

Establishing school-centered asthma programs

Lisa Cicutto, RN, ACNP(cert), PhD, CAE,^a Melanie Gleason, MS, PA-C, CAE,^b and Stanley J. Szeffler, MD^c *Denver and Aurora, Colo*

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Asthma is a common chronic childhood disease associated with significant morbidity and high rates of school absenteeism, along with excessive costs for the patient and society. Asthma is a leading cause of school absenteeism, but this absenteeism is not equally distributed among those with asthma. Second to their home, school-aged children spend the largest portion of their wakeful hours at school. Opportunities exist to partner with schools to reach most children with asthma and those at the highest risk for asthma burden and in need of assistance. Asthma management at schools is important for pediatric

pulmonologists and allergists, primary care providers, and the whole interdisciplinary team working alongside them to provide quality asthma care. The variability of asthma care services and programs provided in schools should prompt clinicians to understand their own school system and to advocate for appropriate services. Models of asthma care that place schools at the center or core of the model and coordinate evidence-based asthma care are applicable nationwide and might serve as a model for managing other chronic illnesses. (*J Allergy Clin Immunol* 2014;134:1223-30.)

From ^aCommunity Outreach and Research, National Jewish Health, and the Clinical Science Program, University of Colorado Denver AMC, Denver; ^bthe Building Bridges Asthma Program, Children's Hospital of Colorado, and the Department of Pediatrics, Section of Pediatric Pulmonary Medicine, University of Colorado School of Medicine, Aurora; and ^cthe Pediatric Asthma Research Program, Breathing Institute, Section of Pediatric Pulmonary Medicine, Children's Hospital Colorado, and the Department of Pediatrics, University of Colorado Denver School of Medicine, Aurora.

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Corresponding author: Stanley J. Szeffler, MD, Pediatric Asthma Research Program, The Breathing Institute, Children's Hospital Colorado, 13123 East 16th Ave, Box 395, Aurora, CO 80045. E-mail: stanley.szeffler@childrenscolorado.org. 0091-6749/\$36.00

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Asthma is a common chronic childhood disease associated with significant morbidity and high rates of school absenteeism, along with excessive costs for the patient and society. Available data indicate that approximately 36,000 children and youth miss school because of asthma each day.¹ High rates of school absenteeism affect a child's ability to learn. A variety of strategies directed at improving overall asthma management to reduce asthma-associated morbidity have been evaluated. The purpose of this review is to engage busy clinicians to think about and become full team members in achieving successful asthma management in schools through exploring the rationale for school-centered interventions, challenges identified in managing asthma in the school setting, strategies implemented and evaluated, and future directions for standardized approaches to school-centered asthma programs and identifying actions that community asthma care providers can take to support asthmatic patients and their families.

Asthma is a leading cause of school absenteeism, but this absenteeism is not equally distributed among those with asthma.² Students attending schools with the highest proportions of low-income students are more likely to miss school because of asthma.³ Data summarized in the US National Interview Survey indicate that children with asthma missed 3 times more school and had a 1.7 times greater risk of having a learning disability compared with well children.⁴

Charles Basch⁵ provided a review on factors that contribute to the achievement gap in schools and reported that asthma directly and indirectly affects academic achievement of school-aged youth. He identified causal pathways that could affect academic achievement, including cognition, high absenteeism, school connectedness, and eventual dropout. Asthma and these causal pathways can have interactive and synergistic effects that result in a complex situation that subsequently must be addressed collectively through a coordinated and partnered approach. School-centered interventions are thus directed at improving asthma control and reducing asthma-related absenteeism.

Previous work has suggested a variety of interventional elements for school-centered asthma care models that can include asthma screening; asthma case identification; supervised administration of maintenance asthma medication; case management; care coordination among students, families, health care providers, and schools; asthma self-management education programs; and creation of asthma-friendly school environments. Although school systems represent an ideal setting for reaching the majority of children and youth with asthma, they are not without challenges and limitations that must be addressed and overcome through a coordinated and collaborative effort among schools, families with asthma, and their asthma care providers.

