

RESEARCH ARTICLE

Sustaining School-Based Asthma Interventions Through Policy and Practice Change

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ABSTRACT

BACKGROUND: Schools are an ideal setting for implementation of asthma interventions for children; however, sustaining school-based programs can be challenging. This study illustrates policy and practice changes brought about through the Childhood Asthma Linkages in Missouri (CALM) program to sustain such programs.

METHODS: Researchers analyzed caregiver-reported quantitative data regarding asthma-related outcomes in preintervention and postintervention surveys and qualitative data regarding sustainability efforts in schools reported by CALM grantees. A grounded theory approach was used to identify key concepts and themes that emerged.

RESULTS: In 330 children, significant improvements were seen in asthma symptoms, rescue inhaler use, health care utilization, school absenteeism, and activity limitations. Overall, 27 school-based policy and practice changes supporting program sustainability were reported, with policy changes most often concerning the assessment and/or monitoring of children with asthma in the school setting, and practice changes most often regarding institution of regular asthma education programs for students and school personnel.

CONCLUSIONS: Sustaining school-based asthma programs is challenging, but can be realized through the participation of diverse partners in enacting policy and practice changes that support the institutionalization of programs into the day-to-day processes of the schools.

Keywords: child and adolescent health; school health services; chronic diseases; policy; evaluation; school nurses.

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According to data from the 2010 National Health Interview Survey, the percentage of people across the United States reporting current asthma was 8.4%;¹ one-third of the cases, or 7 million individuals, were under the age of 17 years.² Four million of those children were reported to have experienced at least one asthma attack in the previous year.²

Asthma takes a toll on the physical health and well-being of many children and also has serious consequences for families, schools, and communities. Children with asthma miss more school days than their

non-asthmatic counterparts;³⁻⁵ asthmatic children were found to be absent from school 1.5-2.7 more days than non-asthmatic children.^{3,4,6,7} Missed school days have financial costs to many families due to missed work days and have financial consequences for schools, as public school funding is often tied to attendance rates. Wang et al⁷ utilized data from the 1996 Medical Expenditure Panel Survey to estimate the direct and indirect costs of asthma to families and society, finding that the direct cost of asthma-related care for asthmatic children was \$401 per child during

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that calendar year. In addition, the total economic impact of asthma among school-age children including health-related costs, school absence days, loss of parental productivity, and premature death due to the condition was \$791 per child. In a review of 68 studies on indirect and direct costs of asthma, Bahadori et al⁸ found that in some cases the indirect cost or lost time and productivity during work hours outweighed asthma's direct costs.

The large number of US children living with asthma—and the huge financial toll the disease takes on families and communities—indicate a serious need for improved asthma management and care. Schools are an ideal setting for providing asthma management programs and care for children, due to the length of time children spend in school, the fact that programs are able to reach children who may not be reached through other settings, and because educational opportunities regarding asthma can be incorporated into existing infrastructure. Many programs have attained positive outcomes in improving asthma self-management in schools, improving asthma-related health outcomes, and decreasing both school absenteeism and asthma-related health care utilization.⁹⁻¹⁴ Unfortunately, it is often challenging to sustain these effective programs in the school setting, due to constraints on finances, staff, and other resources.

Sustaining school-based asthma programs is critical due to the large population affected and because of the considerable health knowledge and behavior change that must occur for symptoms to improve.¹⁵ Goodman et al¹⁶ outlined the need for sustainable programs, including their ability to deliver both complex behavior change and cultural shifts, and the fact that the ending of programs is costly for the organization and the staff employed by them. Sustaining programs over time reinforces education and training, provides opportunities to reach more individuals, helps to reinforce the behavior change necessary to make long-lasting positive effects on health outcomes, and results in improvements in asthma care management.¹⁷

