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Improving Pediatrician Knowledge About Environmental Triggers of Asthma

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Abstract

Background—Control of environmental triggers (ETs) greatly improves asthma outcomes in children. Disseminating these findings to general pediatricians has not been well established.

Methods—After delivering a structured and standardized presentation on ET identification and control to pediatricians, we surveyed them about knowledge and practices of ET assessment and management. We analyzed matched responses for pre/post and 3- to 6-month follow-up using McNemar's χ^2 test.

Results—Matched data were available for 367 participants, and 3- to 6-month follow-up data were available for 83. There was a significant posttraining increase in intention to ask about ETs and recommend ET management. After 3 to 6 months, all responses remained significantly higher than baseline, except "likely to refer to an asthma specialist."

Conclusion—Pediatricians reported a significant improvement in knowledge about ETs of asthma and a willingness to incorporate exposure history questions and remediation recommendations in their routine practice.

Keywords

asthma; environmental triggers; environmental health; education; pediatric

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Declaration of Conflicting Interests

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Introduction

The evidence that children with asthma are adversely affected by environmental triggers (ETs) is clear. Well-established triggers include dust mites, animal dander, cockroach antigen, indoor and outdoor air pollution, molds, and second-hand smoke.[1–6] Numerous research studies demonstrate that measures to reduce exposure to environmental allergens, particularly dust mites, cockroaches, and animal dander, can improve asthma symptoms.[7–14] A randomized controlled trial focused on mold remediation demonstrated a decrease in mold levels, symptom days, and asthma exacerbations.[15] Additional studies have demonstrated an improvement in respiratory symptoms and a reduction in the need for inhaled corticosteroids when comprehensive control of multiple triggers is instituted.[16–18] Expert reviews support the effectiveness of multitrigger interventions. The National Heart, Lung, and Blood Institute (NHLBI) recommends that controlling ETs should be a key component of asthma management.[19,20]

Despite a robust evidence base and related guidelines from respected expert bodies, disseminating the beneficial findings of ET management to general pediatric knowledge and practice can be difficult to achieve.[21] The limited amount of education during residency about pediatric environmental health issues is likely a contributing factor.[22] Surveys of physicians in practice note that the majority was not well prepared to take an environmental history or identify illness that is related to environmental exposure.[23–26] Asthma management varies between general pediatricians and allergists, as noted by superior knowledge of dust mite exposure and use of dust mite controls by patients seen by allergists compared with patients seen by generalists.[27] However, most children with asthma are treated by primary care physicians.

The purpose of this study was to use a peer clinical faculty “champion” model[28] to deliver a short training on ET identification and control to pediatric primary care providers and trainees and evaluate its impact on their knowledge and intentions in clinical practice.

Methods

Setting/Participants

This study took place in 4 academic centers in various regions of the United States (Charleston, SC; Houston, TX; New York, NY; and Seattle, WA). At each center, an academically trained general pediatric faculty member (JRR, CJK, LdY, and JF) participated as asthma faculty champion and delivered the presentation in their region, usually in the form of a grand rounds or noon conference presentation. Leyla McCurdy at the National Environmental Education Foundation (NEEF) organized the project and facilitated the group meetings via bimonthly conference calls. At these calls, faculty members discussed content, delivery, and any problems that arose, to ensure consistency of the intervention.

Intervention

A 1-hour standardized PowerPoint presentation on the environmental management of pediatric asthma was developed for in-person delivery to pediatric physicians (residents, academic pediatricians, and community pediatricians involved in medical student/resident

teaching). This presentation was based on the clinical tools developed by NEEF titled, "Environmental Management of Pediatric Asthma: Guidelines for Health Care Providers."[29] These guidelines were developed by an expert panel convened by NEEF, which included general pediatricians, subspecialists in pediatric allergy/immunology, pediatric nurses and practitioners, and representatives of governmental agencies, and are available online at www.neefusa.org/health/asthma/index.htm. One of the authors (JRR), who also authored the NEEF guidelines, developed the initial set of PowerPoint slides to teach physicians how to control ETs for their pediatric patients.

