

Implementing school asthma programs: Lessons learned and recommendations

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Despite significant advances in the treatment of asthma and the development of evidence-based and evidence-informed guidelines, childhood asthma morbidity remains high. One measure of asthma-associated morbidity is school absenteeism. In this rostrum we summarize key themes from 3 articles in this special issue on school-centered asthma programs. All 3 articles in this series describe several common themes that are essential for successful school-based interventions. These themes include the importance of trust and building strong partnerships, the importance of interaction and communication between multiple key stakeholders (ecological framework), the central and often overlooked role of the primary care clinician, the need for sustainable resources, and the importance of context and public policy. We then discuss how to apply the framework of implementation research to inform and evaluate school-based interventions. Finally, we make a series of recommendations for future work. (*J Allergy Clin Immunol* 2014;134:1245-9.)

Key words: Asthma, school-based asthma programs, implementation research, environment, policy

Despite significant advances in the treatment of asthma and the development of evidence-based and evidence-informed guidelines,^{1,2} childhood asthma morbidity remains high.³ One measure of asthma-associated morbidity is school absenteeism.⁴ With an estimated 36,000 children with asthma who miss school each day, asthma is the leading cause of absenteeism.⁵ Because missing school has been associated with lower academic performance,^{6,7} keeping children in school is critical to the eventual creation of an educated workforce.

This theme issue contains a series of articles focused on school and asthma. Cicutto et al⁸ describe the importance and role of the school nurse in reducing asthma morbidity, whereas Huffaker and Phipatanakul⁹ describe the school environment, school-based environmental interventions, and associated challenges to reduce

Abbreviation used
IR: Implementation research

morbidity. Lynn and colleagues¹⁰ then discuss how changes in school-based public policy could improve outcomes for children with asthma and create greater equity.

These articles are timely and can serve as guides to reducing asthma morbidity and decreasing school absenteeism. Children spend approximately 8 to 12 hours per day, 180 days per year in school on average (16% to 25% of their childhood). Second only to the child's home, children spend more time in the school environment than in any other single location. School structures, such as flat roofs and an absence of downspouts, promote water leaks with attendant mold, and plentiful water and food sources attract mice and cockroaches; all of these pose significant environmental exposures for the child with asthma. On the other hand, schools afford the child with asthma an opportunity to engage school nurses as partners in asthma management to reinforce treatment and education. Thus school nurses could play a major role in enhancing asthma management for children.

Compared with the home environment, however, the internal and external school environment has received little attention, and studies with school nurses or school-based disease management interventions (with the exception of Open Airways¹¹) have had mixed results.^{12,13} In this article we will first briefly summarize the major points of the 3 theme articles.⁸⁻¹⁰ Then we will discuss unifying themes and the framework that can be used to inform school-based interventions, including engaging the primary care clinician as an important stakeholder and the potential role of the specialist. Finally, we will make a series of recommendations for future work.

THE INTERNAL AND EXTERNAL SCHOOL ENVIRONMENT

Decades of research have established the association between exposure to mold, allergens, and pollutants in the home and asthma morbidity in children.¹⁴ Less is known about the school environment, where children spend 8 to 12 hours per day. Huffaker and Phipatanakul⁹ review the challenges and benefits of school environmental remediation as a component of inner-city school asthma programs. Children in urban schools are exposed to the same allergens already known to be important in urban home environments (cockroach, mouse, dust mite, and mold) and to urban pollutants, such as exhaust from idling buses.⁹ Interventions designed to reduce these environmental exposures in schools must engage multiple stakeholders, and they must fit the unique challenges of the school environment and the school year. They must also take into

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consideration the need for intervening in multiple locations in the school and the importance of using well-established methods that are not disruptive to the school environment. Finally, school-based interventions must also consider the home environment, and both settings will need interventions to reduce exposures. Although the effort will be labor-intensive, these interventions have the potential to positively and simultaneously reduce asthma morbidity in large numbers of children.