CHALLENGES IN PROVIDING ASTHMA MANAGEMENT IN SCHOOLS

Staffing at schools

Given the high prevalence of asthma and the shortage of health care personnel in schools, schools often lack the capability to provide appropriate asthma care, even for acute problems. A relatively

Abbreviation used
ED: Emergency department

recent national survey revealed that only 36% of schools had a full-time school nurse, one third of schools had a full-time health paraprofessional, and only 19% of school health coordinators receive professional development training for asthma.⁶ Combined, these observations suggest that schools have a shortage of health personnel prepared to provide evidence-based asthma care.

Communication

A major obstacle to asthma management in schools is poor communication among students, families, school staff, and health care providers.^{7,8} Parents do not inform school nurses of their child's asthma-related needs or provide the supports necessary for successful asthma control at school, such as providing a quick-relief inhaler for use at school or the required completed forms to allow students to carry their inhalers. Schools often have unclear policies and practices for managing asthma at schools.⁹ Often, the policies and procedures are poorly communicated to the school community and might or might not be easy to find on the school district's Web site, which results in parents and school staff not understanding their roles, responsibilities, and expectations. In addition, health care providers are often not aware of the special circumstances that children and youth with asthma and their families must navigate to successfully manage asthma at school. As a result, they often lack the necessary supports, such as completed school asthma care plans outlining asthma management at school.

School asthma care plans and access to rescue therapy

Two important steps for successful asthma management in school settings include beginning the school year with a completed school asthma care plan along with an onsite quick-relief inhaler that is carried by the student, if developmentally appropriate. The purpose of the written school asthma care plan is to outline asthma management steps to support asthma care for that individual student. It also serves as a medical order for schools. Asthma care plans for schools differ from asthma action plans for home use in several ways. Therefore home plans alone might not be considered acceptable or sufficient by school districts for management in the school setting. Schools are required to have a signed release form for sharing health information among school personnel and the student's health care providers, and home-based asthma action plans typically lack this release clause. Home-based plans also lack the signed approval and indication from a parent/guardian and health care provider for either self-carrying the inhaler or the need for assistance from school staff for medication administration. Many schools will not accept home-based asthma plans because they include maintenance medications that are taken on a daily basis, such as inhaled steroids, oral leukotrienes, and nasal steroids. These plans are viewed as medical orders that would require additional school staff to implement the orders. Schools do not typically have the resources to support administration of daily maintenance medication use or the resources to provide

medications. Families often have insufficient finances to support the purchase of asthma maintenance medications for home use and are thus unable to purchase extra medication for storage and administration at school.

As mentioned above, it is important to have easy access to quick-relief inhalers for managing asthma at school. However, reported rates of asthmatic students having a quick-relief inhaler at school range from 14% to 39%.^{10,11} Federal laws exist and many states and school districts have legislation and policies to permit students to possess quick-relief inhalers, to receive support from school personnel in the storage and administration of rescue medication, or both.¹² This observation of limited access to rescue medication suggests that the gap between policy and practice is wide and consequently life-threatening.

Activity in the school setting

Most students with asthma report experiencing symptoms during physical activity at school, prompting students to initiate the self-care steps of using a quick-relief inhaler, sitting out the activity, visiting the school nurse, and/or drinking water.^{13,14} Barriers reported by students for participating in physical activity at school include the lack of a school asthma care plan detailing asthma management (either pretreatment or symptom relief), lack of easily accessible quick-relief inhalers, underlying poor asthma control, and the student's own concern over stigma associated with symptoms caused by physical activity and use of an asthma inhaler in front of peers.¹⁴

EVALUATED SCHOOL-CENTERED STRATEGIES FOR SUPPORTING ASTHMA MANAGEMENT

Despite the numerous barriers and challenges to be overcome in school systems, school-centered asthma care management programs have been evaluated, with many demonstrating benefits. The goals of these programs and interventions have varied but ultimately aim to reduce the burden associated with having asthma for children/youth. Most studies were performed in inner cities to assist high-risk students with asthma. Not surprisingly, because of the existing challenges in school systems, typically, the programs are multifaceted and involve partnerships among school personnel, community health providers, and families. Some strategies have focused on improving the quality of asthma management at schools through direct asthma service provision, some have targeted high-risk students for case management and care coordination, and others have focused on improving the asthma management skills of asthmatic students or improving the supportiveness of schools through policy changes and school staff preparedness. To date, there is not a single school-centered asthma model identified that produces the desired effects, but a significant body of knowledge exists to inform future researchers, implementers, and clinicians. A brief review of the various approaches is presented below.

