

Effect of the School-Based Telemedicine Enhanced Asthma Management (SB-TEAM) Program on Asthma Morbidity

A Randomized Clinical Trial

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 Supplemental content

IMPORTANCE Poor adherence to recommended preventive asthma medications is common, leading to preventable morbidity. We developed the School-Based Telemedicine Enhanced Asthma Management (SB-TEAM) program to build on school-based supervised therapy programs by incorporating telemedicine at school to overcome barriers to preventive asthma care.

OBJECTIVE To evaluate the effect of the SB-TEAM program on asthma morbidity among urban children with persistent asthma.

DESIGN, SETTING, AND PARTICIPANTS In this randomized clinical trial, children with persistent asthma aged 3 to 10 years in the Rochester City School District in Rochester, New York, were stratified by preventive medication use at baseline and randomly assigned to the SB-TEAM program or enhanced usual care for 1 school year. Participants were enrolled at the beginning of the school year (2012-2016), and outcomes were assessed through the end of the school year. Data were analyzed between May 2017 and November 2017 using multivariable modified intention-to-treat analyses.

INTERVENTIONS Supervised administration of preventive asthma medication at school as well as 3 school-based telemedicine visits to ensure appropriate assessment, preventive medication prescription, and follow-up care. The school site component of the telemedicine visit was completed by telemedicine assistants, who obtained history and examination data. These data were stored in a secure virtual waiting room and then viewed by the primary care clinician, who completed the assessment and communicated with caregivers via videoconference or telephone. Preventive medication prescriptions were sent to pharmacies that deliver to schools for supervised daily administration.

MAIN OUTCOMES AND MEASURES The primary outcome was the mean number of symptom-free days per 2 weeks, assessed by bimonthly blinded interviews.

RESULTS Of the 400 enrolled children, 247 (61.8%) were male and 230 (57.5%) were African American, and the mean (SD) age was 7.8 (1.7) years. Demographic characteristics and asthma severity in the 2 groups were similar at baseline. Among children in the SB-TEAM group, 196 (98.0%) had 1 or more telemedicine visits, and 165 (82.5%) received supervised therapy through school. We found that children in the SB-TEAM group had more symptom-free days per 2 weeks postintervention compared with children in the enhanced usual care group (11.6 vs 10.97; difference, 0.69; 95% CI, 0.15-1.22; $P = .01$), with the largest difference observed at the final follow-up (difference, 0.85; 95% CI, 0.10-1.59). In addition, children in the SB-TEAM group were less likely to have an emergency department visit or hospitalization for asthma (7% vs 15%; odds ratio, 0.52; 95% CI, 0.32-0.84).

CONCLUSIONS AND RELEVANCE The SB-TEAM intervention significantly improved symptoms and reduced health care utilization among urban children with persistent asthma. This program could serve as a model for sustainable asthma care among school-aged children.

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Inhaled corticosteroids are the most effective long-term therapy for patients with asthma,¹ and guidelines recommend that preventive medications be used daily for all patients with persistent symptoms.² However, many children with persistent asthma do not receive preventive medications,³⁻⁵ and minority children living in poverty are at highest risk of inadequate therapy.⁶⁻⁹ In addition, many children who are prescribed a preventive medication do not achieve optimal control, at least in part because of poor adherence¹⁰ and a lack of appropriate follow-up care.¹¹ Thus, efforts to improve the delivery of preventive asthma care are warranted.

We have a long-standing partnership with the Rochester City School District to develop programs for urban school-aged children with asthma. Our original School-Based Asthma Therapy study^{12,13} tested directly observed therapy (DOT) of preventive asthma medications in school for children aged 3 to 10 years. By supervising daily medication administration in school, we could ensure that children consistently received their medications, at least on days they attended school. In a randomized clinical trial, we found that children receiving preventive medications at school had more symptom-free days (SFDs) and fewer exacerbations compared with a group receiving usual care.¹³ However, we found that the program was difficult to maintain in its original design because the coordination of the child's assessments, medication prescription, and facilitation of medication delivery through school required an unsustainable effort by the research team.¹⁴