The content of the intervention included a brief introduction to the public health context and burden of pediatric asthma and a review of the 6 key messages on overall asthma management from the NHLBI guidelines (Table 1). The sixth key message, "to control environmental triggers," was the emphasis of the remainder of the presentation. This introductory section of the presentation served a dual purpose. The study team felt that it was important to acknowledge the well-established general treatment of asthma while also pointing out that the NHLBI now recognizes that ET management is equally important for quality care. We also wanted to ensure that late-arriving grand round/conference participants would still be present to hear the entire portion of the next section of the presentation, which was a review of the literature that established the scientific basis for the environmental recommendations. Following the presentation of the evidence, we discussed how to institute environmental changes in the home. The NEEF guidelines also include publicly available patient handouts and online resources developed by the National Institute of Environmental Health Sciences, the Environmental Protection Agency, and the Centers for Disease Control and Prevention (CDC), along with extensive supplemental online resources, so that physicians were given multiple support documents for use in the clinical setting.

Survey Development

The faculty champions administered a pre/post survey during presentation events and collected e-mail contact information for delivery of a 3- to 6-month follow-up survey to assess longer-term retention of knowledge and practice intentions. All presentations were eligible for inclusion to have the survey distributed unless the participating institution for grand rounds or other presentation settings did not permit them. If the audience, in the faculty champion's opinion, contained a large proportion of nonclinicians, the surveys were not distributed.

The research team developed the survey questions based on previously developed asthma surveys.[31,32] The survey was initially pilot tested with pediatric clinicians to produce an instrument that would be clear and acceptable to the intended audience. Because the presentation was structured to include public health–related asthma information at the beginning, late-arriving attendees had time to complete the presur-vey without being subjected to the bias of hearing parts of the ET portion of the presentation.

Demographic and practice setting information were collected on the pretest. Both the presurvey and postsur-vey contained items on the same knowledge and practice questions regarding asthma management focused on ETs. These included a self-assessment of their baseline knowledge about ETs, questions about environmental history taking and clinical

practice, and how often they made recommendations to parents about trigger management. Specific questions are shown in Tables 2 and 3.

Data Analysis

Descriptive statistics and frequency distributions of responses to individual knowledge and practice questions were calculated using SPSS 15.0. Likert scale responses were dichotomized based on the distribution of frequency responses. For example, ET knowledge questions were evaluated as “expert/very good” versus other responses (eg, good, moderate, minimal, and none). Environmental history-taking questions and patient recommendations were assessed using a 6-point scale. History questions were dichotomized: *always* ask about versus all others (eg, *most of the time, fairly often, occasionally, rarely*, and *never*). Patient recommendations were divided as recommend *always* or *most of the time* versus all others. Presurvey and postsurvey matched-response differences were analyzed using the McNemar’s χ^2 test. The 3- to 6-month follow-up surveys were analyzed in an identical manner, though where the numbers were smaller in one or more cells, we used the binomial distribution.

The surveys were linked by codes to maintain pre/post follow-up integrity of the survey responses. Following receipt of the follow-up survey, the identifiers were removed. Each of the 4 faculty champion sites received institutional review board approval at their own university to distribute the survey. In addition, the institutional review board approval at the Medical University of South Carolina also allowed for receipt of deidentified data from the other 3 sites and data analysis.

Results

During the period of September 2007 through September 2011, the 4 faculty champions delivered 102 presentations (19 grand rounds; the remainder included resident noon conference, student conference, and other conference settings). Surveys were distributed at 33 of the presentations. Complete prematched and postmatched data were collected for 367 respondents and matched 3- to 6-month follow-up data available for 83.

The largest proportion of respondents were pediatric residents (50%), followed by academic physicians (21%) and private physicians (8%). Other respondents identified themselves as hospital-based, community-based, and military-based physicians. The majority (77%) reported working in an urban inner-city environment. As regards familiarity with NHLBI guidelines, 18% were very familiar, 47% moderately familiar, 30% somewhat familiar, and 6% unfamiliar.