Supporting the school health team to deliver asthma care

Because of the shortage of available school health personnel who are prepared to provide asthma care, the lack of asthma care supports in schools, and the gaps in asthma care coordination between home and school settings, several

interventions were developed and evaluated to address these shortcomings.

Increasing the size of the onsite school health team.

Strategies have included adding physicians and/or other community health providers, extending the hours of school nurses, forming school-based health centers with asthma programs, and bringing mobile clinics to schools to address the shortage of trained health professionals on site at schools. An intervention that provided a consulting physician for a half day per week to work with school nurses observed increases in the use of quick-relief medications delivered at school instead of home, which led to reductions in the number of students leaving school or requiring a 911 call for administration of short-acting β_2 -agonists.¹⁵ Increasing school nurse support resulted in a reduction in school absenteeism, decreased emergency department (ED) visits, and cost savings.^{16,17} Another way to enhance health care support is through school-based health centers. These centers can provide onsite care delivered by physicians, physician assistants, or nurse practitioners. Two studies focusing on improving asthma care through a school-based health clinic demonstrated reductions in ED visits, hospitalizations, and school absenteeism.^{18,19} The use of onsite school mobile health clinics has been evaluated as an alternative strategy for children obtaining asthma care, and results suggest that improved asthma outcomes are achieved.²⁰⁻²²

Expanding onsite school asthma care services.

Several small and larger randomized controlled studies have evaluated the benefits of directly observed asthma maintenance therapy (primarily inhaled corticosteroids) by school nurses to improve and expand asthma care and support the school health team. This involved significant work to coordinate care among school nurses, primary care providers, and families. Improvements in medication adherence and asthma-related outcomes, such as symptom-free days, asthma control, reduced numbers of exacerbations, and school absenteeism, were noted in several studies.²³⁻²⁵ The success of this intervention strategy might be related to having study physicians and research staff support asthma guideline-concordant care through ensuring that students with asthma had a prescription for an inhaled corticosteroid with an appropriate dose, that inhaled corticosteroids were received by the school nurse for each child, and that school policy and other supports existed to allow directly observed therapy.

Many of the school-centered asthma care interventions evaluated case management and care coordination efforts to expand the level of asthma care available through school settings.^{11,17,20-29} Case management involves spending time contacting and working with the family to build a trusting relationship. Care coordination and case management activities generally include the following steps: an initial assessment of service needs; development of a comprehensive and individualized management plan; coordination of necessary services to implement the plan; monitoring of the student and family to assess the plan's effectiveness; and re-evaluation and revision of the plan as required. Extensive care coordination and case management support in school settings are typically reserved for students who continue to have poorly controlled asthma. A common lesson learned across these studies is that a great deal of effort is needed to engage community health care providers in this level of asthma care. These types of efforts require additional human resources provided by adding team

TABLE I. Actions for clinicians caring for students with asthma⁶²⁻⁶⁵

Actions	Comments
Complete and share asthma care plans	If your local school district has a standardized form, make sure this form is completed and returned to the school. As discussed above, the action plan used for home might not be suitable for the school setting. This form will allow the school health team to provide individualized care.
Schedule a summer tune-up asthma visit	This visit is extremely important for having the student ready for the start of school. At this visit, assess asthma control, prescribe a second quick-relief inhaler for school use, and complete and review the asthma care/action plan for school use.
Ensure students have a quick-relief inhaler for school use	Asthma flare-ups are often unexpected, and therefore it is key to have a quick-relief inhaler easily accessible at school. This typically involves having a second quick-relief inhaler for school use that is kept in the main office or on the student, and therefore providing a back-up prescription is often necessary. Review the responsible use of the inhaler at school and assess and coach for accurate inhaler use.
Encourage parents and students to share with the school community that the student has asthma	Schools are unable to support students to reach their full potential if they are not aware that a student has asthma. Explain to families the importance of letting the school know that the child/youth has asthma in the case of an asthma attack and the ability to use a quick-relief inhaler to relieve symptoms.
Request extra support for case management and care coordination for patients with poorly controlled asthma	Obtain written parental permission to send information to the school, to discuss the child/youth's asthma condition with the school, and to receive information from the school as required by the Family Educational Rights and Privacy Act (FERPA). Contact the school nurse to discuss additional support that can be provided during school hours to support attainment of asthma control and to learn about and discuss previous exacerbations, use of the quick-relief inhaler, school absenteeism, and participation level in school activities (eg, gym class and recess).
Investigate what asthma resources exist at your local schools	If you have never worked directly with schools, check out valuable information at the following Web sites: American Academy of Pediatrics School Health (www.schoolhealth.org) and Schooled in Asthma (www.aap.org/schooledinasthma).
Know your state laws and local school policies concerning asthma	At a federal level, under the Individuals with Disabilities Act, Section 504 of the Rehabilitation Act of 1973, and Title II of the Americans with Disabilities Act, students with asthma are able to have access to life-saving medications and care. Several states have their own legislation regarding asthma medications, and school districts might have their own specific asthma care policies, protocols, and forms. At a minimum, for those without a specific asthma policy, most school districts require completion and submission of a school medication administration form to permit inhalers to be carried by the student or stored at school.
Partner with a local school nurse to hold an asthma education session	Get to know your local school nurses. They welcome support in providing education to other school nurses, school personnel, students with asthma, and their families.
Advocate for creating supportive school environments	Offer to help develop, revise, and review asthma policies and protocols in schools, such as the guidelines or protocol for how to recognize and respond to worsening asthma. Consider becoming active on a school board or the school's health and wellness committee.