We developed the School-Based Telemedicine Enhanced Asthma Management (SB-TEAM) program in hopes of achieving sustainability. The SB-TEAM program expands our successful school partnership by integrating 2 systems of care to ensure access to guideline-based preventive asthma treatment. The SB-TEAM program uses school-based DOT of preventive asthma medications to enhance medication adherence, as well as telemedicine to ensure access to appropriate asthma assessments, preventive medication prescription, and follow-up care. Telemedicine allows clinicians to provide assessment and consultation through remote audiovisual technology and removes barriers to accessing care by enabling children to be seen by a clinician without making a trip to their physician's office.¹⁵⁻²⁰ Our primary hypothesis was that children receiving the SB-TEAM intervention would have more SFDs postintervention compared with children in an enhanced usual care (eUC) group.

Methods

Participants

We recruited 400 children from 49 schools in Rochester, New York, over 4 consecutive school years (2012-2016). Eligibility requirements included physician-diagnosed asthma with persistent symptoms or poor control based on National Heart, Lung, and Blood Institute guidelines,² age of 3 to 10 years, and enrollment in the Rochester City School District. Children and families were ineligible if they were unable to speak English, did not have access to a telephone for follow-up, or had other significant medical conditions (eg, congenital heart disease or cystic fibrosis) that might interfere with assessments. The Uni-

Key Points

Question Can a novel school-based intervention that includes supervised asthma therapy and telemedicine visits overcome key barriers to guideline-based preventive care and improve outcomes for urban children with asthma?

Findings In this randomized clinical trial that included 400 children, increased symptom-free days and fewer emergency department visits or hospitalizations were seen among children receiving the intervention compared with usual care.

Meaning School-based programs that incorporate telemedicine to link to primary care can improve outcomes for urban children with asthma.

versity of Rochester institutional review board approved the study, and written informed consent was obtained from all caregivers and vocal informed assent from all children 7 years and older. The trial protocol can be found in [Supplement 1](#).

Procedures

Screening for eligibility occurred at the start of each school year. School nurses and study team members identified children with asthma from school health records and conducted a telephone survey with the child's caregiver to assess eligibility. Enrollment occurred in a rolling fashion during the first 4 months of school in an attempt to enroll children prior to the onset of peak asthma season. Details of the methods have been reported.¹⁴

Following eligibility screening, a home visit was conducted to obtain informed consent from caregivers and assent from children 7 years and older. The baseline evaluation included an assessment of asthma symptoms, caregiver depression,²¹ exposure to secondhand smoke,²² and standard family and health history. We gave each caregiver an asthma symptom diary to track the child's symptoms throughout the school year. We also obtained a saliva sample from each child to measure smoke exposure through the biomarker cotinine.^{23,24} Lastly, we obtained fractional exhaled nitric oxide (FeNO) measurements using the NIOX VERO monitor (Circassia) to objectively measure airway inflammation.²⁵

Following baseline assessment, each child was randomly assigned to either the SB-TEAM group or the eUC group. A permuted block design was used to ensure balance in groups over time. Randomization was stratified by the use of a preventive medication at baseline and was developed by the biostatistician. The interviewer called the study coordinator for treatment assignment. All families received an educational packet that included basic asthma information, smoking cessation resources, and local asthma resources. Once randomized, primary care physicians (PCPs) received a symptom report from the screening assessment and notification of the child's enrollment. The intervention continued for 1 school year.

SB-TEAM Intervention

For children in the SB-TEAM group, we scheduled a telemedicine visit in the school health office at the start of the school year (within 2 weeks of baseline) for an initial asthma assessment and to determine the starting medication to be administered through

DOT at school. Caregivers were invited to join the child at school for the visit.

Details of the telemedicine intervention have been described.¹⁴ Briefly, a clinical telemedicine assistant who already worked in the school district brought a mobile telemedicine unit to the school and met with children, entered information regarding their symptoms and triggers, and uploaded physical examination data (ie, images, height and weight data, and breath sounds). This information was securely stored in the telemedicine virtual waiting room until a clinician completed the visit from their office (within 3 days), or the visit was done in real-time using videoconferencing. The telemedicine clinician then contacted the child's caregiver via telephone (or videoconference) to discuss the child's asthma, develop a treatment plan, and provide education and referrals as needed.

