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Parental Health Literacy and Asthma Education Delivery During a Visit to a Community-Based Pediatric Emergency Department: A Pilot Study

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Abstract

Objective—The objective of the study was to compare change in asthma knowledge among parents with low or adequate health literacy after video or written asthma education delivered during their child's asthma-related emergency department (ED) visit.

Methods—We recruited a convenience sample of parents presenting to the ED with their asthmatic child 2 to 14 years old. Parents were randomized to receive video (intervention) or written (active-control) asthma education materials. Health literacy levels were determined using the Rapid Estimate of Adult Literacy in Medicine tool. Asthma knowledge was evaluated at enrollment and 6-week telephone follow-up. Differences in knowledge scores were analyzed using Wilcoxon signed rank tests; $[\chi^2]$ tests were used for comparisons of categorical variables.

Results—Of 150 eligible parents, 129 participated (86%), and 117 were eligible for follow-up. Telephone follow-up was completed with 86 parents (74%). Health literacy levels were low in 31% of the parents. High asthma knowledge scores at enrollment were achieved by 33% of low-literacy and 59% of adequate-health-literacy parents ($P = 0.025$). Improvement in knowledge was realized for low-literacy parents regardless of the type of education (P

Conclusions—Asthma education materials distributed at the time of an ED visit increase parental knowledge about the disease. Video-based asthma education appears promising as a tool for increasing asthma knowledge in both low- and adequate-health-literacy parents.

Keywords

asthma; education; health literacy; community

Asthma is the most common chronic childhood illness nationwide, and asthmatic children frequently require emergency care.[1] An emergency department (ED) visit represents an opportunity to provide essential asthma education to those who do not receive regular primary care services and can reinforce the messages delivered in the medical home.[2,3] Effective ED-based asthma education programs could have significant impact on parental knowledge and confidence, resulting in fewer symptoms and improved quality of life for asthmatic children.[4]

The National Heart, Lung and Blood Institute's Guidelines for the Diagnosis and Management of Asthma state, "Patient education should be delivered in the context of ED visits." [5] This recommendation is echoed in the Healthy People 2020 objective to "increase the proportion of persons with current asthma who receive formal patient education." [6] Asthma education has been shown to increase knowledge, decrease symptoms, and decrease use of the ED in pediatric populations.[7] Yet in 2000, only 16% of EDs reported use of an asthma education program.[8]

One factor that may be overlooked in the delivery of patient education about asthma is health literacy. Although health education experts recommend patient instructions be written at or below the fifth-grade level, the mean grade level for asthma action plans in the United States is 8.1.[9] It follows that education material that is not modified for low reading levels may not benefit patients with low health literacy. Clinic-based research links low parental health literacy with lower asthma knowledge, higher disease severity, and greater incidence of ED visits and hospitalizations for asthmatic children.[10]

In this study, we compare change in asthma knowledge among parents with low or adequate health literacy after video or written asthma education delivered during their child's asthma-related ED visit. We hypothesized that, for parents with low health literacy, asthma education delivered in a video format would result in greater increase in asthma knowledge when compared with written materials. Our secondary objectives were to compare parental sense of asthma control, parent report of child asthma symptoms, and health care utilization after the educational interventions. To date, there are no published data comparing the outcomes of video versus written asthma education delivered during the ED visit in relation to parental health literacy.

METHODS

Study Design

We conducted a pilot study using a convenience sample of parents presenting to the ED for the care of their asthmatic child. The study was approved by the institutional review boards of the University of Michigan and Hurley Medical Center.

Study Setting and Population

The study was conducted in the ED of Hurley Medical Center in Flint, Mich. This general community ED sees more than 25,000 pediatric visits each year and has a dedicated pediatric treatment area open 18 hours per day. The pediatric treatment area is often staffed by emergency physicians without dedicated pediatric emergency medicine fellowship training. In Flint, African Americans comprise 53% of the population, and 37% of the city's children live in poverty.[11] Pediatric asthma hospitalization rates in Genesee County have historically been up to 4 times higher than other areas of the state of Michigan.[12]

Parents were eligible to participate in the study if they presented to the ED for evaluation of respiratory symptoms in their 2- to 14-year-old child who had a prior diagnosis of asthma or history of wheeze. Parents were excluded if their child's respiratory symptoms were attributable to another medical condition (e.g., sickle cell disease or cystic fibrosis), if they were not the primary provider of the child's asthma care, if the child required admission to the hospital, if they had no telephone for follow-up, or if they had previously enrolled in the study.

