

Asthma in Schools

How School-Based Partnerships Improve Pediatric Asthma Care



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KEYWORDS

• Asthma • Schools • Asthma action plans • Circle of support • Asthma education

KEY POINTS

- Partnerships among families, clinicians, and school nurses, centered on the child, establish a circle of support to facilitate asthma care.
- Asthma management plans, including individualized asthma action plans, are fundamental tools in coordinating asthma care with schools.
- Comprehensive asthma education and programs that remediate environmental asthma triggers empower schools to provide safe school environments for children with asthma.

BACKGROUND

In the United States, asthma is a leading chronic health condition in children, affecting 1 in 12 children nationwide.¹ Childhood asthma continues to be associated with significant morbidity and high rates of school absenteeism, particularly in children of low socioeconomic status. Reducing the disparity between children with asthma and healthy children will require extending pediatric asthma care beyond the traditional clinic and hospital settings and building effective health partnerships with the community and schools.

Recent data have shown that asthma continues to affect 6 million school-aged children with approximately half of these children experiencing asthma attacks each year.¹ Encouraging data from the Centers for Disease Control and Prevention (CDC)

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have shown that both asthma exacerbations and school absenteeism due to asthma have significantly decreased in the past decade (Fig. 1). During this time, children with asthma were more likely to participate in programs addressing asthma education and more likely to receive an asthma action plan (AAP). Nevertheless, asthma exacerbations remain frequent and result in significant health care utilization: One in 6 children with asthma (16.7%) are seen in the emergency room (ER) for their asthma symptoms each year and 1 in 20 (4.7%) result in hospitalizations.¹

Decreases in asthma exacerbation rates in school children with asthma have also been accompanied by decreases in school absenteeism. However, recently published CDC data show that nearly half of all children with asthma report missing 1 or more school days each year due to asthma.¹ These absences can significantly impact a child's school performance, and especially in vulnerable populations, lead to a cycle of lifelong academic achievement.² In addition, children from low-income families are at a greater risk of impaired access to health care and health insurance and experience a higher degree of fragmented school health resources.

Since 2001, there has been an increasing public awareness of the need for improved asthma control and pediatric asthma care coordination. Advances in asthma guidelines and clinical trials have provided clinicians with increasing tools to assess asthma risk and control, whereas clinical trials have guided clinicians on the best practices and treatments for patients with poor asthma control. In addition, federal and local agencies have advocated for increased patient education and self-management tools, such as the widespread use of AAPs. 2013 CDC data shows that more children receive AAPs (39% in 2003 vs 51% in 2013) and more children receive asthma education, either in clinics or in school, as compared to prior decades.¹

Despite these system-wide initiatives to improve asthma awareness and self-management, children with asthma lack consistent use of daily controller medications. In fact, CDC data indicate that only 30% of children with asthma use their asthma controller medications every day, whereas 67% report using their rescue medications within the past 3 months. Future work, state and federal legislation, and local school district policies will need to address interventions that improve the use of asthma controller medications and improve care coordination programs that advocate the

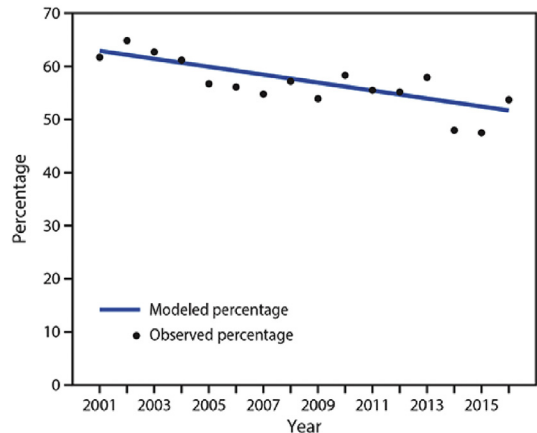


Fig. 1. The percentage of asthma exacerbations in children ages 0 to 17 and school absences as reported by the CDC. (From Zahran HS, Bailey CM, Damon SA, et al. Vital signs: asthma in children - United States, 2001-2016. MMWR Morb Mortal Wkly Rep 2018; 67(5):152; with permission.)

daily use of asthma controller medications. Schools, especially those that are staffed by a full-time registered nurse, can be powerful health care partners in addressing this need, both in their ability to consistently deliver asthma medication and in their resources to provide asthma education and asthma monitoring.