Telemedicine visits used a standard asthma template to assess impairment and risk, and reimbursement requests were submitted to the child's insurance, similar to a standard asthma visit. We scheduled telemedicine visits with the child's primary care practice when possible. If the child's practice did not perform telemedicine visits, we used available clinicians from the University of Rochester and relayed information about the child's visit back to PCPs. Clinicians were offered brief training sessions at the beginning of each intervention year, which included an overview of the burden of asthma, the newest guideline recommendations, and tips for delivering guideline-based care.

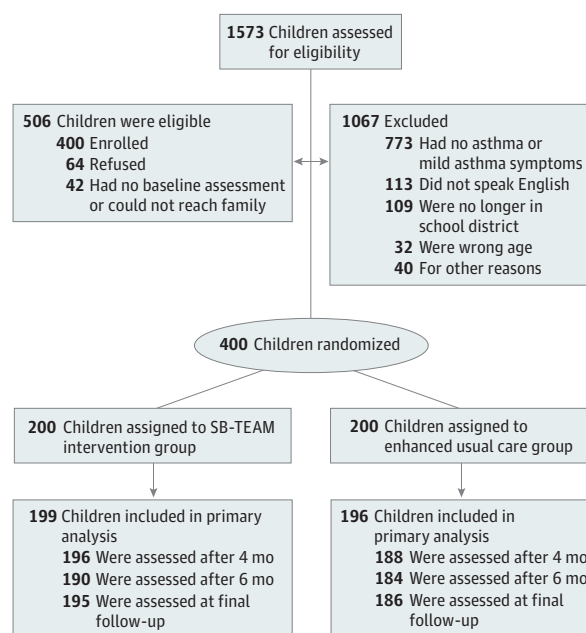
All of the children in the study had persistent asthma or poor control on enrollment and thus required a daily preventive asthma medication. We requested that clinicians send prescriptions to pharmacies that provide delivery services and requested that 2 canisters of medication (with a spacer and mask, as appropriate)—1 for home doses on weekends and days the child did not attend school and 1 for school-based DOT—be delivered. When necessary, we requested early refill overrides from insurers to ensure payment for 2 canisters. Most children received once-daily dosing²⁶ to allow for medication administration during school hours; if more frequent dosing was needed, additional doses were given at home.

Follow-up telemedicine assessments occurred 4 to 6 weeks after the start of DOT and again 4 to 6 weeks later. The follow-up visits allowed for an assessment of the child's asthma control once they were established on DOT and an opportunity to inquire about triggers or comorbid conditions that might interfere with an optimal treatment response. Clinicians were encouraged to deliver asthma education and make guideline-based medication adjustments (or specialist referral) for children who continued to have poor control. Changes to medications were implemented as DOT through school.

The study team nurse reviewed telemedicine visits to ensure efficient completion of guideline-based care, including appropriate prescription of preventive medications. Any discrepancies were relayed back to the telemedicine clinician with specific recommendations.

Two weeks prior to the close of the study, we notified both PCPs and families that children receiving preventive medications at school no longer would receive medications through the study. While a step-down in therapy is appropriate for many

Figure 1. School-Based Telemedicine Enhanced Asthma Management (SB-TEAM) Program Consolidated Standards for Reporting of Trials (CONSORT) Flow Diagram



A CONSORT flow diagram showing the progress of patients throughout the SB-TEAM trial.

children in the summertime, PCPs were encouraged to provide ongoing medication management as needed.

eUC Comparison Condition

Similar to children in the SB-TEAM group, children in the eUC group received a guideline-based symptom assessment, a recommendation for preventive medications, and asthma education materials. After randomization, we sent a symptom report to the PCP with guideline-based recommendations for care. We provided systematic feedback to families and PCPs at the same intervals as the SB-TEAM telemedicine visits and recommended that caregivers schedule follow-up visits. While participants were not blinded to group allocation, they were told that they were randomly assigned to 2 different ways of approaching asthma management.