Responses about baseline knowledge of asthma triggers are listed in Table 2. Of note, most respondents (59%) reported “expert or very good” knowledge about tobacco smoke exposure. Baseline responses were much lower for the other triggers, with 27% to 41% reporting “very good” or “expert” knowledge about cockroaches, dust mites, outdoor air pollution, or indoor chemical use.

Environmental history-taking practices, physicians' recommendations and interventions, and specific attitudes and abilities are all summarized in Table 3. Most physicians were accustomed to asking about tobacco smoke exposure at baseline. Immediately following the intervention, physicians reported a significant increase in intention to ask about all the triggers, even for tobacco smoke exposure, despite the high baseline rate for that question. For these questions, when we included *always* plus *most of the time*, we reached 100% for several of the triggers, so we chose *always* versus all other responses as the cut-point in the analysis. Likewise, for physician recommendations and attitudes, there were significant improvements in all responses.

After the 3- to 6-month period, follow-up surveys showed a persistent and significant increase from baseline in environmental history taking for all exposures except tobacco smoke. For the questions about physician-directed care and self-efficacy responses, participants again reported a significant increase from baseline in their intention to recommend specific interventions as well as increased self-efficacy responses. The 1 exception to these responses was that at the 3- to 6-month follow-up period, 11% were likely to refer patients to an asthma specialist always or most of the time.

Discussion

Achieving quality care for asthma patients requires the dissemination of all components of the evidence-based NHLBI guidelines into clinical practice. Despite the strong evidence base for environmental management of asthma, we found that few pediatric trainees or general pediatricians have sufficient knowledge of this topic. We also found that using a standardized in-person training module improved this knowledge gap and suggest that its translation into practice can be improved.

The largest changes in magnitude of reported evidence-based practices were for history taking regarding dust mite exposure, from 12% (pre) to 63% (post), and having an intention to recommend dust mite covers to their patients (24% to 93%). Both changes likely reflect a low baseline level of knowledge and management of dust mites as well as the strength of evidence available for relatively easy interventions.[7,8,33] The immediate postsurvey improvements on knowledge and practices were lessened at the 3- to 6-month follow-up period. Despite this change in magnitude, the overall positive change remained significant from the preintervention baseline for all content with the exception of tobacco smoke and allergist referral.

Although the high interest among pediatric care providers in environmental health topics has been established, curriculum development and training opportunities for clinicians remain limited.[22–26] Approaches have included "passive" Web-based Continuing Medical Education offerings (www.atsdr.cdc.gov/emes/health_professionals/pediatrics.html), didactics, practical evaluations for medical and nursing students and residents, and faculty training to incorporate environmental health into curricula.[34–37]

Although there are other environmental education studies in the literature, this is the first study to demonstrate a widespread, systematic approach to improving clinician education

regarding ETs of pediatric asthma in a largely academic setting. A study in adults with occupational exposure to isocyanates, chemicals known to cause asthma, provided education for employees about the chemical and how to manage their asthma. This program has been replicated for various occupational settings, but unlike our study, it is directed at the worker level.[38] Another educational study taught adults about lead safe work practices using a similar presurvey and postsurvey methodology as ours.[39]

Previous studies on overall environmental health education have documented shortcomings in current curriculum and faculty preparation, despite a desire on the part of trainees to have a greater amount of environmental health–related content.[22,40–42] Physicians have also responded in other surveys that shortcomings in their own level of knowledge about certain exposures may be a reason why they do not ask about or do not feel confident enough to ask about certain environmental exposures.[23,24,26] The approach of this program is unique, in that it combined an assessment of knowledge and intentions along with specific content designed to provide clinicians with patient-oriented materials to improve care for their patients. This study demonstrates the usefulness of a brief, topic-specific environmental health peer-peer educational approach to improve management of ETs of asthma in an academic setting.

