program of CHWs who were culturally and linguistically competent helped Hispanic caregivers understand their children's asthma condition, medications, and management of asthma exacerbations. Statistically significant reductions in rapid breathing episodes, asthma exacerbations, and ED visits were found in children whose parents received asthma education with parental mentors (Flores et al., 2009). Reductions in missed parental work days and improvements in parental recognition of asthma exacerbations at home were greater when parental mentors were used during the asthma education (Flores et al., 2009).

Rashid et al. (2015) found that home visits with *promotoras* led to significantly greater retention of children involved in the community-based Breathmobile program compared to those who did not have *promotoras*. Children with one or more home visits from *promotoras* had threefold greater odds of remaining in the program for 6 months or longer (Riera et al., 2015).

Patients who stay in the program can be better educated about asthma management and better able to reduce their healthcare utilization.

Furthermore, home visits from CHWs helped improve Hispanic caregivers' home management of their children's asthma. Postma et al. (2011) found that home visits with CHWs helped rural Latino families improve home management of asthma as the parents were educated about reduction of triggers at home such as washing bedding in hot water and providing dust covers for pillow and mattresses. The reduction in environmental triggers at home helped reduce asthma exacerbation as well as ED visits and improved medication management.

Similarly, Lobar et al. (2008) found that asthma education using Asthma Amigos who conducted the education in Spanish helped caregivers understand the impact of asthma on their children's health. The Asthma Amigos presented them with statistics that motivated them to change their home environments to reduce asthma triggers.

Education with culturally and linguistically competent educators was shown to improve asthma medication knowledge. Martin et al. (2011) found that Mexican immigrant CHWs trained by Spanish-speaking physicians regarding asthma pathophysiology and medications in a 15-hour training course improved their knowledge about asthma medications. Therefore, training provided in the same language as the participants in the study helps improve educational knowledge about asthma and medication management.

Educational Topics to Address

Parents identified asthma signs and symptoms, disease management, trigger identification, exposure reduction, and proper use of asthma medications as topics they would

like to discuss and learn more about. Qualitative studies indicated that parents and caregivers are eager to learn more about their children's asthma condition but often lack the proper understanding about disease progression and treatment and management of exacerbations. As a result, EDs are over utilized. Parents reported a sense of helplessness and a lack of understanding about the disease process and the medication treatment regimen (Berg et al., 2007). This lack of understanding about asthma led some to turn to cultural folklore and praying to God when their children had asthma exacerbations and to seek ED care when the wheezing worsened (Coffey et al., 2012). The families perceived the ED as having more resources than primary care clinics (Coffey et al., 2012).

Furthermore, many parents did not understand the terms “wheezing” and “whistling” because they are translated differently in Spanish (Bialostozky & Barkin, 2012). This inability to understand the terms resulted in the parents also not understanding the term “asthma attack”; they thought “attack” referred to the severity of a specific episode instead of its frequency (Bialostozky & Barkin, 2012).

Additionally, parents expressed the need for information about medications and their administration. Fisher et al. (2011) found that 79.3% of caregivers were unclear about what steps to take if asthma medication was not working properly when their children were having an asthma attack. Additionally, only approximately 50% of the patients had successfully filled their prescriptions (Fisher-Owens et al., 2011). Researchers in a cohort study found a statistically significant improvement in knowledge about proper asthma medication administration techniques, from 25% at pretest to posttest of 69% ($p < 0.01$), when education was delivered by

Spanish-speaking physicians to Mexican immigrant CHWs (Martin et al., 2011). Although the participants were CHWs, they were Mexican immigrants who had little knowledge about asthma medication administration techniques. The Martin et al. (2011) study showed that education from healthcare providers about asthma medication can significantly improve knowledge. Employing proper medication administration techniques helps reduce healthcare utilization as parents are able to use the medication properly during an asthma exacerbation. Furthermore, when caregivers were educated about medication administration and asthma action plans, the result was improvement in the caregiver quality of life, lower numbers of missed school days, and increased routine use of peak flow meters (Riera et al., 2015).

Parents and caregivers recognize barriers to managing their children's asthma and seek to reduce environmental triggers in the home to decrease asthma exacerbations. Kueny et al. (2013) found that Hispanic caregivers recognized that environmental conditions in the home can trigger their children's asthma. They saw that overcrowded housing, smoking inside the home, and bringing dust or pollution from work into the home can worsen their children's condition. However, the information parents received from their healthcare providers sometimes conflicted with their cultural traditions. They didn't understand how stuffed animals, pets, blankets, cockroaches, or playing in the grass can worsen their children's asthma (Kueny et al., 2013). Nevertheless, parents actively sought out asthma education so they could learn how to reduce and eliminate triggers in the home. The parents took small steps such as switching from curtains to blinds, getting rid of stuffed animals, washing bedding, and not smoking inside the house (Kueny et al., 2013).

Another study indicated that identifying the triggers at home and reducing them were primary or secondary concerns of parents (Postma et al., 2015). Through photos of items in and around the homes, mothers were able to show which environmental triggers they were concerned about. They identified asthma triggers such as pollen, dander, dust, mold and mildew, cigarette smoke, and sawdust. Minimizing environmental triggers and optimizing indoor air quality by keeping the house properly ventilated, regularly changing furnace filters, and keeping carpets clean by not bringing shoes into the house were prominent components of care found in the study (Postma et al., 2015).

The studies reviewed show that parents are receptive to learning about their children's asthma, their medication regimens, strategies for eliminating environmental triggers, what to do when their children have an asthma exacerbation, and when to take their children to the PCP or ED.