Outcomes Assessment

We assessed outcomes for children in both groups by telephone interviews with caregivers and review of medical and school records. An independent team blinded to group allocation collected follow-up data every other month, and a final follow-up home visit was conducted at the end of the school year. Caregivers received \$25 gift cards following baseline assessment, \$20 after each telephone survey, and \$50 at study completion. There was no payment for participation in the intervention components.

The primary outcome was SFDs postintervention (after 4 months, 6 months, and at final follow-up). Caregivers reported the number of days their child experienced no symptoms of asthma (24 hours with no coughing, wheezing, or short-

Table 1. Population Demographic Information and Baseline Asthma Symptom Variables

Characteristic	No. (%)		
	Overall (n = 400)	Treatment Group	
		SB-TEAM (n = 200)	eUC (n = 200)
Child			
Age, mean (SD), y	7.8 (1.7)	7.7 (1.7)	7.9 (1.7)
Male	247 (61.8)	123 (61.5)	124 (62.0)
Race/ethnicity			
African American	230 (57.5)	112 (56.0)	118 (59.0)
Hispanic	127 (31.8)	67 (33.5)	60 (30.0)
Other	43 (10.8)	21 (10.5)	22 (11.0)
Public insurance	305 (76.3)	156 (78.0)	149 (74.5)
≥1 Smoker in home	193 (48.3)	103 (51.5)	90 (45.0)
Salivary cotinine, mean (SD), ng/mL	1.50 (2.0)	1.54 (2.0)	1.46 (2.0)
Asthma severity over 14 d, mean (SD)			
Symptom-free days	7.2 (5.1)	7.0 (5.2)	7.4 (5.1)
Days with daytime symptoms	4.9 (4.7)	5.1 (4.8)	4.6 (4.5)
Days with nighttime symptoms	3.1 (3.9)	3.0 (3.8)	3.2 (3.9)
Days with limited activity	3.5 (4.3)	3.9 (4.5)	3.2 (4.1)
Days with rescue medication use	4.4 (4.7)	4.5 (4.8)	4.3 (4.6)
Preventive medication prescription	273 (68.3)	135 (67.5)	138 (69.0)
≥1 ED visit or hospitalization	195 (48.8)	91 (45.5)	104 (52.0)
Caregiver			
Education ≥high school	235 (58.8)	115 (57.5)	120 (60.0)
Single marital status	298 (74.5)	143 (71.5)	155 (77.5)
Depressive symptoms	132 (33.0)	73 (36.5)	59 (29.5)

Abbreviations: ED, emergency department; eUC, enhanced usual care; SB-TEAM, School-Based Telemedicine Enhanced Asthma Management.

ness of breath, and no need for rescue medications) over the prior 2 weeks.¹² They were referred to their symptom diaries to assist with recollection. Secondary symptom measures included the number of days and nights with asthma symptoms, days needing rescue medications, and days with limited activity, measured by 2-week recall. Parents were asked to report any health care utilization, including urgent (acute, emergency department, or hospitalization) and nonurgent (primary or specialist) visits for asthma care. Medical records were reviewed for 20% of the sample to confirm health care utilization; all documented visits were also reported by caregivers.

We measured caregiver quality of life using the validated Pediatric Asthma Caregiver's Quality of Life Questionnaire.²⁷ School absenteeism because of asthma was assessed by caregiver report. We also measured FeNO levels at the final assessment.²⁵

Statistical Analysis

We estimated the power to detect the smallest clinically significant difference in mean SFDs postintervention between the SB-TEAM and eUC groups, accounting for repeated measures. Based on prior data, we estimated the pooled standard deviation of SFD at 2.8 and within-participant correlation at 0.3.¹³ A sample of 400 obtains greater than 90% power to detect a difference of 0.8 SFD per 2 weeks or greater (2-sided $P < .05$). Analyses were multivariable modified intention to treat, including all participants with postintervention data.²⁸ Generalized estimating equation (GEE) models were fitted with repeated asthma outcomes (at 4 months, 6 months, and final assessment) as dependent variables and treatment group as the independent variable after controlling for baseline symptoms and use of preventive medications.²⁹ An unstructured covariance matrix was specified. We estimated the within-