HOW SCHOOLS CAN IMPROVE PEDIATRIC ASTHMA CARE COORDINATION

Data have shown that schools can be powerful institutions to affect behavioral change in children with asthma.³ The positive impact of school nurses on chronic disease management is well known and has been associated with significant improvements in immunization rates, vision screening, asthma exacerbation rates, and decreases in school absences for asthma.⁴ Even though school nurses provide important community-based health care to nearly 50 million public school children, they are often not included in collaborative health partnerships. Recent efforts, such as the establishment of the widely endorsed School-based Asthma Management Program (SAMPRO), have supported a greater integration of schools and school nurses into the pediatric asthma care team.⁵

Several studies have supported the use of school-centered asthma programs to improve the delivery of asthma medications and AAPs to schools.^{6–10} Schools, especially when staffed by full-time registered school nurses, provide an infrastructure already in place within a child's daily community to monitor their chronic health condition. Programs that have harnessed the use of school nurses to improve asthma management have been shown to decrease asthma exacerbations and improve school attendance. In particular, 2 recently published programs, one that used a school-based telemedicine intervention and another that facilitated asthma care with community-based, school asthma liaisons, have reported promising results.

In a recently published study, four hundred elementary school children, identified with physician-diagnosed asthma, were enrolled in a randomized controlled trial evaluating the effect of regular school-based telemedicine visits to establish and monitor an asthma treatment plan.¹⁰ The treatment plan was initiated at the onset of the school year with a telemedicine clinician who recommended a treatment plan that was delivered through directly observed therapy (DOT) in the school health office and coordinated with the child's primary care provider (PCP). This care was compared with children who received enhanced usual care consisting of a guideline-based symptoms assessment, asthma education, and recommendations for a treatment plan sent to the PCP. The primary outcome, number of symptom-free days, significantly improved in the school-based telemedicine group (11.6 in school-based group vs 10.9 in an enhanced usual care group within a 14-day period), and importantly, ER visits and hospitalizations were significantly reduced (7% in the school-based telemedicine group vs 15% in the usual care group odds ratio 0.52; 95% confidence interval 0.32–0.84). The study also showed promising feasibility of a school-based intervention in an underresourced district. In fact, the study showed significant results in an urban, low-income elementary school that was not staffed with a full-time school nurse, resulting in only 82% of children eligible for DOT actually receiving it.¹⁰ Other studies, using a similar intervention to deliver asthma education without DOT, showed no statistically significant differences in symptom-free days reported, suggesting that DOT by the school nurse is a key aspect of the effective intervention.¹¹ Further studies are needed to investigate best practices in disseminating and implementing similar tools for school-based management of asthma, and increased advocacy is needed to support adequate funding of these initiatives for all eligible children.

Another well-established program involves the use of a multidisciplinary asthma care team to provide intensive asthma case management, asthma education, and care coordination facilitated by community-based bilingual asthma educators.^{6,12} The program, implemented in a large urban, low-income school district in Denver, Colorado, began with strong stakeholder engagement and support from school administrators, school nurses, clinicians, patients, and their families. Key aspects of the program involved training of this adjunct asthma educator/counselor to review asthma and inhaler education, engaging families to serve as their own health care advocates within the traditional and school health systems, establishing professional development for the school nurses in asthma management for sustainability, and providing a system to coordinate the delivery of AAPs and evaluate asthma control. Two hundred fifty-two children receiving free and reduced lunch were recruited from Denver Public Schools into the Step-Up Asthma program. They participated in a comprehensive education program during the school day and a minimum of 4 care coordination services with the asthma counselors who, when needed, coordinated care with clinicians. Children in the program reported statistically significant reductions in asthma exacerbations, urgent care visits, and school absences.¹²