members to the school health team or partnering with health care organizations in the community to provide services. The expansion in team members is typically supported through project grant funding, and therefore when the grant ends, this additional workforce is lost, posing a challenge for sustainability.

Improving asthma self-management skills of children/youth with asthma

The National Heart, Lung, and Blood Institute Expert Panel Guidelines for the Diagnosis and Management of Asthma emphasize the need for asthma education and development of asthma management skills to achieve successful disease control.³⁰ Best-practice pharmacotherapy provided by clinicians is insufficient on its own to enable successful asthma management but rather requires a skilled child/youth and his or her family to implement the recommendations. As a result, school-centered interventions have evaluated efforts directed at building the asthma management skills of children/youth through self-management asthma education efforts. Until recently, most of these programmatic efforts have targeted elementary school-aged children and have demonstrated improvements in asthma knowledge, confidence/self-efficacy, asthma management skills, and associated asthma morbidity outcomes, such as improved quality of life and reduced symptoms, ED visits, urgent care

visits, hospitalizations, and school absenteeism.^{29,31-41} Some studies have also extended these benefits to improvements in school grades and academic performance.^{33,34,40,41}

Recently, attention has shifted to efforts that improve asthma management skills of adolescents, a group often considered difficult to reach. However, these studies have demonstrated acceptance, involvement, and retention by this age group in that more than 75% of those eligible participated and more than 70% were retained.^{42,43} Benefits noted included improvements in self-confidence in asthma management skills; appropriate use of controller and quick-relief asthma medications; fewer days with symptoms and activity limitation; fewer interrupted nights caused by asthma; decreased hospitalizations, ED visits, and school absenteeism; and improved quality of life.^{27,42-46} Although results vary across studies, systematic reviews suggest that the inclusion of school-centered asthma education have positive clinical, humanistic, health, economic, and academic outcomes.^{40,41}

Developing asthma-friendly schools

Through efforts to enhance asthma care services at schools and improve the asthma management skills of students with asthma, key lessons learned from the projects highlight the need to create supportive school environments. In recognition of the importance of a supportive school environment, several

TABLE II. Resources for busy clinicians

Web sites to access key resources	
American Academy of Pediatrics	
• School Health	www.schoolhealth.org
• Schooled in Asthma	www.aap.org/schooledinasthma
American Lung Association	
• Asthma Friendly Schools Initiative Toolkit	http://www.lung.org/lung-disease/asthma/creating-asthma-friendly-environments/asthma-in-schools/asthma-friendly-schools-initiative/
Centers for Disease Control and Prevention	
• School and Childcare Providers	http://www.cdc.gov/asthma/schools.html
• Creating an Asthma Friendly School	http://www.cdc.gov/HealthyYouth/asthma/creatingafsf/
• Strategies for Addressing Asthma within a Coordinated School Health Program	http://www.cdc.gov/healthyyouth/asthma/strategies/asthmacsh.html
Creating Asthma Friendly Schools (Asthma Plan of Action, Ontario Ministry of Health)	
• Creating Asthma Friendly Environments for Youth	http://www.asthmainschools.com
National Association of School Nurses	
• Asthma resources and tools	https://www.nasn.org/ToolsResources/Asthma
US Environmental Protection Agency	
• Creating Healthy Indoor Environments in Schools. Tools for Schools	http://www.epa.gov/iaq/schools/
• Managing Asthma in the School Environment	http://www.epa.gov/iaq/schools/managingasthma.html