school intraclass correlation coefficient and found little clustering effect (intraclass correlation coefficient range, <0.01–0.02); therefore, school was not included. We also tested the interaction of treatment by time and specified contrasts to test the treatment effect at each time point. For binary outcomes, a binomial error and logitlink function were specified. Changes in FeNO level and quality of life were compared using 2-sample t tests. We examined missing data patterns and performed a sensitivity analysis using weighted GEE, implementing the inverse probability-weighted method to account for dropouts under the missing at random assumption.^{29,30} Because weighted GEE requires data to have a monotone missing data pattern, multiple imputation was used to impute the nearest missing observations postintervention using baseline characteristics and outcome measurement within treatment group.³¹ All P values were 2-tailed, and significance was set at $P < .05$.

Results

We screened 1573 children and found that 506 were eligible. We enrolled 400 children (200 for the SB-TEAM group and 200 for the eUC group) from 49 schools for a participation rate of 79.1%. For children in the SB-TEAM group, 196 (98.0%) had at least 1 telemedicine visit completed, 172 (86.0%) completed 2 visits, and 108 (54.0%) completed all 3 visits; 193 of 476 visits (40.5%) were performed by the child's primary care practice. Most children (165 [82.5%]) initiated DOT at school. Data were available for more than 90% of participants at each follow-up assessment (**Figure 1**); almost all (395 [98.8%]) had at least 1 follow-up for the primary outcome. Seven children withdrew from the study (1 from the SB-TEAM group and 6 from the eUC group).

Table 2. Primary Study Outcomes^a

Outcome	Treatment Group		Comparative Measure ^b
	SB-TEAM (n = 199)	eUC (n = 196)	
Symptom-free days, mean (SD)	11.6 (2.7)	10.97 (3.2)	0.69 (0.15 to 1.22) ^c
Secondary outcomes, mean (SD)			
Days with daytime symptoms	1.7 (2.0)	2.1 (2.2)	-0.46 (-0.85 to -0.07) ^c
Days with nighttime symptom	0.9 (1.5)	1.4 (2.0)	-0.41 (-0.74 to -0.09) ^c
Days with limited activity	1.3 (2.1)	1.6 (2.2)	-0.40 (-0.77 to -0.03) ^c
Days with rescue medication use	1.9 (2.5)	2.0 (2.5)	-0.14 (-0.62 to 0.33) ^c
≥1 d Absent from school due to asthma, No. (%)	89 (44.7)	103 (52.6)	0.79 (0.56 to 1.11) ^d
Medications and acute health care visits, No. (%)			
Preventive medication prescription	181 (91.0)	132 (67.3)	8.67 (4.19 to 17.95) ^d
≥1 ED visit or hospitalization	14 (7.0)	29 (14.8)	0.52 (0.32 to 0.84) ^d

Abbreviations: ED, emergency department; eUC, enhanced usual care; SB-TEAM, School-Based Telemedicine Enhanced Asthma Management.

^a Asthma symptoms over 14 days averaged between assessments at 4 months, 6 months, and final follow-up.

^b Adjusted for baseline symptoms and baseline preventive medication use.

^c Estimated mean difference (95% CI) between groups.

^d Estimated odds ratio (95% CI).

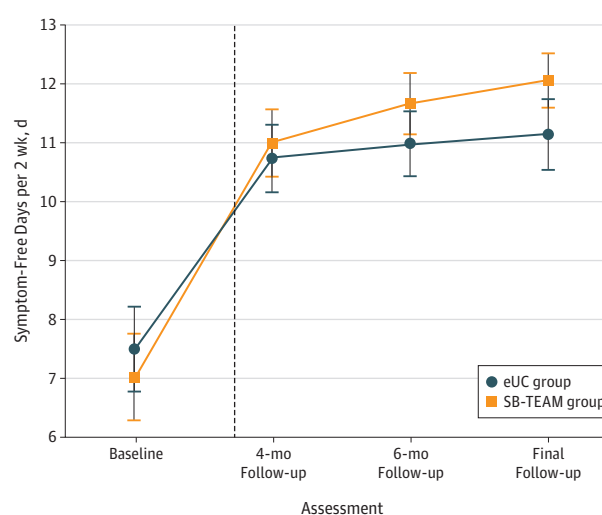
Table 1 shows demographic characteristics. Of the 400 enrolled children, 247 (61.8%) were male, and the mean (SD) age was 7.8 (1.7) years. Most children were described by their caregivers as African American (230 [57.5%]) or Hispanic (127 [31.8%]), and 305 (76.3%) had public health insurance. Almost half of the children (193 [48.3%]) lived in a home with a smoker, and 132 caregivers (33.0%) endorsed symptoms of depression. There were no differences between groups in demographic characteristics or exposure to smoke at baseline assessment.