In addition to interventions using school-based telemedicine and community-based workers, previously implemented programs, such as mobile school-based health clinics (SBHC) and innovative Breathmobile programs, have increased access to asthma care and shown similar statistically significant improvements in asthma exacerbation rates, school absenteeism, and asthma control, particularly for high-risk, low-income populations.^{13–15} SBHCs offer the additional benefit of providing an infrastructure for the delivery and integration of a wide spectrum of chronic health disease services. It is important to emphasize that each community may need to develop their own school-based implementation practice that is best adapted to their individual patient, clinician, and school health populations. Cultural competencies, state and local regulations, school district policy, and staffing of school health resources will impact the availability, funding, and subsequent delivery of an effective school-based asthma program. With these considerations in mind, and after review of the shared aspects common to successful school-based asthma interventions, the American Academy of Allergy, Asthma, and Immunology (AAAAI) in collaboration with the National Association of School Nurses, developed the SAM-PRO and have worked with national partners for widespread endorsement and dissemination.⁵

DEVELOPING AN SCHOOL-BASED ASTHMA MANAGEMENT PROGRAM

In 2016, the AAAAI, in collaboration with the National Association of School Nurses, developed an SAMPRO with 4 key components.⁵ These components include the following:

1. A Circle of Support described as a coordinated model for communication among patients, families, clinicians, and school nurses (**Fig. 2**);
2. The use of Asthma Management Plans (AMPs) to provide emergency and individualized asthma care in schools;
3. Comprehensive asthma education for patients, families, and schools; and
4. Strategies for reduction of school environmental triggers.⁵

The AMPs include individualized AAPs and a standardized Asthma Emergency Treatment Plan for schools that detail an emergency treatment plans for all students.



Fig. 2. The SAMPRO advocates for establishing a Circle of Support, consisting of families, clinicians, and school nurses centered on the child with asthma. (Modified from American Academy of Allergy Asthma & Immunology. Available at: <https://www.aaaai.org/conditions-and-treatments/school-tools/SAMPRO>. Accessed January 15, 2019.)

Component One: Circle of Support

The foundation of SAMPRO emanates from establishing a Circle of Support centered on the child with asthma. Building the Circle of Support involves several key steps, including the following:

1. Founding partnerships and pathways of communication around the child among the families, clinicians, and school nurses;
2. Ensuring that clinicians develop individualized AAPs, medications, and complete authorization forms at the initiation of the school year to optimize the monitoring of systems and delivery of asthma medications at schools;
3. Educating school nurses and families with evidence-based asthma education programs to better recognize and self-manage asthma systems; and
4. Reducing communication barriers among all members of the Circle of Support.

It is important to recognize that school-based telemedicine, extended electronic medical record access, and community health workers can all play a role in each of these steps, and the best intervention will depend on the individual needs of each community.

Component Two: Asthma Management Plans

Component 2 involves the use of AMPs, which includes the Asthma Emergency Plan and an AAP for use at home and at school⁵ (Box 1, Figs. 3 and 4). The Asthma Emergency Treatment Plan provides an emergency management plan designed for the child at school with acute asthma symptoms, without an individualized or updated AAP available. The use of the asthma emergency treatment plan by schools allows the delivery of rescue medications for children of high medical necessity and supports the stocking of albuterol in all schools.

In addition to the Asthma Emergency Treatment Plan, SAMPRO advocates the use of an individualized AAP developed for use at home and at school. The SAMPRO AAP (see Fig. 4) uses the familiar stoplight algorithm with additional key features. These features include asthma severity, risk for future asthma exacerbations, asthma

Box 1**Risk factors for fatal asthma attacks****Asthma history**

- Previous severe exacerbation (eg, intubation or intensive care unit admission for asthma)
- Two or more hospitalizations for asthma in the past year
- Three or more emergency department visits for asthma in the past year
- Hospitalization or emergency department visit for asthma in the past month
- Using >2 canisters of short-acting beta2-agonist per month
- Difficulty perceiving asthma symptoms or severity of exacerbations
- Other risk factors: lack of a written AAP, sensitivity to *Alternaria*

Social history

- Low socioeconomic status or inner-city residence
- Illicit drug use
- Major psychosocial problems

Comorbidities

- Cardiovascular disease
- Other chronic lung disease
- Chronic psychiatric disease

Adapted from National Heart, Lung, and Blood Institute (NHLBI). Expert panel report 3: guidelines for the diagnosis and management of asthma, 2007. Available at: <https://www.nhlbi.nih.gov/health-topics/guidelines-for-diagnosis-management-of-asthma>. Accessed October 12, 2018; with permission.

triggers, identification of asthma medications to be administered at school (including the need for preexercise albuterol), parental release of information, and the authorization for a child to self-carry and administer asthma medications.