SCHOOL-BASED INTERVENTIONS

Cicutto et al,⁸ in this issue of the *Journal*, describe the varied school-centered asthma intervention models that have been tested. These interventions range from supporting the school health team to case management and care coordination systems to more intense direct observation of daily inhaled corticosteroid use.¹² Most of these studies have demonstrated improvements in asthma knowledge, increased regular use of preventive asthma medications, and reductions in school absenteeism, but mixed results have been found for urgent and emergency care. The reasons for these inconsistent results, as Cicutto et al⁸ point out, are multifactorial and range from the little control students have over their own environmental exposures to the inclusion of students with well-controlled asthma who might not benefit from an intervention. Another major challenge has been failure to engage all of the key stakeholders, namely the primary care clinician. Challenges to implementing and sustaining even successful asthma interventions include an insufficient number of school nurses, and inadequate information technology capability and nursing technology knowledge.

PUBLIC POLICY

Depending on a school district's existing infrastructure, funding, and federal, state, or district school policies, school-based asthma programs require resources for implementation and maintenance. One important effort for the sustainability, scalability, and equity of school-based interventions is public policy. As Lynn et al¹⁰ discuss in this issue of the *Journal*, asthma experts and investigators leading school-based interventions are well poised to advance policy change in multiple stages within the process. To do this, asthma experts can build awareness and can advocate, implement, and evaluate programs for effectiveness. Essential to policy change, yet largely unknown in school-based asthma programs, is their cost-effectiveness. For example, although having a full-time school nurse in every school is the gold standard, is their presence cost-effective? The Student-to-School Nurse Ratio Improvement Act of 2013¹⁵ encourages awarding competitive demonstration grants through the US Department of Education to address this standard. Other opportunities for policy change include revisiting building standards for new schools and policies related to sharing information about asthma between primary care clinicians and schools nurses and policies related to inhaler self-carry by students.

CREATING A FRAMEWORK FOR SCHOOL INTERVENTIONS: LESSONS FROM IMPLEMENTATION RESEARCH

The major unifying theme in the articles in this special issue is the central value of implementation research (IR) in

school-based asthma programs (Table I). IR is designed to understand and work within real-world situations.^{16,17} In general, the goal of IR studies is not to acquire new knowledge but rather to determine how to transfer/translate that knowledge into the real world. Important in IR work is context, the health system, structure, and end users. It is in the application of IR principles that the articles in this series create a framework for school-based interventions. The systematic process of evaluating a program's effectiveness and modifying it to adapt to real-world settings is critical to maintaining the essence of a program's effect. Unfortunately, as Lynn et al¹⁰ point out, this iterative monitoring function is often left out in resource-strapped environments. Identifying ways to continuously evaluate and simplify programs to make them (more) cost-effective while maintaining their outcomes is essential. For example, assigning a policy advocate whose background is in clinical asthma care or school-based asthma to an advisory committee can provide feedback to site champions, and using surrogate end points, such as enrollment in a program of proved effectiveness once more established outcomes, such as reductions in hospitalization, have been demonstrated might be helpful. Likewise, aligning the investigator's research goals with a school district's mandates (such as the School Based Asthma Report in Connecticut) can satisfy different end points.

Building trust

One of the first steps in IR is identifying the key end users and stakeholders and engaging them. Both Huffaker and Phipatanakul⁹ and Cicutto et al⁸ emphasize the importance of engagement and buy in by school administration, staff, and school nurses and the building of trust.¹⁶ Too often, scientists and the research community have created interventions that are then imposed on schools and school nurses. These researchers then disappear with their intervention after they have obtained their results (what a Denver School Nurse called "parachuting") only to return again when they have a new intervention that they want to study. The failure to engage end users in the design, implementation, modification, and evaluation of a project is a major reason why successful interventions have not been successfully translated or disseminated. Each party must get something out of the relationship: there must be mutual benefit. The researcher must often give up certain aspects of an intervention to fit the intervention into what the school can or cannot do, and the only way to know whether this will be necessary is to engage the key stakeholders in the school and listen to what they say. A school nurse might not be able to implement an intervention if the school administration is not supportive of the effort or if the intervention is cumbersome, requires space, or is overly time-consuming. The timing of the intervention is also important; asking school nurses to conduct an asthma intervention at the start of the school year is difficult without added resources, but it might also be the most important time for the intervention. How to begin the intervention at the start of the school year requires a dialogue and negotiation between the researcher and the school nurse. Engagement of school administration from the board of education to the school principal is also essential. Policy then supports this partnership by reducing barriers, such as reducing mold exposure by changing building regulations for new schools and decreasing the number of 911 calls by allowing activated and skilled school nurses to better respond to asthma emergencies.