At baseline assessment, children had on average 7.2 SFDs per 2 weeks, with frequent daytime and nighttime symptoms and use of rescue medications. Almost half (195 [48.8%]) had an emergency department visit or hospitalization for asthma in the prior year, and 273 (68.3%) were prescribed a daily preventive medication. There were no significant differences in asthma morbidity, health care utilization, or preventive medication use at baseline assessment between groups.

Table 2 shows study outcomes by group. For the primary outcome, we found that children in the SB-TEAM group had more SFDs per 2 weeks postintervention compared with children in the eUC group (11.6 vs 10.97; difference, 0.69; 95% CI, 0.15-1.22; $P = .01$). The secondary analysis using weighted GEE to accommodate missing data also showed significant treatment effects (difference, 0.73; 95% CI, 0.20-1.27). Children in the SB-TEAM group also had fewer symptom days, symptom nights, and days with limited activity compared with children in the eUC group. More children in the SB-TEAM group were prescribed a preventive asthma medication (91% vs 67%; odds ratio, 8.67; 95% CI, 4.19-17.95), and fewer had emergency department visits or hospitalizations for asthma (7% vs 15%, odds ratio, 0.52; 95% CI, 0.32-0.84) compared with children in the eUC group. In a longitudinal analysis of the primary outcome, findings were most pronounced at the final follow-up assessment, with a difference of 0.85 SFDs per 2 weeks between groups (95% CI, 0.10-1.59) and a significant treatment-by-time interaction ($P = .02$) (Figure 2).

Table 3 shows changes in FeNO level and quality of life from baseline assessment to the final follow-up. We found that children in the SB-TEAM group had a greater decline (ie, improvement) in FeNO level compared with children in the eUC group (mean difference, -5.54; 95% CI, -9.8 to -1.3); while quality of life improved for caregivers in both groups, there were no significant differences. There were no significant adverse events.

Figure 2. Mean Symptom-Free Days per 2 Weeks by Follow-up Assessment



At the postintervention follow-up time points, children in the School-Based Telemedicine Enhanced Asthma Management (SB-TEAM) group had significantly more symptom-free days than children in the enhanced usual care (eUC) group (treatment-by-time interaction, $P = .02$), adjusted for preventive medication use at baseline. At 6-month follow-up, the mean difference between groups was 0.732 (95% CI, -0.017 to 1.480); at final follow-up, the mean difference was 0.847 (95% CI, 0.101-1.593). The dotted line indicates the telemedicine component of the intervention ending. Error bars indicate 95% CIs.

Importantly, satisfaction with the program was high (eTable in Supplement 2), with most caregivers stating that the program was helpful (361 [95.7%]) and that they would be willing to participate in a similar program (365 [96.5%]). More caregivers of children in the SB-TEAM group endorsed that the program helped them better understand asthma medications (152 [78.8%] vs 111 [60.3%]), improved communication with their school nurse (105 [54.4%] vs 74 [40.2%]), and they were comfortable with the nurse giving medications (187 [96.9%] vs 162 [88.0%]).