It is important to recognize that the school nurse is a key health care provider that is based in the school setting. Both clinicians and school nurses need to exchange protected health information in accordance with HIPAA and FERPA privacy laws, local school district policy, and individual health organization legal regulations. The SAMPRO AAP includes a paragraph addressing these privacy concerns with participating entities. Along with the AAP, individual schools may require authorizations for the delivery of medications at schools, and clinicians may need to prescribe additional medications for home and school. In addition, the SAMPRO workforce strongly recommends faxing, the use of secure Web portals, or electronically transmitting AAPs directly from the clinician to the school nurse to facilitate the reliable health information exchange among health care providers.

The implementation of the AAP in school requires that the school nurse receives and processes the forms securely and in a timely manner. SAMPRO strongly advocates for communication infrastructures that facilitate the electronic delivery of AAPs as well as periodic updates of the changes to a child's asthma status, including recent hospitalizations and ER visits, from the clinician to the school nurse. In this manner, the Circle of Support is a living communication framework that facilitates the bidirectional flow of communication that allows the school nurse to share changes in a child's activity or health status with clinicians and facilitates critical elements of asthma care coordination among families, school nurses, and clinicians.

Component Three: Comprehensive Asthma Education

Comprehensive asthma education, particularly programs that engage students, families, clinicians, and schools as an integrated team, has been shown to improve asthma knowledge and self-efficacy.^{7,16,17} Furthermore, within the schools, identifying