TABLE I. Applying the IR framework for successful school-based asthma interventions

Build trust	• Identify key stakeholders and engage them (ie, school administrators, nurses, staff, families, clinicians) • Maintain flexibility • No “parachuting” • Create an intervention that is meaningful and resonates with subjects
Engage primary care community	• Establish close links with asthma care providers and school nurses • Create meaningful systems of communication between asthma care providers, families, and school nurses • Empower school nurses to communicate important asthma information to clinicians, families, and teachers
Create team partnerships	• Identify team members and assign roles • School nurse reinforces asthma treatment and education and assesses asthma control • Primary care clinician prescribes appropriate therapy and distributes an understandable written asthma treatment plan • Parental support of program and knowledge of child’s asthma severity/control key and medication administration
Use an ecological context	• Interventions must be adapted to existing environment • Assess school environment to identify potential asthma triggers • Propose cost-effective solutions (eg, integrated pest management and air filtration systems)
Implement policy and build resources	• Support evaluation of programs • Determine cost-effectiveness • Provide financial and human capital within current context • Establish asthma-friendly policies

Finally, families, parents, and children need to be engaged in the intervention. The investigator needs to know that the question being addressed or the goal of the intervention is important and meaningful to families and that the proposed intervention resonates with families and is achievable. Sustaining change requires a system/behavior change, and successful interventions need to include behavior change strategies directed at the families and children, such as goal setting and problem solving.

Engaging the primary care clinician

As Wheeler et al¹⁸ point out, the number one lesson learned from prior school-based asthma programs is the need to establish strong links to the primary care clinician, and this is an area where many programs have not succeeded. Primary care clinicians need to be engaged, and they need to partner with school nurses and parents. The primary care clinician has multiple roles in the care of the child with asthma. First, primary care clinicians are responsible for diagnosing asthma and starting asthmatic children on therapy appropriate for their asthma severity. The medical community also plays a role in starting the education process about when and how to use this therapy, in providing families with understandable written instructions about their asthma treatment, and in educating families about asthma triggers and their avoidance.

Starting children with asthma on appropriate therapy has a significant and sustained effect on medical services use and is the centerpiece of the long-running disease management program called Easy Breathing.¹⁹ Pediatrician engagement has been present since the program began. First, the pediatric general community identified asthma treatment as a major concern/problem and as an area they wanted to address. Pediatricians, with guidance from the asthma research community, then helped design the program, which underwent multiple revisions in the first 6 months of implementation to improve efficiency and ease of use. Questions and activities that were thought originally to be important were removed to decrease the burden on the clinician. Through Easy Breathing, we have learned that when asking clinicians to implement a new program, less is more. Rather than ask clinicians to engage in a comprehensive asthma program, the Easy Breathing program asked them to do 2 things²⁰: make the diagnosis and start

the right therapy. This involved a total of originally 4 and now 5 components: (1) make the diagnosis, (2) assign a severity, (3) prescribe severity-appropriate therapy, (4) provide a written asthma treatment plan, and (5) assess asthma control during follow-up contacts (added after the release of the 2007 National Asthma Education and Prevention Program’s Expert Panel Report 3¹).

For each component, a simple validated tool²¹⁻²³ is provided to help guide the clinician. In return, clinicians realize improvements in their patient’s asthma control and decreased time in the office spent treating the child with acute asthma and at night on call (Easy Breathing has reduced clinician time spent on asthma by almost 50%). For the Medicaid payer, the program has resulted in a positive return on investment of \$3.58 per child with asthma per year (pharmacy costs included).²⁴ By understanding the constraints of the primary care clinicians in terms of time and resources and engaging them as active participants, Easy Breathing has reduced the 464-page 2007 National Asthma Education and Prevention Program’s Expert Panel Report 3 document to 3 “pieces of paper” and, as a result, has engaged more than 400 pediatric clinicians in Connecticut, who have enrolled more than 130,000 children in the program since 1998 in addition to programs in 8 other states.