Components of the Educational Program

Home visits with or without culturally and linguistically competent CHWs such as *promotoras* or parental mentors were found to help families improve their understanding of their children's asthma condition, decrease the number of asthma exacerbations by increasing knowledge about potential home triggers, and improve asthma inhaler administration techniques (Fox et al., 2007; Horner & Brown, 2014; Postma et al., 2011; Rashid, Carcel, Morphew, Amaro, & Galant, 2015; Riera et al., 2015; Woods et al., 2012). These positive results helped decrease healthcare utilization. The addition of follow-up telephone calls after clinic visits helped

improve follow-up visits with the healthcare provider as well as answer questions about medication administration and prescription refills (Fisher-Owens et al., 2011).

Furthermore, asthma education received from a nurse specializing in asthma in both community-based and school-based settings led to better symptom management, better medication administration techniques, reduction of environmental triggers at home, and reduction in missed school days. In addition, the education helped create a better relationship between parents and healthcare providers (Kintner et al., 2015; Magzamen et al., 2008; Peterson-Sweeney et al., 2007; Wyatt & Hauenstein, 2008).

The incorporation of healthcare providers in asthma education was shown to be essential in helping to decrease healthcare utilization. Parents who received education from their healthcare providers had increased knowledge about asthma and a better attitude about asthma medication use, which helped to bring the parent's understanding closer to the professional model of asthma and improved the parent's relationship with the provider (Peterson-Sweeney et al., 2007). Collaboration between healthcare provider and families also helped parents know when to take a child to the ED or clinic. Families understood the components of an asthma exacerbation, developed asthma action plans, and knew when to take their children to the clinic instead of the ED (Coffey, Cloutier, Meadows-Oliver, & Terrazos, 2012). As a result, parents had more confidence in managing their children's condition and utilized the ED only when they could not manage the asthma exacerbation effectively.

Children need to be involved in the education in addition to the caregivers. Participation of both parents and children in the educational program helps improve cooperation in reducing

environmental triggers at home such as removing stuffed animals, not allowing pets indoors, and eating in a healthier manner (Kueny et al., 2013; Postma et al., 2015). Caregiver and child participation is important in the adoption of effective asthma self-care behaviors such as symptom management techniques, prevention methods such as using pillow covers, watchful monitoring for stimuli and symptoms, and proper use of medications as prescribed (Kintner et al., 2015).

Children who received asthma education in the schools were able to have greater number of undisturbed nights of sleep and decreased healthcare utilization, and their caregivers had improved quality of life. The children also had significant increased asthma knowledge and attitude scores between pretest and posttest (Wyatt & Hauenstein, 2008). When a school-based asthma curriculum was led by a nurse or healthcare provider and given to middle school and high school children, there was significant reduction in ED visits or hospitalizations, physician visits, and average missed school days (Magzamen et al., 2008). There was also significant improvement of asthma symptoms and medication administration techniques such as use of a spacer and peak flow meters (Magzamen et al., 2008). Furthermore, children who received asthma education at school understood their condition better and were open to talk to their healthcare provider about their condition (Bruzzese et al., 2011). Additionally, students who were not formally diagnosed with asthma became more aware of their symptoms, which led to a statistically significantly greater proportion of students being diagnosed, being prescribed medications, and seeking care from a healthcare provider (Bruzzese et al., 2011).

Overall, the studies showed that asthma education is effective in decreasing healthcare utilization, missed school days, and missed parental work days, thus leading to increased quality of life for both children and caregivers. The use of cultural and linguistically competent healthcare workers in the educational program is helpful. Parents are receptive to the education and want to learn more about how to reduce asthma exacerbations in their children. Healthcare providers need to take time to educate children and parents so they are knowledgeable about what to do during an asthma exacerbation and develop an asthma action plan.

DISCUSSION

In the United States, asthma affects more than 6.6 million children ("Vital signs: asthma prevalence, disease characteristics, and self-management education: United States, 2001--2009," 2011). Among Hispanic children, asthma is highest among Puerto Ricans (16.1%) and lowest in Mexican Americans (5.4%); however, Mexicans who were born in the United States have a higher risk of asthma than those born in Mexico (Rosser, Forno, Cooper, & Celedon, 2014). The prevalence of asthma in children in the state of California is highest in the San Joaquin Valley; Latino children in Fresno County are hospitalized at a rate of 289 per 100,000 residents (Casarez, 2012). The high incidence of Hispanic children affected by asthma can be attributed to their disproportionately lower income, higher ER visits and hospitalizations, and lack of communication with physicians and understanding regarding physician's instructions (Schwartz & Pepper, 2009). Therefore, awareness of various aspects of asthma through education can help decrease healthcare utilization and reduce the health disparity between Hispanic families and others.

In this study, an integrative review of literature described how asthma education in school, community, and healthcare provider settings can decrease healthcare utilization such as ED visits and improve quality of life for both children and caregivers. The review examined economic impact of asthma education, components needed for an effective education program, and educational topics that need to be addressed with families.

The evidence in this review reinforces the potential of asthma education in community, school, or healthcare settings as effective in reducing healthcare utilization such as ED visits and

hospitalizations. Key findings include statistically significant reductions in ED visits and hospitalizations, improved quality of life through decreased number of missed school and missed parental work days, and increased cost savings and societal net economic gain. Furthermore, the use of culturally competent health educators and case management from nurses specializing in asthma reinforces the educational information and allows for better adoption of the learning at home and better management of children's asthma. Additionally, the qualitative studies showed that parents were eager to participate in educational programs and learn about their children's asthma. Parents expressed a willingness to make changes in their homes to reduce environmental triggers and wanted more communication with their healthcare professional regarding asthma medication administration and steps to take during an asthma exacerbation. The results of this study indicate the importance of asthma education in reducing healthcare utilization and helping to eliminate health disparities for Hispanic families and others.

The literature reviewed demonstrated that asthma education resulted in statistically significant reductions in healthcare utilization. This suggest that asthma education in any type of setting, whether in the community, in schools, or in the healthcare provider's office, is helpful in reducing ED visits and hospitalizations. Cost analyses of more than one asthma education program indicated statistically significant reductions in per-patient costs from reduced ED visits and hospitalizations and increased cost savings per patient as the education progressed through the years (Bhaumik et al., 2013; Karnick et al., 2007). Furthermore, education resulted in increased quality of life for both children and parents as reflected in decreased missed school

days and fewer missed parental work days from a reduction in healthcare utilization (Riera et al., 2015; Woods et al., 2012).