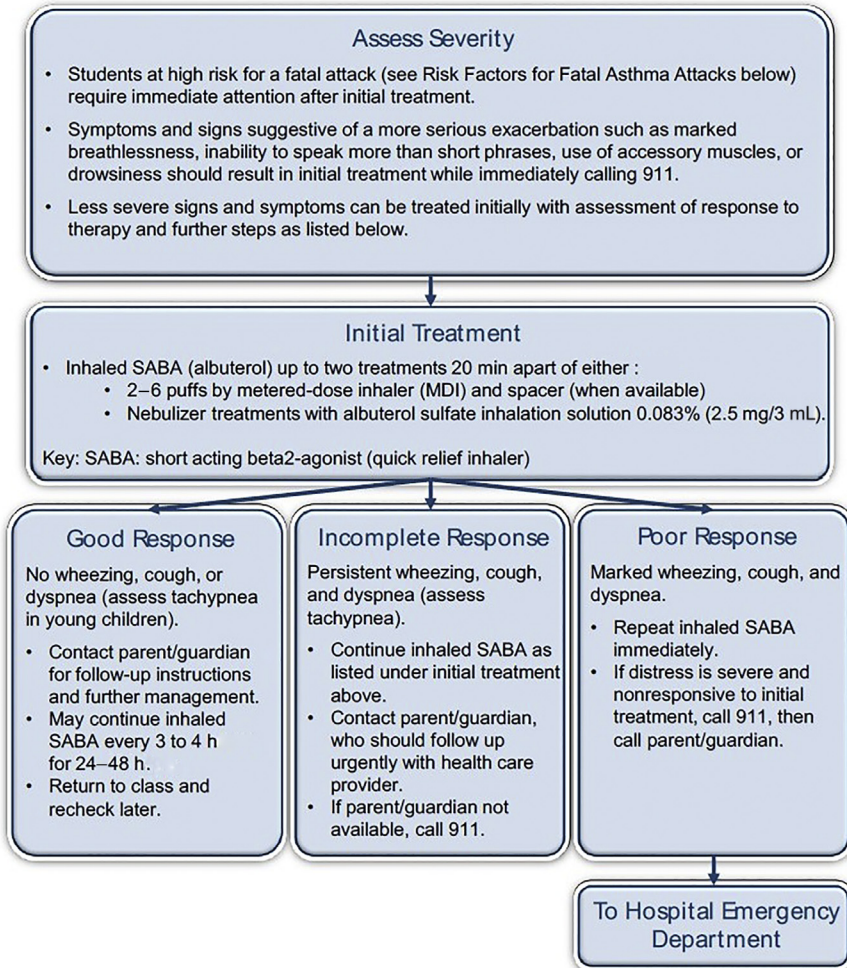


Fig. 3. Asthma Emergency Treatment Plan for the child with acute asthma symptoms at school. This plan is developed to treat urgent asthma symptoms for the child without an updated individualized AAP available at school. SABA, short-acting beta2-agonist. (Adapted from National Heart, Lung, and Blood Institute (NHLBI). Expert panel report 3: guidelines for the diagnosis and management of asthma, 2007. Available at: <https://www.nhlbi.nih.gov/health-topics/guidelines-for-diagnosis-management-of-asthma>. Accessed October 11, 2018; with permission.)

asthma champions throughout the school system, including school nurses, teachers, administrators, and custodial staff, can help to improve dissemination of asthma education and improve programmatic success.^{3,18,19}

Component 3 involves the development of a comprehensive education plan for families and schools that identifies the child with asthma, recognizes asthma symptoms, evaluates asthma control with validated tools, and uses best practices in care coordination, communication, and asthma management within the home and school. School health officials and school nurses can promote the use of formal education



Name: _____ Birthdate: _____

Asthma Severity: ☐ Intermittent ☐ Mild Persistent ☐ Moderate Persistent ☐ Severe Persistent
 ☐ He/she has had many or severe asthma attacks/exacerbations

 Green Zone Have the child take these medicines every day, even when the child feels well. Always use a spacer with inhalers as directed. Controller Medicine(s): _____ Controller Medicine(s) Given in School: _____ Rescue Medicine: Albuterol/Levalbuterol _____ puffs every four hours as needed Exercise Medicine: Albuterol/Levalbuterol _____ puffs 15 minutes before activity as needed	
 Yellow Zone Begin the sick treatment plan if the child has a cough, wheeze, shortness of breath, or tight chest. Have the child take all of these medicines when sick. Rescue Medicine: Albuterol/Levalbuterol _____ puffs every 4 hours as needed Controller Medicine(s): _____ ☐ Continue Green Zone medicines: _____ ☐ Add: _____ ☐ Change: _____ If the child is in the yellow zone more than 24 hours or is getting worse, follow red zone and call the doctor right away!	
 Red Zone If breathing is hard and fast, ribs sticking out, trouble walking, talking, or sleeping. Get Help Now Take rescue medicine(s) now Rescue Medicine: Albuterol/Levalbuterol _____ puffs every _____ Take: _____ If the child is not better right away, call 911 Please call the doctor any time the child is in the red zone.	
Asthma Triggers: (List) _____ _____ _____	
School Staff: Follow the Yellow and Red Zone plans for rescue medicines according to asthma symptoms. Unless otherwise noted, the only controllers to be administered in school are those listed as "given in school" in the green zone. ☐ Both the asthma provider and the parent feel that the child <u>may carry and self-administer their inhalers</u> ☐ School nurse agrees with student self-administering the inhalers	
Asthma Provider Printed Name and Contact Information: _____ _____	Asthma Provider Signature: _____ Date: _____
Parent/Guardian: I give written authorization for the medications listed in the action plan to be administered in school by the nurse or other school members as appropriate. I consent to communication between the prescribing health care provider/clinic, the school nurse, the school medical advisor and school-based health clinic providers necessary for asthma management and administration of this medication. Parent/guardian signature: _____ Date: _____	School Nurse Reviewed: _____ Date: _____

Please send a signed copy back to the provider listed above.