How might school-based asthma management and care programs overcome resource constraints and be sustained over time? Sustainability in the context of health programs has been focused on the program's ability to continue to achieve positive health outcomes among participants, sustain activities, and continue to build the capacity of the community to continue activities after the end of funding.¹⁸ Without a regular influx of money to provide resources for program implementation, staff, equipment, etc, to sustain the work and the outcomes, the services and practices being provided through the programs need to be taken up by the agency implementing the program and absorbed into its day-to-day processes. There is much literature regarding the benefits and strategies involved in this absorption of the work, which is most often

referred to as the institutionalization of health promotion programs.¹⁶⁻¹⁸ Institutionalization of health promotion programs was first discussed by Goodman et al,¹⁶ who defined it as occurring when a program is sustained as an integral part of an organization. Institutionalization does not require the formalized writing of policies or regulations, but the continuation of procedures or routines in the day-to-day process of the organization.¹⁹ School-based interventions may be sustained through policy and practice changes both interinstitutional—change occurring in the ways institutions, caregivers, and other entities interact with each other—and intrainstitutional—change occurring within one institution.²⁰ Friedman et al²¹ outlined the 4 sustainability strategies that emerged from the Allies Against Asthma work as resource development, institutionalization, system change, and capacity building. These approaches, which can occur both within and between organizations, were reported to help sustain the work of the Allies Against Asthma coalitions over time.

Policy and practice changes have been shown to increase the sustainability of programs and ultimately encourage health promotive behaviors and prevent chronic diseases.²²⁻²⁵ Brownson et al²² found that changing the physical environment through policy and practice changes by increasing access to health promotive resources, plus altering the communication and economic environment surrounding the behavior, were effective in bringing about positive behavior change regarding physical activity, healthy eating, and tobacco use.

Policy and practice changes have also been incorporated into asthma programs to improve care and to increase the opportunity for sustainability of programs.^{17,21} The Healthy Learners Asthma Initiative, a school-based asthma program in the Minneapolis Public Schools, saw several sustained changes and practices that became part of the daily staff routine and resulted in sustainability of the program.¹⁷ Schools in this program institutionalized the following practices: the review of health forms by nurses in order to identify and reach out to children with asthma, documentation of care of students and communication with parents and providers by school nurses, and education of students, families, teachers, and staff.

This article describes policy and practice changes brought about to sustain effective school-based asthma programs in 14 communities across the state of Missouri. Whereas there is much literature regarding institutionalizing and sustaining such programs, this project is unique in that it encompasses a diverse range of agencies implementing school-based programs across many communities and settings. It provides a broad view of the types of policy and practice changes which may be achieved by those implementing comprehensive school-based programs.

Additionally, as the evaluation of the project includes child-level health outcomes data in addition to sustainability factors, this study adds to the literature around sustaining programs proven to be effective at improving health outcomes. Whereas other studies have taken a retrospective look at changes which have occurred, this study has tracked changes as they have taken place, providing more insight into the process of sustaining such programs.

METHODS

The Childhood Asthma Linkages in Missouri (CALM) program was designed in 2008 by the Missouri Foundation for Health (MFH) to support collaborations among schools, medical care providers, and other community organizations working to improve asthma care and health outcomes for children. As the prevalence of asthma among children in Missouri is even higher than it is nationally, with 10.1% of children 18 years or younger reporting current asthma, according to the 2008 wave of the Behavioral Risk Factor Surveillance System,²⁶ the need for effective interventions for children with asthma in Missouri is especially salient. CALM grantees—schools, hospitals, community- and university-based health centers, and public health departments across the state—were tasked by MFH with developing and implementing comprehensive asthma programs which incorporate long-term behavior change as well as develop systems to advance and sustain asthma care for children. Thus, the need for sustainability was present at the inception of the program and one of the foundations of the work of the CALM grantees.

Participants

Fourteen Missouri programs comprised CALM, ranging from communities in rural Missouri to programs housed in urban St. Louis. Within the parameters set out by MFH, the grantees developed diverse interventions responding to the needs of their communities, including home visits, community and media outreach, Physician Asthma Care Education (PACE) physician training, children's asthma camps, and many school-based interventions. The CALM school-based programs included education and training for students, creation and sharing of asthma action plans, training for and provision of devices to school nurses, educational programs for other school staff, air quality improvement through filtration, and referrals to pharmacies, physicians, and other social service providers for families of children with asthma. In addition to the many interventions provided within their communities, CALM grantees worked over the years to create linkages and to enact policy and practice changes to support their work and improve coordination of care.