organizations have identified goals and supports for creating asthma-friendly schools. Typically, efforts directed at improving the supportiveness of schools are prescribed by the policies and protocols of the schools, school districts, or both.^{9,47-52} Because deaths from asthma in schools have occurred and might be attributable to delays in school personnel providing assistance,⁵³ efforts to train administrators, secretaries, teachers, and other school staff in the recognition of and appropriate response to worsening asthma and use of asthma medications have occurred and have demonstrated improvements in asthma knowledge and practice.^{52,54-57}

An additional aspect of creating an asthma-friendly school system is the availability of an information technology infrastructure that allows data sharing to promote coordination of care among schools, families, and health care providers. Benefits reported as a result of a shared database in the Charlotte Mecklenburg Schools included the ability to identify students with an increased level of need to receive priority care status from the asthma education program and an ability to evaluate program outcomes that were not possible before implementing the program, such as academic performance, school attendance, school behavior, and quality of life.⁵⁸

BUILDING ON LESSONS LEARNED

Building on the lessons learned over the last 2 decades of research, a collaborative program was developed and is being implemented and evaluated in Denver, Colorado, and Hartford, Connecticut, entitled “Building Bridges for Asthma Care.”

Program partners consist of and represent asthma care providers (specialist and primary care), school districts (administration, school health teams, and information technology teams), and students and their families affected by asthma. Building Bridges for Asthma Care uses an innovative model that combines and links school-centered asthma programming and professional development activities directed at primary care providers to provide quality asthma care. The integration of school-centered approaches with primary care professional development for quality asthma care is novel and important. A major lesson learned from the work reviewed above is the central role that primary asthma care providers play in determining whether asthma will be managed successfully at school. Therefore a primary asthma care professional development program, Easy Breathing, was added to communicate consistent messaging of needs, requirements, and expectations among families, schools, and providers, as well as to support the team approach necessary for successful management in school settings. Easy Breathing is a cost-effective, evidence-based asthma management program for health care providers that includes training and tools to improve the recognition and management of childhood asthma.^{59,60} The program has led to improvements for inner-city children with asthma in reducing hospitalizations, outpatient visits, and asthma-specific ED visits, which varied among black and Hispanic children.⁵⁹ For additional information about the Easy Breathing program, please access their Web site at <http://www.connecticutchildrens.org/community-child-health/easy-breathing-asthma/>.

The Building Bridges school-centered asthma program incorporates many of the effective components described above because it includes completed school asthma care plans; easily accessible quick-relief inhalers at school; asthma education for students, families, and school staff; an expanded asthma-specific information technology infrastructure; expanded support for the school health team; and, for students most at risk of experiencing unnecessary asthma, extended asthma care services in the form of case management and care coordination.²⁸ The Denver Public Schools developed and integrated into their existing system an asthma-specific tab as part of the district’s information technology infrastructure to support the care, communication, and coordination efforts required for this project. This system will support communication, asthma care, case management, and coordination by documenting the receipt of a school asthma care plan, the availability and location of an onsite quick-relief rescue inhaler, and the student’s at-risk asthma status and will monitor school absenteeism, visits to the school health office for asthma, and 911 calls for asthma.^{28,61}

The primary implementers of the program are school nurses. At the beginning of the school year, school nurses identify students with asthma based on the parent-provided history; request completion of a student asthma intake form to identify the current level of asthma control and the level of risk for unnecessary asthma burden based on the use of emergency care, hospitalizations, steroid bursts, and school absenteeism in the last year; and request a completed school asthma care plan and provision of a quick-relief inhaler to be kept at school. For students identified as at risk for unnecessary asthma burden, school nurses work with the student and his or her parents/guardians by providing case management, care coordination, and asthma education through at least 3 encounters over the school year. Encounter summary