Fig. 4. The SAMPRO AAP for use at home or at school. (Courtesy of American Academy of Allergy Asthma & Immunology, Milwaukee, WI.)

programs, such as the American Lung Association’s Open Airways for Schools, Kickin’ Asthma, Iggy and the Inhalers, and Fight Asthma Now, to improve self-efficacy and knowledge of asthma management and understanding by students and school staff. ^{16,17,20,21} In this way, the school nurse serves as a health care provider and advocate for children in school and supports recognition and treatment of asthma symptoms at the time of onset. Links to these and other programs are available in the SAMPRO toolkit.

Component Four: Environmental Asthma Management

Component 4 advocates for the reduction of asthma triggers found within the school environment. It is well recognized that environmental exposures can influence the development of asthma symptoms, and school poses unique triggers that may affect a child's asthma.^{22,23} In addition, specific triggers may differ depending on the school's setting and resources. For example, data from school-based studies in the inner city have shown that mouse allergen is present in significant levels in the school environment and may be associated with increased asthma morbidity.^{24,25} Other studies have indicated that individual schools may expose children to higher levels of air pollutants based on proximity to high-density traffic, idling school buses, poor ventilation, and suboptimal building ventilation and maintenance.²⁶ Current evidence and expert consensus support allergen removal, pest management, and mitigation of air pollutants in the school environment via multifaceted interventions.^{24,27}

Recent data have also suggested that variations in school endotoxin exposure may potentially influence children with asthma.²⁸ Current studies are limited and have primarily involved the inner-city population. Given that the school microbiome is likely affected by student population, urban versus rural settings, climate, and components within individual buildings, future work is needed to establish the relationship between school microbiomes and pediatric asthma.

The Environmental Protection Agency has developed the Indoor Quality Tools program (<http://www.epa.gov/iaq/schools/managingasthma.html>) to empower schools and families to mitigate pertinent allergen and pollutant exposures within their individual school environments. Using this resource, schools can access walk through checklists, mobile apps, and relevant links to help identify strategies to reduce exposure to air pollutants, such as school bus diesel exhaust, and to use integrated pest management tools as well as mold and mite reduction programs.

SCHOOL-BASED ASTHMA MANAGEMENT PROGRAM: DISSEMINATION AND IMPLEMENTATION

To promote the use of the program, the SAMPRO workforce and the AAAAI have committed resources to develop comprehensive recommendations in its white paper and the development of the SAMPRO toolkit to establish program efficacy.

The SAMPRO toolkit (available at <http://aaaai.sampro.org/>), constructed in collaboration with the University of Wisconsin HIPxchange program, contains additional key resources, online learning, and downloadable electronic forms of the Asthma Emergency Plan, the AAP, and the Supplementary School Treatment Form in English and Spanish. This toolkit is a powerful dissemination tool that provides users with tangible resources for dissemination and implementation of SAMPRO in local communities, including slide sets with and without narration, videos to teach inhaler techniques, and links to educational and other online tools developed outside the SAMPRO workforce. Checklists for each member of the Circle of Support are available to promote the pediatric asthma care coordination that is the bedrock of the Circle of Support. Recent advances also include the creation of maintenance of certification (MOC) part II and part IV activities for physicians, clinic nurses, and school health nurses.

SUMMARY AND FUTURE CONSIDERATIONS

Childhood asthma remains the most common cause for school absences and is marked by frequent and episodic exacerbations. Schools, particularly those with full-time registered school nurses, provide an established system to deliver health

care and patient education and improve monitoring of asthma symptoms. SAMPRO is a widely endorsed school health program that promotes an integrated approach to coordinate pediatric asthma care among clinicians, families, and school nurses.

In parallel to the development of the white paper and toolkit, the SAMPRO workforce and the AAAAI have supported state and federal legislation to support government funding and financial incentives to support school-based asthma care. It is important to recognize that sustainability of SAMPRO will depend on schools having adequate financial resources to maintain funding for school health that coordinate care with clinicians, the stocking of asthma rescue and controller medications, and infrastructure for training of school personnel on asthma management. Future efforts should focus on standardizing requirements for the exchange of health care information among families, schools, and clinicians and to establish a system of standardized data collection to assess health and educational for children with asthma.

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