Program participants were children and youth aged 0-19, recruited through a wide range of methods via schools, hospitals, physician offices, and community events. All participants were reported as having a history of asthma-related symptoms, but were not required to have been given a diagnosis of asthma. Nine of the 14 CALM grantees reported individual level data regarding asthma-related health outcomes of program participants, with 330 preintervention and postintervention surveys completed by parents and guardians of participants from January 2011 to April 2013 included for analysis.

Instruments

The instruments created to document and track changes at both the community and individual levels were developed using tools in use by grantees as well as validated tools in the field of asthma and through a process with multiple rounds of feedback and pilot-testing by CALM grantees. One of these instruments was created to track the systems and policy changes brought about by the grantees that changed the way stakeholders interacted and operated and aimed to help ensure sustainability of their work past the CALM funding period. For data collection and reporting purposes, a "systems change" was defined as a change in a system—such as a school—related to the work of the CALM program that will help sustain the work over time and contribute to positive changes in the lives of children with asthma. "Policy changes" were defined as policies that have been enacted or enforced that supported the work of the CALM project and improved the lives of children with asthma; these changes should be documented in written policies, procedural manuals, organizational handbooks, job descriptions, etc. Systems and policy changes were reported annually. For this article, analyses focus on the data reported by the grantees regarding these changes that support the sustainability of their work, while highlighting the asthma-related health outcomes as a demonstration of the effectiveness of the programs. Asthma-related health outcomes were reported through a survey of caregivers of CALM program participants, administered at baseline and after 1 year of participation. De-identified and coded surveys were reported to the evaluation team online via the Qualtrics (Provo, UT) reporting system.

Procedure

Researchers at the Center for Managing Chronic Disease (CMCD) at the University of Michigan worked collaboratively with the CALM grantees and MFH to develop and implement a comprehensive evaluation regarding the program's reach, linkages, sustainability of efforts, and asthma-related outcomes for children. A mixed methods approach was utilized for the evaluation, with grantees reporting both

qualitative and quantitative data regarding reach, linkages, sustainability of efforts, lessons learned, and asthma-related outcomes.

The CALM evaluation began in January, 2011, with grantees reporting caregiver surveys on a rolling basis as participants were recruited into the program, and continued through April 2013. Data regarding systems and policy changes supporting sustainability of their efforts were reported by grantees in June 2011 and 2012. Once reported to the researchers at CMCD, the data were then analyzed across the programs, and common themes were summarized.

Data Analysis

Analyses of the policy and systems changes included an initial content analysis of the qualitative data reported by grantees regarding sustainability. A grounded theory of analysis approach was used to identify key concepts and themes that emerged from the data. Codes were created for each grantee, and common themes were identified and verified across all programs. Data were imported into NVivo 10 (QSR International, Melbourne, Australia), a qualitative data management software program, and themes were organized and enumerated by sector of grantee (school; hospital; or other, including health clinics and health departments), type of change reported, and setting of change.

Analyses of child-level health outcomes included caregiver surveys administered to 330 caregivers across all CALM sites. All survey variables were examined for consistency and completeness prior to analysis. The outcome variables include days and nights of symptoms, days of activity limitation and days of rescue inhaler use in response to asthma symptoms over the past 4 weeks, health care utilization and school absenteeism over the past 12 months, and presence of an asthma action plan. The distribution of the variables with continuous values (days and nights of symptoms, days of rescue inhaler use, days of activity limitation, and days absent from school) were assessed for normality and found to be skewed to the left, for this reason Wilcoxon signed rank tests for non-parametric, paired data were used to test significant changes over time. Asthma control was calculated based on the Expert Panel Report 3 (EPR-3) guidelines¹⁵ using symptom days and nights and rescue inhaler use to produce 3 categories of control: very poorly controlled, not well controlled, and well controlled asthma. Change over time in asthma control as well as the other categorical variables—any urgent health care use in the past 12 months and presence of an asthma action plan—were tested using a measure of symmetry, McNemar’s test for variables with only 2 categories and Bowker’s test for more than 2 categories. All analyses were conducted using SAS 9.3 (SAS Institute, Inc., Cary, NC).