One of the most surprising findings of the integrative review was the impact of culturally and linguistically competent CHWs or parental mentors. The incorporation of these CHWs in either community education or home visitation programs improved retention in the educational program, improved clinician-to-parent interaction, and enabled Hispanic caregivers to better understand their children's asthma condition (Berg, Anderson, Tichacek, Tomizh, & Rachelefsky, 2007; Rashid et al., 2015). The CHWs helped parents better recognize asthma exacerbations in the home and improve medication administration, which reduced ED visits and missed parental work days (Flores et al., 2009).

One factor that could have influenced these results is that parents were more comfortable speaking to someone from the same cultural and linguistic background. Hispanic parents often expressed a need for collaboration between themselves and their healthcare provider regarding steps to take during an asthma exacerbation, such as the symptoms to look for, how to administer the medications properly, and when to take the child to the ED (Coffey et al., 2012). Indeed, parents whose primary language was Spanish were less likely to communicate with their healthcare provider about disease management, when to use the emergency department, administration of medications during an attack, and developing a written asthma action plan (Claudio & Stingone, 2009). Use of culturally competent CHWs can help bridge the communication gap, eliminating cultural and linguistic barriers between parents and healthcare providers.

Furthermore, asthma education programs that incorporated home visitation were effective in decreasing healthcare utilization, improve medication management, reducing environmental triggers in the home, and helping parents control their children's asthma (Fox et al., 2007; Postma et al., 2011; Woods et al., 2012). In an integrative review of home-based asthma education, Giese (2018) found that home-based asthma programs were both beneficial and cost effective for children with poorly controlled asthma. They led to reductions in healthcare utilization with significant decreases in ED visits, use of urgent care, and acute visits after implementation of the intervention. Giese (2018) also found that home-based education that incorporated multiple components such as environmental assessments and remediation, social services, and care coordination were more effective in decreasing symptom days, school absenteeism, and acute asthma visits. Furthermore, some studies showed that having only one educational component in the home-based programs was not as effective as having multiple components (Giese, 2018). Therefore, asthma education should include multiple components such as use of culturally competent workers, telephone case management, interdisciplinary care coordination with involvement of the healthcare provider, and various educational setting venues to help reinforce the education for the parents and children.

Hispanic parents' and caregivers' eagerness to learn more about their children's asthma and their willingness to reduce environmental home triggers shows that asthma education is important and necessary. Parents articulated a desire to communicate with their healthcare provider regarding asthma symptoms and medication management (Bruzzese et al., 2011). When unable to effectively communicate with a healthcare provider regarding their concerns, the

parents felt a sense of hopelessness regarding management of their children's asthma. Indeed, Hispanic children from lower-income families experienced higher morbidity from asthma due to cultural and linguistic barriers between families and healthcare providers (Rashid et al., 2015). This lack of communication led parents to misunderstand the terms "wheezing" and "attack." Consequently, parents were unaware of the signs and symptoms during an asthma attack, which led them to not have an asthma action plan and brought them to the ED as their only resource instead of calling the PCP or the clinic.

Parents expressed a desire to learn about other topics as well, such as medication knowledge and administration and identifying and reducing environmental triggers at home. This desire to learn shows that parents want to be active participants in managing their children's asthma. In the qualitative studies, parents were able to recognize barriers to their children's asthma and sought to improve their environmental conditions at home by removing pets from the house, washing bedding, and not smoking inside the home (Kueny et al., 2013). It is evident from the literature that parents want to be educated about their children's asthma and will take necessary steps to make sure their children's health conditions improve.

Most importantly, the evidence from this study suggests that interdisciplinary care coordination is needed to reduce healthcare utilization. The incorporation of multiple components in asthma education, such as home visits from culturally and linguistically competent community health workers or *promotoras*, case management with a nurse specializing in asthma in both community-based and school-based settings with telephone follow-up after each visit, collaboration with the healthcare provider, environmental and self-management

education, social services, a needs assessment, and environmental assessments and remediation are important parts of any program to effectively reduce healthcare utilization.

Javenic et al. (2016) found that African American and Latino pediatric patients with poorly controlled asthma who participated in an asthma care coordination program had 2.2 fewer symptom days per month ($p < 0.01$) and 1.9 fewer symptom night per month ($p < 0.01$). There were also reductions in the number of ED visits. The asthma care coordination program consisted of asthma education including asthma action plans and trigger remediation; a team of various professionals such as nurses, health educators, and CHWs; and home visits to assess triggers and address social and environmental barriers in asthma management in neighborhoods, schools, outpatient clinics, and federally qualified health centers. This study demonstrates that asthma education that is interdisciplinary, multi-component, and administered in various settings can be effective in reducing asthma symptoms and healthcare utilizations.