Fewer training participants reported using referral of patients to an asthma specialist at the 3- to 6-month follow-up. Although the training content endorsed and described situations where specialist referral may be most useful, it is possible that respondents grew more comfortable with environmental exposures and therefore felt more enabled to manage these patients on their own. This study is not intended to suggest that generalists should manage all asthma patients on their own in lieu of a referral to an asthma subspecialist (eg, allergist / pulmonologist). On the contrary, the goal is to provide generalists with the knowledge and resources to be able to consider possible exposures through the environmental history and consider appropriate recommendations, which may include specialty referral. The inner-city asthma study demonstrates the value of patient-specific environmental allergen management.[17,18] Specific allergen testing may be valuable along with general environmental management guidance for allergen and other nonallergen triggers of concern.[27]

There are several limitations to our study. We did not assess behavioral change of physicians directly or patient outcomes. We only provided the first step in the continuum of clinician education and behavior to improved patient outcomes. We also demonstrated the effectiveness of a modest educational approach to pediatric clinician education regarding environmental management guidelines. Although our data represents 4 regions of the country, it reflects a largely urban and academic setting and practice. In addition, data at 3 to 6 months reflected a smaller subsample of those who complied with the requested survey. These respondents may reflect a subgroup that is more motivated to endorse the guideline content and intentions.

Conclusions

Following a brief, targeted educational intervention, physicians reported a significant increase in knowledge about ETs of asthma and a willingness to incorporate exposure

history questions and remediation recommendations in their routine practice. These improvements persisted at a 3- to 6-month follow-up interval when compared with baseline levels.

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Table 1

The 6 Key Messages of the National Heart Lung and Blood Institute's Guidelines for the Diagnosis and Management of Asthma.[30]

Use inhaled corticosteroids
Use a written asthma action plan
Assess asthma severity
Assess and monitor asthma control
Schedule periodic asthma visits
Control environmental exposures

Table 2

Pediatrician Self-reported Baseline Knowledge of Asthma Triggers.

Environmental Trigger	"Expert" or "Very Good"
Tobacco smoke exposure	59%
Animal allergens	41%
Mold exposure	38%
Cockroach exposure	34%
Dust mites	34%
Outdoor air pollution	33%
Indoor chemical use	27%

Table 3

Pediatrician's Self-reported Environmental Management of Asthma Practice Behaviors and Attitudes Before, Immediately After, and 3 to 6 Months After a Brief Educational Presentation.

	Before	Immediately After	3 to 6 Months Later
"Always Ask About . . ."[a]			
Tobacco smoke	60%	84%[b]	61% (NS)
Animal allergens	38%	75%[b]	60% (.021)
Mold exposure	14%	57%[b]	30%[b]
Cockroach exposure	14%	61%[b]	29%[b]
Dust mites	13%	62%[b]	31%[b]
Outdoor air pollution	12%	47%[b]	25%[b]
Wood smoke	6%	39%[b]	16%[b]
Indoor chemical use	7%	44%[b]	17%[b]
Recommend "at least most of the time"[a]			
Dust mite covers	24%	92%[b]	64%[b]
Advise family to quit smoking	84%	95%[b]	90%[b]
Refer to asthma specialist	19%	52%[b]	11% (NS)
Provide written asthma action plan	37%	85%[b]	62%[b]
"Strongly agree"[c]			
I am comfortable advising patients about decreasing secondhand smoke exposure	35%	70%[b]	69%[b]
I am comfortable teaching patients about environmental influences on asthma	19%	60%[b]	46%[b]
I know where to find patient information about managing environmental asthma triggers	17%	63%[b]	49%[b]

[a] Scale: 1 = *always*, 2 = *most of the time*, 3 = *fairly often*, 4 = *occasionally*, 5 = *rarely*, 6 = *never*.

[b] McNemar's χ^2, $P < .001$ compared with preintervention.

[c] Scale: 1 = *strongly agree*, 2 = *agree*, 3 = *disagree*, 4 = *strongly disagree*.