Table 1. Summary of Reported Policy and Practice Changes

Type of School-Based Change	Type of Grantee	Themes		Total Changes Reported
		Improved Care	Improved Communication	
Policy change	School	7	3	7
	Hospital	2	0	2
	Other*	3	1	3
				12
Practice change	School	7	0	7
	Hospital	6	1	6
	Other*	0	2	2
				15

Changes may include more than one theme; categories are not mutually exclusive.

*Other denotes grantees not school or hospital based, specifically those based in community or university-based health centers and health departments.

RESULTS

At the organizational level, 50 changes supporting sustainability were reported by CALM grantees from 2011 to 2012. Of these, 21 were policy changes and 29 were practice changes; none of the reported changes were changes to systems. Of the total 50 reported changes, 27 were school-based changes, with 12 policy changes and 15 practice changes. For this article, changes enacted in school settings are discussed.

School-based policy and practice changes reported were found to fall within 2 themes: those supporting sustainability of Improved Care for Children with Asthma and those supporting sustainability of Improved Communication between Caregivers and Health Care Providers. Under these 2 main themes, the following sub-themes emerged (reported policy and practice changes often encompassed multiple themes) (Table 1).

Changes supporting sustainability of Improved Care for Children with Asthma included the following sub-themes across the 14 programs:

1. Asthma action plan creation, revision, and/or sharing.
2. Changes in the way students with asthma are assessed and/or monitored.
3. Increasing access to asthma medications and/or ensuring students are prescribed and taking medications per the National Heart, Lung, and Blood Institute’s (NHLBI) EPR-3 guidelines.
4. Training or education of students, school nurses, and/or other school staff.
5. Reduction of environmental asthma triggers.
6. Promoting EPR-3 guidelines.

Changes supporting sustainability of Improved Communication between Caregivers and Health Care Providers included the following sub-themes across the 14 programs:

1. Communication with child's primary care physician.
2. Communication with child's parent/guardian.

A majority of the school-based policy changes were reported by school grantees and were changes in the way students with asthma are assessed and/or monitored. Examples of these policy changes included:

1. A policy now documented in the health policy manual that describes the procedure for assessing children with asthma at regular intervals, based on illness severity. Students assessed to have poorly controlled asthma are monitored at the beginning of each school day, while students with better asthma control are monitored on a weekly basis.
2. A policy included in the school nurse manual regarding the use of metered dose inhaler technique check with In-Check Dial—a tool to assess and coach inhalation technique—when assessing children with asthma. Proper inhalation technique is critical to assure inhaled medication is deposited in the lungs.
3. A policy outlining the use of a new asthma assessment form, which is documented in the school nurse procedure manual. The new form promotes EPR-3 guidelines and standardizes care across nurses in the school district.
4. A policy regarding a new communication tool used by the school nurses when communicating assessment findings with primary care physicians of children with asthma, which is outlined in the school nurse handbook. The tool encourages care based on EPR-3 guidelines, and provides for more consistent care across providers.

School-based grantees and grantees based in other settings enacted a number of policy changes regarding the creation, revision, and sharing of asthma action plans in the school setting, including:

1. A new school board policy implementing standardized asthma action plans for all students with asthma in the district.
2. A new district-wide policy requiring students with asthma to have up-to-date asthma action plans on file at the schools.
3. The creation of a new asthma action plan including parental consent that enables schools and clinics to communicate with primary care providers, in use now across the school district.

School-based grantees also brought about a number of practice changes regarding asthma education and training, mostly involving regularly scheduled annual asthma training for clinic staff, school staff, athletic coaches, and school bus drivers.