Implications for Practice

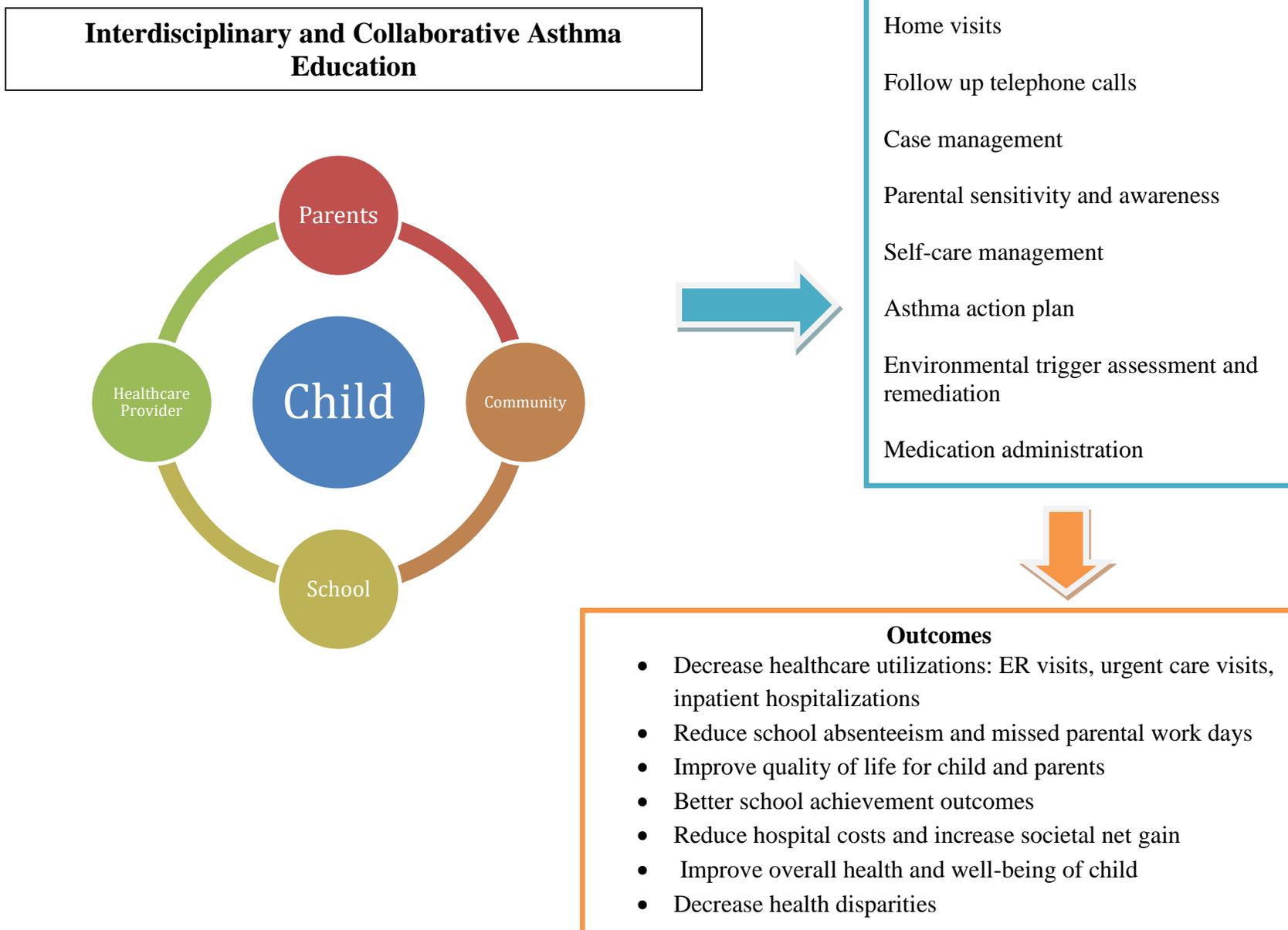
The evidence from this integrative review suggests that asthma education in community, school, or clinic setting is effective in reducing healthcare utilization. Schools can incorporate asthma education as part of their curriculum or after-school programs. Programs for low-income families such as Early Head Start or ProYouth Heart can hold asthma educational sessions for children and their parents. These sessions should include general asthma education and opportunities for face-to-face discussion or individualized components. The individualized components with support personnel can help families develop written asthma action plans and train parents to easily recognize the signs and symptoms of an impending asthma attack. School

teachers, staff, and nurses can participate in the educational program so they can recognize symptoms early and help manage asthma exacerbations when they occur in school. Developing teacher and school staff awareness and abilities can minimize the frequency of attacks and reduce school absenteeism (Davis et al., 2011).

In the community setting, community resource programs can partner with schools, nonprofit organization, government agencies, and healthcare facilities to promote asthma education. Public health outreach programs can target low-income Hispanic families and children.

Most importantly, an asthma educational program should incorporate a comprehensive, interdisciplinary, multi-faceted, and multi-modal approach (Figure 2). In this way, children and parents receive consistent information and the education is reinforced. Furthermore, this type of program enables parents to receive additional education and support so they can become sensitized caregivers in order to easily recognize and respond to their children's asthma exacerbations (Davis et al., 2011).

Figure 2. Interdisciplinary and Collaborative Asthma Education



The incorporation of culturally and linguistically competent CHWs is also important. The educational program should use these personnel during every clinic visit related to a child's asthma. Additionally, these personnel can help with follow-up care in home visits and case management. After each clinic visit, parents should receive a follow-up telephone call or home visit to address further questions the parents might have and to determine if there were any problems obtaining medications. Furthermore, in addition to basic asthma knowledge, the education should include information about environmental and self-management strategies for parents and children, avoidance of triggers, home remediation strategies, and asthma treatments. A multi-faceted asthma education and care coordination informs parents so they are better able to manage their children's condition and reduce the number of ED visits.

Asthma educational intervention is a prevention measure that can reduce healthcare utilization, improve the quality of life for families, and decrease the economic impact of asthma. Asthma education is tertiary prevention. It not only reduces ED visits, inpatient hospitalizations, and school absenteeism; it also reduces parental missed work days, making parents better able to support their children by working more, providing a better living condition, and eliminating environmental triggers in the home. Changing current practices by incorporating asthma education interventions decreases healthcare utilization, reduces the economic impact of asthma exacerbations and hospitalizations, and improves the quality of life for children and parents.

Implications for Education

As previously mentioned, asthma education can be integrated into the community, school, and healthcare provider settings. An important aspect of the education is developing an

asthma action plan so parents and children know the steps to take during an exacerbation.