Discussion

We found that the SB-TEAM intervention yielded statistically significant improvements in outcomes among urban children with persistent asthma. Children receiving the intervention had more SFDs, fewer days with activity limitation, re-

Table 3. Changes in FeNO Levels and Quality of Life Measure From Baseline to Final Follow-up Assessment

Variable	Treatment Group, Mean (SD)		Difference (95% CI)
	SB-TEAM	eUC	
Change in FeNO level ^a	-5.44 (19.5)	0.10 (21.9)	-5.54 (-9.8 to -1.3)
No. ^b	186	178	NA
Change in quality of life measure ^c	0.79 (1.1)	0.65 (1.1)	0.14 (-0.08 to 0.37)
No. ^b	195	184	NA

Abbreviations: eUC, enhanced usual care; FeNO, fractional exhaled nitric oxide; NA, not applicable; SB-TEAM, School-Based Telemedicine Enhanced Asthma Management.

^a Airway inflammation based on FeNO level reading from the NIOX VERO monitor (Circassia).

^b The number of children varied because of survey or task refusal or inability to perform task.

^c Pediatric Asthma Caregiver Quality of Life Questionnaire.²⁷

duced airway inflammation, and fewer emergency department visits or hospitalizations for their asthma. The differences were comparable although slightly less than in our prior school-based work^{32,33} and were consistent with other community-based asthma programs.³⁴⁻³⁶ Importantly, this program was novel because it used telemedicine to enhance sustainability by linking children to PCPs. Further, the program was feasible and well accepted by families.

The telemedicine model is one form of connected care that enhances access to medical services for traditionally underserved children^{17,37} and was an efficient way to link children to primary care and facilitate asthma assessment and treatment in this study. We were able to initiate telemedicine visits for almost all children in the SB-TEAM group, and most started DOT of preventive asthma medications at school. Importantly, models of care facilitated by telemedicine are now commonly used in both urban and rural settings, for both primary and specialty care.³⁸⁻⁴¹

It is important to note that the role of the school nurses or health aides in this program is critical. This study took place in an impoverished school district. Most of the nurses covered multiple schools and had many competing demands on their time, yet children received their preventive medications almost every day they were in school. Nurses did not receive extra compensation for their efforts for this program. However, they frequently told us that they prefer to focus on preventive care rather than caring for children when they are experiencing an exacerbation. We suspect that the benefits related to supervised medication administration reach beyond simply assuring adherence to effective preventive medications and include the therapeutic relationships that were built between students and school nurses as well as the opportunities for ongoing monitoring and education.

Many of the children in this study lived in very difficult social situations and faced challenges that often accompany residing in impoverished communities. Most were in families with a single caregiver, many of whom reported depressive symptoms. Environmental tobacco smoke exposure was common. The struggles that families faced on a day-to-day basis were very real, and we acknowledge that an asthma care program can serve to relieve only a small part of these struggles.

However, we were encouraged by the high participation and retention rates as well as high program satisfaction. We strongly believe that community partnerships can yield programs that are well accepted and lead to improved outcomes, even in the context of high rates of poverty and adversity.

Limitations

There are some potential limitations to this work. First, blinding of caregivers, children, and physicians was not possible. However, we performed blinded outcome assessments as well as objective measurements. Further, children in the eUC group may have experienced improved care simply through participating in the study, creating a conservative bias. While telemedicine is now used in many different settings to improve care, this study was done in a medium-sized city in elementary schools, and therefore, findings can only be generalized to similar settings and age groups. Only 82% of children in the SB-TEAM group received DOT at school; with more consistent protocol adherence, even more significant differences in outcomes may be observed.

Conclusions

We have consistently found that school-based programs can enhance care and improve outcomes for urban children with persistent asthma. The integration of telemedicine with school-based care represents one successful method to enhance access to guideline-based treatments and ensure appropriate primary care follow-up assessments. As we continue to work toward sustainability of these care models, it is important to consider resources available in each community to build collaborations that can be continued. Such models are most valuable if they reach the children at highest risk, fit logically into existing care systems, and ensure treatment can be delivered systematically and efficiently. In the future, sustained and enhanced funding for school-based programs will be critical, as care provided in schools can clearly improve outcomes for the children with greatest need. Our hope is that such care models will continue to expand nationwide to ensure the goals of therapy are met for all children with asthma to ultimately eliminate disparities in their health status.

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