Study Protocol

Over 27 months, between October 2006 and April 2009, electronic triage records were monitored by a trained research assistant (RA) to identify eligible parents. Subjects were recruited during daytime and evening hours on both weekdays and weekends. Recruitment was suspended temporarily in March/April 2008 and January/February 2009 because of low numbers of asthma visits during those months.

After placement in an ED treatment room and the initiation of medical care, parents were approached by the RA who obtained informed consent from those eligible and interested in participating. Children older than 8 years provided assent for their parent to discuss their asthma history.

Parents completed an orally administered survey providing information about the child's asthma history, current asthma symptoms, health care utilization, and demographic characteristics. Baseline asthma knowledge and sense of asthma control were assessed.

After baseline data collection, parents were randomized to receive either video (intervention) or written (active-control) asthma education materials. The intervention group viewed a 20-minute asthma educational video entitled "Roxy to the Rescue" before discharge from the ED. Developed by the New England Research Institute, this animated program targets urban families with asthmatic children. Although produced in 1995, the content remains relevant to the 2007 National Heart, Lung and Blood Institute Key Educational Messages: (a) basic facts about asthma, (b) roles of medications, and (c) patient skills.⁵

The active-control group received written educational materials to review in the ED or at home. The written materials were developed in 2004 by a multidisciplinary committee under the guidance of the Michigan Department of Community Health and have been distributed to health care providers across the state as a part of the Michigan Asthma Resource Kit.[13]

Information sheets were selected to match the messages delivered in the video. The average Flesch-Kincaid grade level of the information sheets is 8.0, calculated using built-in software in Microsoft Word 2003 (Microsoft Corporation, Redmond, Wash).[14]

Subjects were contacted by telephone, 4 to 6 weeks after study enrollment. Research assistants were blinded to the type of educational intervention the subject had received. At follow-up, the knowledge and sense of control measures were repeated. Subjects also reported on frequency of the child's asthma symptoms and health care utilization. After completion of follow-up, subjects were mailed a \$20 gift card to a major retailer.

Measurements

Parental health literacy level was determined with the validated Rapid Estimate of Adult Literacy in Medicine (REALM) tool.[15] Parental asthma knowledge was assessed with 14 true-false questions. Ten questions were adapted from the National Asthma Education and Prevention Program asthma knowledge questionnaire, [16,17] and 4 were created by the study team to match key messages from the educational interventions. Parental sense of control in managing their child's asthma was assessed with 8 items from the Perceived Control of Asthma Questionnaire.[18] Parents indicated their degree of agreement with statements using a 5-point Likert-type scale. Possible scores range from 8 to 40, with higher values indicating greater sense of control.

The Measures of Morbidity Questionnaire was used to define persistent asthma [19] and determine the maximal days of symptoms during the follow-up period. Consistent with the National Asthma Education and Prevention Program guidelines, persistent asthma was assigned to children who had equal to or greater than 2 days of symptoms per week or equal to or greater than 2 nights with symptoms per month.[20] The maximal number of days with symptoms was defined as the largest value among the following 3 variables from the Measures of Morbidity questionnaire: number of days with wheezing, chest tightness, or cough; number of nights with disturbed sleep; and number of days on which the child had to limit activity because of asthma. Parental report was used to determine the number of primary care physician (PCP) and ED visits in the year before the index ED visit and in the follow-up period. To assess the severity of the asthma exacerbation, the Pulmonary Index Score [21] was completed by the medical provider caring for the child in the ED.