Collaboration between the primary healthcare provider and the family enrolled in the educational program is necessary. Parents expressed a need for collaboration to help them develop an asthma action plan that included when to seek the ED or clinic during an asthma exacerbation (Coffey et al., 2012). CHWs also need to be educated on asthma management so they can give correct information to parents and children. In the San Joaquin Valley, asthma education should entail discussion of air pollution and air quality. Although an air quality index exists that informs people about the condition of the outside air, not many people know what it means or how to interpret it. Providing education about air pollution and explaining how it affects a child's asthma helps parents and children know when to avoid going outside during the summer and winter months when the air quality is poor. This knowledge can help reduce asthma exacerbations and ED visits.

Implications for Policy

As the rate of childhood asthma increases and the burden disproportionately falls on low-income and minority communities, policies need to change so health disparities do not continue to widen. An important policy implication is the need for funding, resources, and staff for asthma education in schools. Incorporating staff, school nurses, and teachers in asthma education enables children to obtain the vital education at a young age and learn to effectively manage their condition as they get older.

Home visitation programs also need increased funding. Currently, healthy homes asthma visitation programs are funded by grants that vary year to year (Giese, 2018). The available

interventions vary in intensity, duration, providers, outcomes, and results (Giese, 2018).

Therefore, having reliable funding for home visitation programs can keep asthma education consistent. Findings from this study suggest that home visitation programs are particularly effective in reducing asthma symptoms, improving asthma management, and decreasing healthcare utilization and inpatient stays. As part of the home visitation interventions, environmental home assessments can be included that provide education in trigger reduction and offer resource materials such as free air filters for the homes and new bedding and pillow covers.

Findings in this study showed that asthma education was able to decrease hospital costs and increase societal net gain over a 3-year period (Bhaumik et al., 2013; Karnick et al., 2007; Woods et al., 2012). As ED visits and inpatient hospitalizations for asthma decrease, reimbursement rates for hospitals and clinics should increase. The increase in available funds should be put towards care coordination with interdisciplinary collaboration and case management through culturally and linguistically appropriate staff. Increased funding should increase access to asthma educational resources in multiple settings from appropriately trained personnel so that parents and children receive education about asthma symptoms, use of medications, home or environmental triggers, and preventative measures.

Recommendations for Future Research

It was very difficult to find studies specifically tailored towards Hispanic children and parents in the San Joaquin Valley. Only one study incorporated samples from the San Joaquin Valley. Even that study examined only two clinics from Fresno and Madera (Fox et al., 2007). Most of the studies investigated children and parents in urban settings such as Oakland and Los

Angeles. A challenge for future research is to see whether Hispanic children and parents in the San Joaquin Valley have high healthcare utilization and what educational interventions are being taught to them compared to what is offered to people living in urban areas. Additional research should also investigate whether QOL improves for children and parents when they transition to better housing conditions and reduce environmental triggers at home. The cost effectiveness of using culturally and linguistically competent CHWs should also be evaluated. Understanding the cost effectiveness of CHWs is essential to obtaining funding and resources for community- and home-based educational programs. More research needs to be done on the effects of home visits and school-based asthma education so policies can be approved and grant funding obtained for effective programs.

Limitations of the Study

This integrative review encompassed a broad range of literature from many different journals. The findings are subject to limitations. First, a convenience sampling was used; if a study included Hispanics or Latinos in its sample, it was included. Although the qualitative studies reviewed contained mostly Hispanic participants, the RCTs and quasi-experimental studies did not have primarily Hispanic participants. Some of the studies included other ethnicities such as African Americans. Finding RCT studies that focused on Hispanic children and parents was challenging. Most of the settings in the studies were urban, so the study populations may not be representative of the Hispanic populations in some cities of the San Joaquin Valley.

Second, the participants in most of the studies of school-based asthma education were students in junior high or high school. As a result, additional research is needed that looks at younger school-aged children, such as those ages 5 to 8 years, and explores their understanding of asthma symptoms and management.

Third, the final number of 22 studies included in this research was very small. Although the articles underwent quality appraisal using the CASP appraisal tool to determine the rigor and validity of each study, time constraints limited the research to studies with high appraisal scores. Additionally, the studies themselves had small sample sizes, particularly the qualitative studies. Furthermore, the studies did not provide sufficient information on the Hispanic children. Mexican Americans born in the United States have a higher risk of developing asthma than those born in Mexico (Rosser et al., 2014). Further research is needed to determine whether the effects of asthma education is the same for first- and second-generation Hispanic children with asthma.

Fourth, some of the educational interventions, particularly in the qualitative studies, were conducted only one time. Failure to repeat the intervention affected the reliability of the studies and the ability to replicate them. Some of the studies had no control group because of the experimental design. Some of the studies lacked rigor and some of the RCTs were of insufficient length. However, despite these limitations, the studies were helpful in demonstrating the effect of asthma education in decreasing healthcare utilization.

Fifth, only one appraisal tool was used to determine the reliability and validity of the studies reviewed. Other tools were available. Studies that were not RCTs could have been evaluated using the Transparent Reporting of Evaluations with Nonrandomized Designs

(TREND). The case studies could have been evaluated using the Consensus Standard for the Reporting of Organizational Case Studies. The observational studies could have been evaluated using Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist. However, using separate appraisal tools could lead to the inability to compare between different study types and therefore create even more questions regarding reliability and validity of the studies.

Although the participants and the settings in many of the studies reviewed do not reflect the Hispanic parents and children with asthma in the San Joaquin Valley, the findings are still relevant for the current research. The positive effects of the educational interventions, the feelings of the parents, and the topics covered in the interventions are applicable.