Role of the specialist in school-based asthma interventions

Specialists play an important role in school-based asthma programs by providing expert opinion and guidance to school boards and local and state commissions and being an advocate for school nurses. Just as the patient-centered “medical home” has emerged as the new model for primary care delivery, for the child with asthma, the specialist plays a major role in the “medical neighborhood,” an expanded concept of patient-centered care.²⁵ The specialist in a patient-centered specialty practice reinforces care coordination, improves access to specialty care,²⁶ reduces unnecessary tests, enhances communication, and evaluates performance measures. Thus the specialist can create partnerships with school nurses and school systems and enhance care to support children with asthma and especially children with poorly controlled or difficult-to-control asthma.

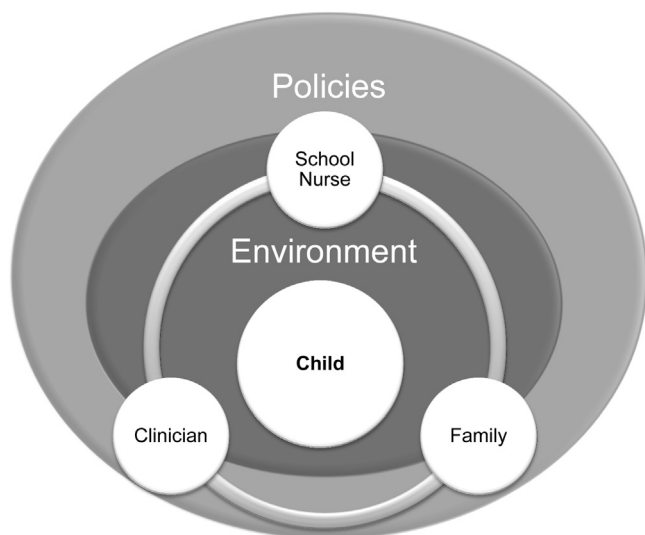


FIG 1. Creating a partnership team. It takes a community to support the child with asthma. School nurses can reinforce initial education and treatment from the primary care clinician and can work with children to improve inhaler technique. School nurses and parents need to work cooperatively to ensure optimal care for the child, such as parental compliance with school asthma policies. Clinicians initiate asthma therapy and education with families in the office. All of this occurs against a backdrop of existing infrastructure and policies.

Creating a partnership team

"It takes a village to raise a child," and it takes a community to support the child with asthma. Central to this community are families, school nurses, and the primary care clinician (Fig 1). The school nurse can reinforce the initial education and treatment from the primary care clinician, can work with children to improve their inhaler technique, and is optimally positioned to assess the adequacy of therapy and asthma control in a real-world environment. She or he is the best person to assess whether a child can self-carry an inhaler and might on occasion be called on to assist with controller medication administration.¹² However, this can occur only when the school nurse and the child's clinician are working together.

Mechanisms for the exchange of this information are needed. Similarly, school nurses and parents need to work cooperatively, ensuring optimal care for the child with asthma. However, these measures will not be completely successful if the school (and home) environment is a reservoir for allergens and pollutants. Huffaker and Phipatanakul⁹ offer several solutions to the school exposures that consider context and the end user, including integrated pest management and updating and improving school air filtration systems. Finally, standardized policies for inhaler self-carry and for administration of rescue medication through a nebulizer with a compressor are needed, as well as improving the exhaust systems of school buses and enforcing idling policies. In their role in the medical neighborhood, specialists can aid communities in establishing these policies and best practices.

Health care providers who understand their own school system, including primary care clinicians and specialists, can advocate for appropriate asthma services. Similarly, the standardization of asthma forms, particularly the asthma treatment plan (also known as the asthma action plan), can help key stakeholders speak the same language when managing asthma in multiple places by

multiple individuals. All children should receive a written asthma treatment plan that families can understand and implement.²⁷ This treatment plan establishes the common platform for communication between clinicians, families, and school nurses. However, asthma therapy can be effective only when all stakeholders know what the clinician has prescribed. Therefore advocating policies for the direct sharing of the asthma treatment plan with the child's school nurse can create continuity of asthma care. One of the challenges experienced by many school nurses is obtaining signed medication administration forms for onsite quick-relief inhalers. One way to address this problem is to combine the medication authorization with the asthma treatment plan on one sheet of paper or, better still, electronic transfer of the information to a secure system. This has successfully been implemented in Easy Breathing in Connecticut and can be used as a model for other school-based asthma programs.