Data Analysis

The REALM scores were used to identify low (less than ninth grade) and adequate (high school) health literacy levels in the study population.[10] The 3 subjects who refused to undergo the REALM assessment, 2 of whom reported completing less than a 12th-grade education, were analyzed in the low-literacy group. Parent report of the number of ED visits in the past year was collapsed into the following categories: none, 1 to 2, or 3 or more.

The main outcome measure was the change in asthma knowledge. Based on the median number of correct responses on the pretest, parents with fewer than 11 correct responses were assigned a low knowledge score, and parents with 11 or more correct responses were assigned a high knowledge score.

Secondary outcome measures include parental sense of asthma control at follow-up, maximal number of days with symptoms during the follow-up period, visits to the PCP, and return visits to the ED between study enrollment and follow-up. Sense of asthma control was analyzed as a continuous variable. The maximal number of days with symptoms was analyzed as a continuous variable. Primary care physician and ED visits in the follow-up period were analyzed as a dichotomous variable yes or no.

Baseline demographic and clinical data were summarized with medians and interquartile ranges (IQRs) or proportions as appropriate. Differences in asthma knowledge and sense of control were assessed using Wilcoxon signed rank tests. Categorical data were analyzed using χ^2 tests. Fisher exact test was used for comparisons with low expected values for individual cells.

All data were entered into an Excel spreadsheet by 2 RAs. Accuracy of data entry was confirmed by the lead author. All analyses were conducted in Stata 10.0 (Stata Corporation, College Station, Tex).

RESULTS

Of 227 triage records that were screened, 57 were ineligible, and 20 were not approached (Fig. 1). Of 150 eligible parents, 129 agreed to participate (86%). Twelve children were admitted to the hospital after study enrollment, leaving 117 subjects eligible for follow-up. Of those eligible for follow-up, 86 subjects (73.5%) completed the telephone interview. Of those who did not complete follow-up, 22 were not able to be reached within 6 weeks, 7 had nonworking telephone numbers, and 2 were no longer caring for the child. No subjects withdrew from the study.

Baseline Characteristics

Demographic characteristics of subjects with low versus adequate health literacy and their children are presented in Table 1. Overall, 31% of the study population was considered to have low health literacy. Eighty-five percent of the subjects were mothers, 4% fathers, and 11% other, including grandparents, foster parents, and older siblings. The asthma exacerbations were mild with a median pulmonary index score of 1 (IQR, 0–4).

Although roughly 30% of children in both groups had persistent asthma symptoms, and nearly all parents identified that their child had a PCP, children of low-health-literacy parents were significantly less likely to receive care from an asthma specialist (Table 2). Less than one fifth of low-literacy parents and less than one third of adequate-health-literacy parents reported having an asthma action plan for their child, even though this is a cornerstone of nearly all asthma care guidelines. There was an overall high use of the ED in the sample, with more than 80% of parents reporting their child had at least 1 asthma-related ED visit in the prior year. The children of low-literacy parents had significantly more asthma-related ED visits in the past year ($P = 0.04$) (Fig. 2).

Significantly fewer parents in the low-literacy group had high knowledge scores at enrollment. Perceived control of asthma at enrollment was high regardless of parental health

literacy level, with a median score of 30 (IQR, 28–33) of 40 possible points. After randomization, both parent and child characteristics were not statistically different between the video and written groups. Equal numbers of low-literacy parents assigned to each group. In addition, there were no baseline differences in asthma knowledge or sense of asthma control between the intervention and active-control groups.

Outcomes at Follow-Up

Follow-up was completed for nearly 75% of subjects in an average of 5.67 (SD, 1.0) weeks for the video group and 5.45 (SD, 1.2) weeks for the written group. Fourteen (33%) of the parents in the video group had low health literacy compared with 13 (30%) in the written group ($P = 0.70$). No statistically significant differences were identified in the baseline characteristics between the subjects who completed follow-up and those who were lost to follow-up.

Improvement in asthma knowledge at follow-up was realized for low-literacy parents regardless of the type of educational intervention (Fig. 3) ($P < 0.001$). Of those with adequate health literacy, only parents viewing the video showed increase in knowledge at follow-up. The significant differences in high asthma knowledge scores by health literacy level at enrollment were no longer present at follow-up.