CONCLUSION

Asthma education that is interdisciplinary, multi-modal, and collaborative among children, parents or caregivers, healthcare providers, schools, and communities has the potential to reduce asthma-related healthcare utilizations. Asthma education programs that incorporate home visits with environmental remediation, utilize culturally and linguistically competent healthcare workers, include case management with nurses and follow up telephone calls, provides continual involvement between parents and healthcare providers, and enables parents to develop asthma action plans can reduce asthma exacerbations and potentially be cost effective. Furthermore, asthma education can improve quality of life for both parents and children, decreasing school absenteeism and missed parental work days. However, as the burden of asthma among low-income Hispanic children grows, healthcare disparities will continue to widen, especially in the San Joaquin Valley. Therefore, implementation of an asthma educational program in the community, schools, and clinics can be a step towards improving the health status of children. As that step is taken, asthma-related healthcare utilization is likely to decrease.

REFERENCES

- American Lung Association. (2016). *State of the air*. Retrieved from <http://www.lung.org/local-content/california/documents/state-of-the-air/2016/sota-2016-full-report.pdf>.
- Anderson, B. (2015, April 11). Chronic diseases take their toll among central San Joaquin Valley residents. *Fresno Bee*. Retrieved from <http://www.fresnobee.com/news/local/article19648839.html>
- Archibald, M. M., Caine, V., Ali, S., Hartling, L., & Scott, S. D. (2015). What is left unsaid: An interpretive description of the information needs of parents of children with asthma. *Research in Nursing & Health*, 38(1), 19.
- Berg, J., Anderson, N. L., Tichacek, M. J., Tomizh, A. C., & Rachelefsky, G. (2007). One gets so afraid: Latino families and asthma management—an exploratory study. *Journal of Pediatric Health Care*, 21(6), 361-371. doi:10.1016/j.pedhc.2006.08.004
- Bhaumik, U., Norris, K., Charron, G., Walker, S. P., Sommer, S. J., Chan, E., . . . Woods, E. R. (2013). A cost analysis for a community-based case management intervention program for pediatric asthma. *Journal of Asthma*, 50(3), 310-317. doi:10.3109/02770903.2013.765447
- Bialostozky, A., & Barkin, S. L. (2012). Understanding sibilancias (wheezing) among Mexican American parents. *Journal of Asthma*, 49(4), 366-371. doi:10.3109/02770903.2012.660298
- Bruzzese, J. M., Kingston, S., Sheares, B. J., Cespedes, A., Sadeghi, H., & Evans, D. (2011). Feasibility and preliminary outcomes of a school-based intervention for inner-city, ethnic

- minority adolescents with undiagnosed asthma. *Patient Education and Counseling*, 85(2), 290-294. doi:10.1016/j.pec.2010.09.019
- Canino, G., Koinis-Mitchell, D., Ortega, A. N., McQuaid, E. L., Fritz, G. K., & Alegria, M. (2006). Asthma disparities in the prevalence, morbidity, and treatment of Latino children. *Social Science and Medicine*, 63(11), 2926-2937. doi:10.1016/j.socscimed.2006.07.017
- Casarez, D. (2012, June 19). Latinos lack asthma info. *Vida en el Valle*. Retrieved from <https://www.vidaenelvalle.com/news/article28129765.html>
- Centers for Disease Control and Prevention. (2011). Vital signs: Asthma prevalence, disease characteristics, and self-management education: United States, 2001-2009. *MMWR Morbidity and Mortality Weekly Report*, 60(17), 547-552.
- Claudio, L., & Stingone, J. A. (2009). Primary household language and asthma care among Latino children. *Journal of Health Care for the Poor and Underserved*, 20(3), 766-779. doi:10.1353/hpu.0.0164
- Coffey, J., Cloutier, M., Meadows-Oliver, M., & Terrazos, C. (2012). Puerto Rican families' experiences of asthma and use of the emergency department for asthma care. *Journal of Pediatric Health Care*, 26(5), 356-363. doi:10.1016/j.pedhc.2011.01.006
- Davis, D. W., Gordon, M. K., & Burns, B. M. (2011). Educational interventions for childhood asthma: A review and integrative model for preschoolers from low-income families. *Pediatric Nursing*, 37(1), 31-38.
- Everhart, R. S., Fedele, D. A., Miadich, S. A., & Koinis-Mitchell, D. (2015). Caregiver quality of life in pediatric asthma: Associations with beliefs and concerns about medications and

- emergency department use. *Clinical Pediatrics*, 54(3), 249.
- Fisher-Owens, S. A., Boddupalli, G., & Thyne, S. M. (2011). Telephone case management for asthma: An acceptable and effective intervention within a diverse pediatric population. *Journal of Asthma*, 48(2), 156-161. doi:10.3109/02770903.2011.554938
- Flores, G., Bridon, C., Torres, S., Perez, R., Walter, T., Brotanek, J., . . . Tomany-Korman, S. (2009). Improving asthma outcomes in minority children: A randomized, controlled trial of parent mentors. *Pediatrics*, 124(6), 1522-1532. doi:10.1542/peds.2009-0230
- Fox, P., Porter, P. G., Lob, S. H., Boer, J. H., Rocha, D. A., & Adelson, J. W. (2007). Improving asthma-related health outcomes among low-income, multiethnic, school-aged children: Results of a demonstration project that combined continuous quality improvement and community health worker strategies. *Pediatrics*, 120(4), e902-911. doi:10.1542/peds.2006-1805
- Giese, J. K. (2018). Evidence-based pediatric asthma interventions and outcome measures in a healthy homes program: An integrative review. *Journal of Asthma*, 1-12. doi:10.1080/02770903.2018.1472279
- Hispanic. (n.d.). *Merriam Webster's online dictionary*. Retrieved from <https://www.merriam-webster.com/dictionary/Hispanic>
- Horner, S. D., & Brown, A. (2014). Evaluating the effect of an asthma self-management intervention for rural families. *Journal of Asthma*, 51(2), 168-177. doi:10.3109/02770903.2013.855785
- Janevic, M. R., Stoll, S., Wilkin, M., Song, P. X. K., Baptist, A., Lara, M., . . . Malveaux, F. J.