Many of the changes enacted by the hospital-based grantees were practice changes involving asthma education and/or training. Examples of these practice changes include:

1. Training of school nurses by hospital-based asthma educator regarding the use of peak flow meters and assessment of asthma severity—while not included in formal job responsibilities, it is an ongoing practice.
2. Hospital-based asthma educator is provided regular time by school administration to implement asthma education with youth at high risk of having poorly controlled asthma.
3. Hospital-based asthma educator provides annual asthma education to school staff, with active support of school administration.

Grantees, in addition to reporting actual changes, reported ways in which changes helped enable sustainability of their efforts. Common themes which emerged across policy and practice changes reported by grantees included:

1. Improving awareness, knowledge, and skills related to asthma.
2. Continuation of high level of care for students with asthma.
3. Building capacity within the schools to better manage asthma.
4. Improving communication with caregivers and health care providers.
5. Increasing standardization of care for children with asthma, especially surrounding EPR-3 guidelines.

Evaluation of the CALM program has shown statistically significant positive changes in health outcomes for children with asthma after participation in the program. Parents and guardians of a sample of 330 child participants, average age of just under 9 years old (range 0.3-19 years), with slightly more boys in the sample (53%) than girls, reported significant decreases 1 year after program participation began in their report of daytime asthma symptoms (mean reduced from 5.8 to 2.7 days), nighttime awakenings due to asthma (mean reduced from 3.0 to 1.2 nights), rescue inhaler use (mean reduced from 5.7 to 3.0 days), and activity limitation due to asthma (mean reduced from 1.7 to 1.1 days). The proportion of those with well-controlled asthma as defined by EPR-3 guidelines increased from about half to three-fourths of the sample from baseline to 1 year later. Health care utilization (reduction from 57% to 36% with at least one urgent health care visit due to asthma), and both school absenteeism overall (mean reduced from 5.4 to 4.5 days) and school absenteeism due to asthma (mean reduced from 2.0 to 1.1 days) also showed significant reductions from baseline to follow-up. There was a statistically

Table 2. Asthma-Related Health Outcomes

Health Outcome	Mean (SD) at Baseline	Mean (SD) at 1-Year Follow-Up
Days of asthma symptoms in past 4 weeks	5.8 (8.1)	2.7 (5.2)*
Nighttime awakenings due to asthma in past 4 weeks	3.0 (6.0)	1.2 (2.7)*
Days of rescue inhaler use in past 4 weeks	5.7 (8.8)	3.0 (6.0)*
Days absent <i>overall</i> in past 12 months	5.4 (6.0)	4.5 (5.4)*
Days absent <i>due to asthma</i> in past 12 months	2.0 (3.8)	1.4 (3.2)*
Days not active due to asthma in past 4 weeks	1.7 (4.2)	1.1 (3.4)*
Health Outcome	Percentage at Baseline	Percentage at 1-Year Follow-Up
Students with well-controlled asthma, per EPR-3 guidelines	52	74*
Students with asthma action plans	64	78*
Students with at least one reported urgent health care visit due to asthma in past 12 months	57	36*

*Significant at $p < .01$.

significant increase in parent report of the existence of asthma action plans as a management tool for their children's asthma, from 64% of students at baseline to 78% at follow-up (Table 2).

DISCUSSION

The CALM evaluation has shown that school-based policy and practice changes can be brought about through the work of schools, hospitals, and other community partners. Although school-based policy changes were more likely to be enacted by school-based grantees, practice changes were equally likely to be brought about by school-based and hospital-based grantees, and were also reportedly effected by grantees based in community and university-based clinics as well as health departments. It is not surprising that school-based grantees were more likely to be successful at implementing school-based policy changes; it is surprising, however, that grantees based in non-school settings were also successful at bringing about policy changes in the school setting. As these grantees operated independently without the support of a formal community-based coalition, it is a testament to the relationships and linkages created within these programs that they were able to enact such sustainable change in the school setting.