Overall sense of asthma control was unchanged for both groups at follow-up, with a median score of 30. Return visits to the PCP between the initial ED encounter and follow-up telephone call were relatively high at 58% for the total sample; 14% of subjects had returned to the ED during this time frame. Return visits to the ED and follow-up with PCPs were more common in children whose parents had viewed the video, regardless of health literacy level (Table 3).

Feasibility and Acceptability of Asthma Education During an ED Visit

The video group had clinically and statistically significantly longer stays in the ED, 167 minutes (IQR, 130–216 minutes) versus 134 minutes (IQR, 102–166 minutes) for the written group ($P = 0.007$).

In general, asthma education during the ED visit was viewed favorably by parents. Ninety-two percent of parents agreed with the statement, “It was easy to learn about asthma while my child was in the ED.” Of the 7 subjects who felt the ED was too distracting to learn about asthma, 3 received the written materials, and 4 watched the video. The 2 subjects who believed ED-based asthma education made their stay longer had received the written educational materials.

DISCUSSION

In this study evaluating 2 simple ED-based asthma educational interventions, we found that parental asthma knowledge scores increased regardless of the mode of education delivery. As more than 90% of US children are seen in general EDs,²² educational interventions that are applicable to community ED settings are vital for broad impact on parents of asthmatic children. Consistent with previous research, low parental health literacy was associated with

lower asthma knowledge scores and higher utilization of health care resources in our sample.[10,23–25] Notably, our results indicate that exposure to asthma education during an ED visit can reduce gaps in asthma knowledge between low- and adequate-health-literacy parents.

We hypothesized that parents with low health literacy would be more responsive to video than written education materials, and our findings support this hypothesis. It was unexpected to find that, even with the written materials, low-health-literacy parents showed significant improvement in knowledge. This result may reflect the fact that the written materials were taken home. In the home, low-literacy parents may have referred back to the materials and perhaps reviewed the information with the help of others.

It was somewhat surprising to find the adequate health literacy group showed greater improvement in knowledge scores with the video intervention compared with the written education materials. This suggests that parents were receptive to the simple educational messages of the video regardless of their health literacy level. Although we know the video was played in the room for all study parents randomized to this mode of education, we did not assess if the written materials were reviewed. It is possible that parents with adequate health literacy did not read the written materials.

Although ED-based asthma education appears to improve asthma knowledge, we found no difference in the secondary outcomes-sense of asthma control and health care utilization. The lack of change in sense of asthma control may in part reflect the fact that the educational interventions were directed at knowledge and not designed to specifically address sense of asthma control. It is also possible that a single educational intervention is not effective in increasing parental sense of control in disease management. Our findings related to health care utilization, with the video education group tending to have more visits to the PCP and ED in the follow-up period, may be related to differences in treatment of the asthma exacerbation and subsequent symptom control that were not assessed in the study.

We selected educational interventions for study that would be easily transferable to other general EDs. Both the video and written educational materials used in this study were well received by parents, were inexpensive, and did not require the addition of staff to review the materials with the family. However, the use of video education in the ED setting may be limited, particularly during times of high patient volumes, if it results in increased length of stay. It is important to note that all subjects in this study were recruited after initial evaluation by a health care provider, which often followed waiting times in excess of the 20 minutes required to review the video. Viewing the video during the time parents were awaiting evaluation and treatment for their child would have likely eliminated any differences in ED length of stay related to the type of asthma education provided.

In our sample, parents sought care for their asthmatic child in the ED nearly as often as they were seen in the primary care setting. The high numbers of ED visits suggest that this contact with the health care system could be an important opportunity to provide asthma education. We find that ED-based asthma education can be offered during these unscheduled visits and can increase parental asthma knowledge. Asthma education programs that provide

consistent messages across the whole spectrum of clinical care-primary care office, specialist office, ED, and hospital-may be of greater benefit and are worthy of study.