- (2016). Pediatric asthma care coordination in underserved communities: A quasiexperimental study. *American Journal of Public Health, 106*(11), 2012-2018.
doi:10.2105/AJPH.2016.303373
- Karnick, P., Margellos-Anast, H., Seals, G., Whitman, S., Aljadeff, G., & Johnson, D. (2007). The pediatric asthma intervention: A comprehensive cost-effective approach to asthma management in a disadvantaged inner-city community. *Journal of Asthma, 44*(1), 39-44.
doi:10.1080/02770900601125391
- Kintner, E. K., Cook, G., Marti, C. N., Allen, A., Stoddard, D., Harmon, P., . . . Van Egeren, L. A. (2015). Effectiveness of a school- and community-based academic asthma health education program on use of effective asthma self-care behaviors in older school-age students. *Journal for Specialists in Pediatric Nursing, 20*(1), 62-75.
doi:10.1111/jspn.12099
- Kueny, A., Berg, J., Chowdhury, Y., & Anderson, N. (2013). Poquito a poquito: How Latino families with children who have asthma make changes in their home. *Journal of Pediatric Health Care, 27*(1), e1-11. doi:10.1016/j.pedhc.2011.02.007
- Lobar, S., Brooten, D., Youngblut, J. M., Hernandez, L., Herrera-Perdigon, J., Royal, S., & Robins, C. (2008). The experience of being an Asthma Amigo in a program to decrease asthma episodes in Hispanic children. *Journal of Pediatric Nursing, 23*(5), 364-371.
doi:10.1016/j.pedn.2007.12.005
- Magzamen, S., Patel, B., Davis, A., Edelstein, J., & Tager, I. B. (2008). Kickin' asthma: School-based asthma education in an urban community. *Journal of School Health, 78*(12), 655-

665. doi:10.1111/j.1746-1561.2008.00362.x

Martin, M. A., Mosnaim, G. S., Rojas, D., Hernandez, O., & Sadowski, L. S. (2011). Evaluation of an asthma medication training program for immigrant Mexican community health workers. *Progress in Community Health Partnerships*, 5(1), 95-103.

doi:10.1353/cpr.2011.0004

Peterson-Sweeney, K., McMullen, A., Yoos, H. L., Kitzmann, H., Halterman, J. S., Arcoleo, K. S., & Anson, E. (2007). Impact of asthma education received from health care providers on parental illness representation in childhood asthma. *Research in Nursing and Health*, 30(2), 203-212. doi:10.1002/nur.20182

Polit, D.F. and Beck, C.T. (2017). *Nursing Research: Generating and Assessing Evidence for Nursing Practice* (10th Edition). Philadelphia, PA: Wolters Kluwer.

Postma, J. M., Evans-Agnew, R., & Capouya, J. (2015). Mexican-American caregivers' perceptions about asthma management: A photovoice study. *Journal of Asthma*, 52(6), 593-599. doi:10.3109/02770903.2014.996651

Postma, J. M., Smalley, K., Ybarra, V., & Kieckhefer, G. (2011). The feasibility and acceptability of a home-visitation, asthma education program in a rural, Latino/a population. *Journal of Asthma*, 48(2), 139-146. doi:10.3109/02770903.2010.529221

Rashid, S., Carcel, C., Morphew, T., Amaro, S., & Galant, S. (2015). Effectiveness of a promotora home visitation program for underserved Hispanic children with asthma. *Journal of Asthma*, 52(5), 478-484. doi:10.3109/02770903.2014.986738

Riera, A., Ocasio, A., Goncalves, P., Krumeich, L., Katz, K. H., Trevino, S., & Vaca, F. E.

- (2015). Findings from a community-based asthma education fair for Latino caregivers. *Journal of Asthma*, 52(1), 71-80. doi:10.3109/02770903.2014.944982
- Rosser, F. J., Forno, E., Cooper, P. J., & Celedon, J. C. (2014). Asthma in Hispanics: An 8-year update. *American Journal of Respiratory and Critical Care Medicine*, 189(11), 1316-1327. doi:10.1164/rccm.201401-0186PP
- Schwartz, N. A., & Pepper, D. (2009). Childhood asthma, air quality, and social suffering among Mexican Americans in California's San Joaquin Valley: "Nobody talks to us here." *Medical Anthropology*, 28(4), 336-367. doi:10.1080/01459740903303944
- Tulare County Health and Human Services Agency. (2017). *2017 Community Health Assessment*. Retrieved from [https://tchhsa.org/eng/assets/File/Public%20Health/Tulare%20County%20CHA%20\(2017_03_28\)%20FINAL.pdf](https://tchhsa.org/eng/assets/File/Public%20Health/Tulare%20County%20CHA%20(2017_03_28)%20FINAL.pdf)
- Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52(5), 546-553. doi:10.1111/j.1365-2648.2005.03621.x
- Woods, E. R., Bhaumik, U., Sommer, S. J., Ziniel, S. I., Kessler, A. J., Chan, E., . . . Nethersole, S. (2012). Community Asthma Initiative: Evaluation of a quality improvement program for comprehensive asthma care. *Pediatrics*, 129(3), 465-472. doi:10.1542/peds.2010-3472.
- Wyatt, T. H., & Hauenstein, E. J. (2008). Pilot testing *Okay with Asthma*: An online asthma intervention for school-age children. *Journal of School Nursing*, 24(3), 145-150. doi:10.1177/1059840522334455

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ABSTRACT

Asthma is a chronic pediatric condition that affects nearly 7 million children and accounts for approximately 750,000 emergency department (ED) visits per year. In the San Joaquin Valley (SJV), 1 in 6 or 105,000 children have asthma. The worsening air pollution in most of the counties in the Valley accounts for having the highest rate of asthma in the nation. Prevalence of asthma in Hispanics or Latinos are higher and with increased ED visits compared to non-Hispanic children. The proposed study is integrative literature review of the literature regarding asthma education in Hispanic children and the effectiveness of the programs in reducing healthcare utilizations (ED visits and/or hospitalizations) so that they can be implemented in the SJV.