letters are provided to families and their student's asthma care provider that detail the level of asthma control, reported medication use, and recommended next steps to be considered by the family and their health care provider. During the school year, the student's absenteeism, physical activity, and asthma control levels are monitored and communicated to the student's parents and health care provider. It is our intent that this level of communication, case management, and coordination will be useful in better preparing students for school, preventing seasonal exacerbations, and supporting the overall implementation of school and home asthma care plans. At the end of the school year, efforts are made to get families and health care providers organized for the next academic school year by sending a "Getting Ready for School Asthma Packet" to families of students with asthma and their asthma care provider that includes a checklist for being prepared (have an asthma care visit over the summer, have well-controlled asthma, get a second quick-relief inhaler for school use plus a spacer, and complete the school asthma care plan) and the required school forms to be completed and returned to the school during registration. An important feature of this program being investigated is identifying sustainability mechanisms that might exist through schools or funding arrangements with payers for case management and care coordination activities.

This work will make a significant contribution to the literature because it will be the first to combine a multifaceted school-centered program and a multifaceted asthma care provider program while identifying barriers to overcome and the potential synergies realized. Models of asthma care that place schools at the center of the model and coordinate evidence-based asthma care are applicable nationwide and might serve as a model for managing other chronic illnesses.

HOW COMMUNITY ASTHMA CARE PROVIDERS MAKE A DIFFERENCE IN SCHOOL ASTHMA MANAGEMENT

Several barriers and challenges to managing asthma in schools were described above along with interventions that were developed to overcome these barriers. This discussion should highlight for community asthma care providers the important role they play in achieving successful asthma management at school and in supporting their patients in reaching their full academic potential. As astutely pointed out by Wheeler et al,⁶² the number one lesson learned from earlier school-centered programs is the need for strong links to primary care clinicians. Clinicians providing asthma care must engage with the family and school nurses for successful asthma management.

Community asthma care providers are in a unique role for fostering seamless asthma management between home and school. A requirement of school settings to provide asthma care to students is the need for completion of their standardized form for communicating the asthma care needs and supports of the individual student. It is important for asthma care providers to support harmonization of school asthma care approaches using and completing the required forms of the patient's school district. This will lead to more consistent asthma practice in the school community and less confusion. School nurses want to support and provide the best care for students but require direction from students' asthma care providers that meets the legal requirements

of their school district. Thus there is a need for ongoing bidirectional communication between community asthma care providers and the schools, which should prompt a spirit of collaboration and coordination. As suggested above, the landscape for managing asthma in schools is complex and involves many stakeholders. Community asthma care providers need to work with patients and their families, school nurses, school personnel (eg, teachers and coaches), and payers to support patients in achieving successful management at school. Specific to payers, it is important that community asthma care providers play a central role in advocating for their patients and to stress the importance of the family's ability to acquire multiple quick-relief inhalers and the need for reimbursement for disease management, case management, and care coordination efforts for high-risk children/youth. A concerted and coordinated effort should result in better asthma control for patients that allows them to take full advantage of the opportunities for growth and development at school.

To assist busy community asthma care providers, [Tables I and II](#)⁶²⁻⁶⁵ are provided as a guide and references for use in your practice. The tables summarize the literature reviewed and resources of best practices.

SUMMARY

Second to their home, school-aged children spend the largest portion of their wakeful hours at school. Several studies and systematic reviews demonstrate that students with asthma, when supported through school-centered asthma care programs, can have improvements in asthma knowledge, confidence in and actual practice of asthma management skills, regular use of preventive asthma medications, reduced school absenteeism, better school performance, and use of urgent and emergency asthma care. Collectively, available research demonstrates that programs that either provide asthma care directly at school and/or ensure adequate links between school, family, and asthma care providers have achieved a reduction in asthma morbidity.⁶² The synergy created by collaborative and coordinated efforts of schools and asthma care providers assists students and their families to achieve asthma control and reduce associated morbidity. Community asthma care providers are the linchpin to successful asthma management across the home and school settings.

What do we know?

- Asthma is a leading cause of school absenteeism, but this absenteeism is not equally distributed among those with asthma.
- The variability of asthma care services and programs provided in schools should prompt clinicians to understand their own school system and to advocate for appropriate services.

What is still unknown?

- The cost-effectiveness of school-centered asthma programs
- How to sustain program implementation once research funding no longer exists
- Whether models of asthma care that place schools at the core of the model and coordinate evidence-based asthma care are applicable nationwide

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