LIMITATIONS

Our study has several limitations. First, parental self-report is subject to recall bias. A future study would be strengthened by obtaining data from additional sources such as the primary care office and administrative claims. Although this small pilot study did not detect statistically significant differences in outcomes, our results suggest that important changes in knowledge can be realized with ED-based education. Statistically significant increases in knowledge after exposure to video education compared with written materials may emerge with a larger sample size.

Our study was conducted in a single urban community ED with rates of low health literacy consistent with rates in the published literature for parents of asthmatic children seeking care in outpatient clinics 10 and for US parents in general.²⁶ The delivery of these same asthma educational materials to a different population of parents in another community may not yield the same results. To address questions related to the external validity and generalizability of our findings would require a larger multicenter study. Along this line, the written materials evaluated in this study, which were at an eighth-grade reading level, may not be representative of all written asthma education materials used in clinical practice. We suspect that some asthma education materials provided to patients are written at higher reading levels.

CONCLUSIONS

Asthma education materials distributed at the time of an ED visit are acceptable to parents and increase their knowledge about the disease. Video-based asthma education appears promising as a tool for increasing asthma knowledge in both low- and adequate-health-literacy parents. Comprehensive asthma management programs within health systems should identify ways to incorporate asthma education into the ED visit as it represents an additional opportunity to provide parents with key educational messages about asthma.

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FIGURE 1.
Subject flow.

FIGURE 2.
Asthma-related ED visits in the past year by parental health literacy level.

FIGURE 3.
Change in percentage of subjects with high knowledge scores.

TABLE 1**Demographic Characteristics of Subjects by Health Literacy Level**

	Low Health Literacy (n = 27)	Adequate Health Literacy (n = 59)	P
Caregiver characteristics			
Caregiver age, %			
19–24 y	20.0	3.6	0.05
25–30 y	32.0	23.2	
31–40 y	32.0	41.1	
>40 y	16.0	32.1	
Annual household income, %			
<\$10,000	33.3	20.7	0.06
\$11,000–20,000	37.5	27.6	
\$20,000–30,000	12.5	17.2	
\$30,000–40,000	16.7	12.1	
>\$40,000	0	22.4	
Highest grade completed, %			
<High school	25.9	8.5	0.002
High school	55.6	32.2	
Some college	18.5	40.7	
College	0	18.6	
Child characteristics			
Age median (interquartile range), y	9.9 (4.9–12.4)	8.0 (4.7–9.8)	0.21
Sex, %			
Male	69.2	49.1	0.10
Female	30.8	50.9	
Child's race, %			
African American	11.1	24.1	0.42
White	81.5	67.2	
Hispanic	0	3.5	
Mixed race	7.4	5.2	
Insurance, %			
Medicaid	66.7	45.8	0.15
Private	33.3	52.5	
Uninsured	0	1.7	

TABLE 2**Baseline Asthma Characteristics by Parental Health Literacy Level**

	Low Health Literacy (n = 27)	Adequate Health Literacy (n = 59)	P
Child has persistent asthma, %	29.6	28.8	1.0
Child has a PCP, %	92.6	96.6	0.58
Child sees an asthma specialist, %	14.8	44.1	0.007
Family has an asthma action plan, %	18.5	32.2	0.30
Hospitalized for asthma in the past, %	25.9	13.6	0.22
Total PCP visits in the last year			
Median (interquartile range)	2 (1–5)	3 (1–6)	0.59
Symptomatic days in the last 6 mo			
Median (interquartile range)	7 (5–48)	6 (3–30)	0.24
Perceived asthma control			
Median (interquartile range)	29 (27–33)	30 (28–33)	0.45
High asthma knowledge score, %	33.3	59.3	0.025

TABLE 3**Health Care Utilization at Follow-Up**

	Low Health Literacy	Adequate Health Literacy	<i>P</i>
Return visit to the PCP, %			
Video	71.4	57.1	0.50
Written	23.1	67.7	0.009
Return visit to the ED, %			
Video	14.3	25.0	0.69
Written	7.7	6.5	1.0