INTRODUCTION

In California, approximately 5.2 million people have asthma. ED visits and hospitalizations from asthma cost Fresno patients and insurers approximately \$35 million/year, and with school absenteeism and missed parental work days the cost is at \$87 million/year. Most Hispanic/Latino residents in SJV are lower income, experience lower quality of health services, and face linguistic barriers with healthcare providers. Asthma education in schools, communities, and healthcare settings that is culturally and linguistically appropriate is necessary but is sparsely available in the SJV.

PICO

Population: Hispanic/Latino children age 0-18 years old
Intervention: Asthma education
Comparison: No comparison
Outcome: Reduced number of health care utilizations (ED visits, hospitalizations, hospital days, and clinic visits)

Do children who receive asthma education have reduced number of health care utilizations?

CIRCLE of SUPPORT



AAA American Academy of Allergy Asthma & Immunology

Health Care Service	Hispanic Children With Asthma (%)	Low-Income Children With Asthma (0%-199% federal poverty level) (%)
	<i>n</i> = 149	<i>n</i> = 122
Takes daily medication for asthma control	53.4*	49.4*
ER visit in the past 12 months because of asthma	58.5*	48.7*
Hospitalizations in past 12 months because of asthma	79.7	
Number of doctor visits in the past 12 months		
0-3 visits	24.3*	39*
4-25+ visits	60.7*	61*

Note. For low-income population, spaces with no data are because a cell is statistically unstable (estimates are not stable). An unstable cell has not met the intended number of responses needed (e.g., five per cell). CHS strongly recommends reporting any figure of this nature.

*Pearson χ^2 , $p < .05$.

Table 1. Utilization of Health Care Services Among California's Hispanic Children with Asthma, Ages 1-5 Years. (Source: Wright and Newman-Giger 2010).

MATERIALS AND METHODS

An integrative review using Whittemore and Knafl (2005) methodology was used to evaluate and synthesize the literature. Data bases such as Pubmed, MEDLINE, CINAHL, Cochrane Review, and Google Scholar were used to retrieve research studies with key words such as “pediatric asthma”, “Hispanics or Latino”, and “ED visits”. Ancestry research was also used. Inclusion criteria were papers published from January 2007-December 2017, done either in urban cities or rural areas in the U.S., and where the majority of the samples were Hispanic/Latinos. Exclusion criteria included papers older than 2007, participants or subjects were not majority Hispanics or Latinos, and studies that took place in other countries such as Canada or the UK. The Critical Appraisal Skills Programme (CASP) appraisal tool was used to determine validity, rigor, and applicability each study. Each research article was also evaluated based on the level of evidence according to the study design used. A literature matrix was constructed to help organize the literature. Data comparison among each of the different studies were examined to identify patterns, themes, or relationships. After several themes were gathered, a synthesis of the important elements or conclusions of each subgroup was performed. The synthesis allows for a comprehensive understanding of the primary sources and to draw conclusions regarding the research topic in question.

RESULTS

- Asthma education (community or school) leads to statistically significant decreased ED visits and hospitalizations, increased yearly net savings, reduced hospital costs, decreased missed school and caregiver missed work days
- Community based education using culturally competent community health workers (CHWs) improves medication knowledge, increases competence of medication use, and enhances quality of life (QOL) for both parents and children.
- Families or caregivers expressed inability to manage child's asthma due to: 1.) lack of knowledge regarding asthma severity and disease process; 2.) barriers to changing or managing asthma symptoms in the home; 3.) sense of helplessness during an asthma attack; 3.) inability to communicate with healthcare provider (HCP), and 4.) inability to understand treatment regimen.
- Home visits helps parents to understand environmental triggers in the homes, introduce strategies to reduce indoor pollution, taught how to properly use the medications, and create an action asthma plan to reduce ED visits.

RESULTS CONTINUED

- School based asthma curriculum led by a nurse or health care provider is effective in reducing symptoms, activity limitations, missed school days, and health care utilization.
- Collaborative education between HCP, parents, and children helps to promote awareness and better understanding of asthma symptoms and medications, which reduces healthcare utilizations.

DISCUSSION

- Most studies were conducted in urban areas and only 1 was done in a rural area. Need for more studies done in rural areas.
- Schools can incorporate an asthma education as part of their curriculum.
- Next step: implement a community or school based asthma education and determine its effectiveness.

CONCLUSIONS

- **Education = parental and child awareness = sensitivity of symptoms = greater independence for parents and children = increased QOL = decreased healthcare utilizations = cost savings**
- Need for culturally acceptable strategies to eliminate cultural and linguistic barriers between families & HCP
- Use of culturally competent asthma educators significantly reduces wheezing, asthma exacerbations, ED visits, and missed parental work days and improved parental recognition of asthma exacerbations at home.

REFERENCES

- Anderson, B. (2015, April 11). Chronic diseases take their toll among central San Joaquin Valley residents. Retrieved from <http://www.fresnobee.com/news/local/article19648839.html>.
- Childers, L. (2017, March 23). Driven By High Asthma Rates, Central Valley Tries to Improve Indoor Air Quality. Retrieved from <https://www.calhealthreport.org/2017/03/23/driven-by-high-asthma-rates-central-valley-tries-to-improve-indoor-air-quality/>.
- Coffey, J., Cloutier, M., Meadows-Oliver, M., & Terrazos, C. (2012). Puerto Rican families' experiences of asthma and use of the emergency department for asthma care. *J Pediatr Health Care*, 26(5), 356-363. doi:10.1016/j.pedhc.2011.01.006
- Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *J Adv Nurs*, 52(5), 546-553. doi:10.1111/j.1365-2648.2005.03621.x
- Wright, K., & Newman-Giger, J. (2010). California's young Hispanic children with asthma: disparities in health care access and utilization of health care services. *Hispanic Health Care International*, 8(3), 154-164. doi:10.1891/1540-4153.8.3.154