As expressed by clinicians, a clear benefit of a school-based asthma program is knowledge that the school nurse is assessing and educating the patient on proper asthma care. Communication of important information, such as the level of asthma control, number of absences, and frequency of office visits for symptomatic asthma, from the school nurse to the clinician is also beneficial. When school nurses communicate this information (preferably in a standardized common language) to clinicians, it empowers them and provides a missing piece of information essential to achieving good asthma control.

Context: Ecological framework key to achieve success

In addition to engaging all of the key stakeholders, interventions must be adapted to fit the context in which the work is being done. The structure of the environment is critical to program success. Changes in the classroom environment must be done in every classroom, which adds significant expense to an environmental intervention. Programs that fail to understand how the school functions, its needs, and its challenges and that do not account for these in the intervention are likely to fail. This is illustrated in the national guidelines related to childhood obesity that were released several years ago.²⁸ This thoughtfully created document uses an evidence-informed approach to outline what a pediatrician should do related to nutrition and physical activity at each office visit and notes that it will take approximately 20 minutes to fully complete. However, the average office visit is only 12 minutes. Pediatricians cannot use these guidelines in their practice in this format. The time required to implement an intervention is the most frequent question that school nurses, families, clinicians, and schools ask. Removing activities in the intervention that are not critical or essential to the primary goal are important to getting buy in from clinicians and school nurses. Other elements can be added later, once the benefit of the intervention to the clinician or school nurse becomes apparent.

Sustainable resources

The final major theme discussed in the theme articles⁸⁻¹⁰ is the need for sustainable resources in the form of financial and human capital for school-based asthma interventions. These resources are essential for implementation and evaluation of any new program. Most often, school-based asthma programs are investigator-initiated projects with outside funding. These

researcher-led initiatives employ multiple study staff on projects with finite end dates. Key to making the transition from the intervention phase to the adoption phase is knowledge of what is needed to sustain the program and whether the program is cost-effective. Unfortunately, this type of analysis has been missing from most school-based asthma programs conducted in the past. Cost-effectiveness analyses are a needed component to determine whether a school-based asthma program is effective in a real-world setting and to clearly list the financial resources needed to implement the program.

FUTURE DIRECTIONS

In the future, school-based asthma programs could benefit from simplification, greater enforcement of local policies, and better cost/benefit analyses. Randomized controlled trials are not always the gold standard for IR.¹⁷ Mixed methods that use qualitative techniques, including interviews and focus groups, can help to formulate research questions and determine the feasibility and content of interventions.²⁹ Key stakeholders need a seat at the table, and as a research community, we need to listen to these stakeholders. New research methods, such as the stepped wedge design, cost less to implement and can more readily engage more schools that might not otherwise want to be involved if they are part of a control group. Importantly, actively linking the asthma care clinician to the school intervention is essential. Cost and cost-effectiveness analyses need to be incorporated into every school-based intervention, and real-world considerations need to be included in study design. Interventions might require changes in school nurse functions and resources; both direct and indirect costs need to be assessed. School-based interventions will greatly benefit from investigators using community-based participatory research approaches to IR, which define need, describe a planned approach, engage key stakeholders, and implement and modify interventions to achieve sustainability and dissemination. Finally, policy changes are needed to allow clinicians to share home asthma treatment plans with schools and school nurses (similar in Connecticut to recently enacted immunization information-sharing policy).

The 3 articles in this special theme issue⁸⁻¹⁰ describe and highlight the successes and challenges of implementing school-based asthma interventions. Overall, they emphasize some major themes common in successful programs. The most important theme is to identify and establish trusting relationships between investigators and stakeholders, school districts, parents, school nurses, and clinicians and to engage them early in the study design phase of the intervention. Without engagement of all stakeholders, interventions will have limited long-term success.

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