The work of CALM demonstrates 2 critical factors in the development of school-based asthma programs. First, directing grants toward schools allows for

development of policy changes that will influence the programs and practices in place in schools. Second, emphasizing the importance of schools developing linkages with clinical providers and other community partners allows for immediate influence in asthma-related outcomes for children.

Across the programs, individual asthma-related health outcomes of children improved significantly after participation in the CALM interventions. The school-based policy and practice changes outlined above have the potential to sustain the interventions that have been correlated with these improved health outcomes and thus have a positive impact on the health of a large number of children through schools across the state of Missouri.

The outcomes reported here reflect a process in which diverse organizations caring for children with asthma have formed linkages to allow for more comprehensive and coordinated approaches to disease management. Schools, clinicians, and other community partners are increasing their communication and coordination and are connecting more often with families to improve care for children with asthma. Improved coordination of care is critical for supporting children with asthma and their families; to support ongoing coordination of care, it is essential to use an approach that highlights policy and practice changes. As noted in Clark et al,²⁰ the management of asthma is influenced by more than the actions of the asthma sufferer. Efforts to coordinate care and create linkages across all of those who participate in management—primarily schools, clinics, and homes—help children assume responsibility for their own care and provide consistent approaches.

Limitations

As the policy and practice changes reported have only recently been realized, it remains to be seen whether or not they will be sustained over time. Practices may be discontinued or modified; policies may be changed or unenforced. A limitation of this study is the lack of long-term evaluation of the practice and policy changes within these school settings, and also of the impact of these practices and policies. In addition, the lack of comparison group data for children with asthma not receiving the intervention makes it impossible to definitively conclude that the program changes caused the improved health outcomes. As the program has shown to be related to improved health outcomes for the children in the intervention, it is likely that sustaining the practices and policies that allow the program components to continue will show positive results for more children. However, that is beyond the scope of this study.

Conclusions

The CALM evaluation has shown the program to be correlated with significantly improved asthma-related health outcomes for program participants, as well as numerous policy and practice changes effected in the school settings that will help to sustain the effective programs over time across the state of Missouri. CALM grantees based in schools, hospitals, and other settings all played roles in bringing about the policy and practice changes, which highlights the importance of the engagement of diverse partners in school-based asthma program implementation.

IMPLICATIONS FOR SCHOOL HEALTH

Effective school-based asthma programs improve health outcomes for children as well as support schools in helping students reach their academic potential, by supporting higher rates of attendance and decreased health care utilization, and successful implementation and institutionalization of these programs helps to maintain positive outcomes. Sustaining school-based programs that were found to be effective in improving health outcomes for children—such as the CALM program in the state of Missouri—should be a priority, in order to reach more children in need of care. School-based programs reach more children than programs in clinical or other settings as they interact with more children, and with much more frequency, thereby having the potential to improve the health of large numbers of children. The results from this study highlight a number of areas in which grantees have been able to bring about long-lasting changes in the school setting to carry on their work and continue to have a positive impact on children with asthma. These changes are enabling positive practices to continue without additional funding, which benefits both the schools and the communities. Information from this study can be used by schools and their partners when considering ways to incorporate positive asthma practices into their schools. One of the critical pieces of information imparted from the CALM program is the importance of working with diverse partners to sustain asthma programs in schools. Schools, hospitals, and other partners have access to varied resources and expertise that can be brought to bear on efforts to better coordinate care and sustain effective asthma programming for children. As schools face ongoing challenges regarding resources, and as the number of children with chronic disease continues to rise, working with community partners to collectively bring about positive health outcomes for children will be a necessity. Finding ways to create these healthy and mutually beneficial linkages at the outset of planning and programming, as was evident within the work of the CALM grantees, can pave the way for sustaining programs and health benefits for

children. Also important in supporting this work is the contribution of funders who are aware of the importance of working toward policy and practice change and the sustainability of the work, and who actively create more funding opportunities for schools and other community partners to develop these linkages in support of school-based asthma programs coordinating care for children in their communities.

Human Subjects Approval Statement

This study was determined to be exempt from oversight by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board due to its use of de-identified organizational-level programmatic evaluation data.

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