

EDUCATION AND ADHERENCE

Children's and Parents' Report of Asthma Education Received from Physicians

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Objective. Clinical practice guidelines recommend that physicians provide asthma education to patients and their families. To characterize parents' and children's perception of physician practice, we examined: (i) proportion of parents and children reporting physician discussion of asthma education topics; (ii) age-group differences in children's report; (iii) site differences in children's and parents' report; (iv) sociodemographic and disease characteristics associated with children's report; and (v) the relation between children's report and adherence to daily controller medications. **Methods.** We conducted a cross-sectional study of 125 children with asthma (mean age = 11.3 years; 62% were male) and their parents. Parents provided demographic and disease data. Children reported whether physicians had ever discussed each of 16 asthma education topics with them. We used logistic regression to examine age-group and site differences in children's report of physician discussion of each topic. Multivariate linear regression was used to determine associations between demographic (e.g., child age, race) and disease (e.g., symptom severity) variables and topics discussed. **Results.** On average, 34.7% of children reported physician discussion of a topic; 8–10-year-olds reported significantly fewer topics discussed than children aged 11 and older ($p < .05$). Whereas parents' report differed by practice setting, children's report did not. In multivariate analyses, child age ($\beta = 0.46$ (SE: 0.17); $p < .01$), persistent symptoms ($\beta = 1.59$ (SE: 0.80); $p < .05$), and number of outpatient asthma visits ($\beta = 0.19$ (SE: 0.08); $p < .05$) remained significantly associated with number of topics discussed. **Conclusion.** These results suggest that the majority of children either may not receive, or may not recall receiving, information from their physicians about the fundamentals of asthma management. Physicians have an invaluable teaching opportunity in the medical office visit and should consider capitalizing on this opportunity to build children's sense of self-efficacy and competence in their self-care.

Keywords asthma education, asthma self-management, children and adolescents, parents, physician–patient communication, physician practice

INTRODUCTION

Clinical practice guidelines specifically recommend providing asthma education to patients and their families to enhance asthma management (1). Physicians, however, have reported wide variation in the extent to which they follow these guidelines. National data indicate that asthma education (broadly defined) occurred at only an estimated 47% of clinic visits for patients under age of 18 years (2). In addition to this variation in care, and despite an increased focus on need for patient-centered care (3,4), there is a lack of information on families' perspective on asthma education. Assessment of patient-centered care should be made by patients themselves (3–6). Patients' views on their healthcare, not physicians' views, may better predict health outcomes (3–6).

To our knowledge, only two published studies have examined parents' report on receiving asthma education from their children's physicians (7,8). In one study (7),

75% of parents reported that their children's healthcare providers had fully discussed how to manage an asthma attack whereas 58% reported provider discussion about how to recognize a change in the child's asthma symptoms. This study also suggested that parents' socioeconomic status was inversely related to parents' report of asthma education. In a study that specifically focused on parents' report of receiving written self-management tools from pediatric primary care physicians, Cabana et al. (8) found that only about 30% of parents reported receiving these tools known to facilitate children's medical adherence. This study also showed an inverse association between parents' socioeconomic status and parents' report of written self-management tools received.

We found no published study that has examined children's perception of the asthma education that they receive from physicians. Relevant literature on physician–parent–patient communication in the medical consultation (9–11) suggests that the pediatric medical consultation is dominated by the physician and the parent; the child is included only marginally. In fact, an estimated 90% of verbal interactions exclude the patient (9). Moreover, children's involvement is limited largely to the medical history-taking phase of the consultation (e.g., symptom report); children tend to be excluded from

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discussion about diagnosis and treatment (9,10). This research suggests that children may be receiving even lower levels of asthma education than would be expected based on physicians' report (2).

It is important, given both economic and quality of life costs, to improve chronic illness self-management in children and adolescents (1). Additionally, parents allow children considerable responsibility for chronic illness self-management as early as in middle childhood, with child responsibility increasing dramatically through adolescence (12–16). Determining the range and type of asthma education that parents and children perceive that they receive from physicians over the course of the child's illness is, therefore, essential.

Rates of physician delivery of asthma education may also vary with type of practice setting. Such data could benchmark, as well as inform, the design of appropriate interventions to enhance delivery of asthma education in different settings.

In this study, we examined: (i) the proportion of children and parents who reported *ever* having fully discussed each of 16 topics of asthma education with a physician; (ii) age-group differences in the proportion of children reporting physician discussion about each topic; (iii) practice site differences in proportions of parents' and children's reporting physician discussion; (iv) sociodemographic and disease characteristics associated with children's report of topics discussed with their physician; and (v) whether children's report of the number of topics discussed was associated with children's adherence to daily controller medications.

METHODS

Study Population

We analyzed data from a broader study on parent-to-child transfer of responsibility for asthma management. This study was approved by the Institutional Review Board of the University of California, San Francisco. We recruited a sample of children and adolescents with asthma aged 8–16 years, and their primary caregiver, from three sites: a general pediatrics clinic at an academic medical center, a county hospital-based pediatric asthma clinic, and a community pediatric group practice. At each clinic, we used administrative data to identify patients who met initial eligibility criteria. For the hospital-based clinics, we contacted families by mail and followed up with telephone calls to request participation of the parent/guardian most involved in the child's healthcare (defined as the adult who takes the child to healthcare visits) and to determine study eligibility. For the community group practice, letters were mailed to parents and children; parents could then contact us if interested.

Children were included only if they had physician-diagnosed asthma, no other medical condition with pulmonary complications, and were literate in either English or Spanish. The overall response rate from eligible families across the three sites was 41% (125/308).

Data Collection

Parents provided consent and children signed assent to participate. Parents and children completed a one-time, in-depth, face-to-face, semi-structured interview and written survey either at their homes or at our office. Trained research assistants interviewed parents and children separately to ensure independent reporting. Research personnel administered the written survey to all children younger than 10 years old or when it was determined that children needed assistance. Parents received \$30 gift cards and children received \$20 gift cards.

Study Variables

Parents provided all demographic and disease data. Independent variables included characteristics of the child (age, gender); parent (age, race/ethnicity, education level, income, number of dependents, payor); and disease (duration, number of medical office visits in the preceding 12 months, symptom severity). Given that participants were recruited from three medical settings, we also included practice site as an independent variable. Parent education was categorized as either "high school/general equivalency diploma or less" or "vocational school/college or more." Race was classified as "white," "black," or "other." We used the definition of poverty published by the US Department of Health and Human Services in 2009 (17) to determine whether annual household income was below or above the federal poverty level, adjusting for the number of dependents.

We classified patients as having intermittent or persistent asthma based on the National Heart, Lung, and Blood Institute guidelines (1). Persistent asthma was defined based on parents' report of whether the child had experienced either nighttime symptoms more than two times per month, daytime symptoms more than two times per week, or use of a daily asthma controller medication.

Adherence to daily controller medication was calculated as the percent ratio of parents' report of the number of daily doses taken in an average week to number of doses prescribed.

Parents completed the 16-item Parent Report of Asthma Education Received measure (7). Children completed a modified version of this measure. This measure requires respondents to indicate whether a physician had ever discussed each of 16 topics either "fully," or "briefly/not at all" with them in the past. Scale integrity was verified using Cronbach's alpha ($\alpha = 0.83$). Children's report of asthma education received was calculated as the sum of topics (0–16) that the child reported as ever having been fully discussed with them by a physician.

Data Analyses

SAS 9.2 (SAS Institute, Inc., Cary, NC, USA) was used for data analyses. Statistical significance was defined as $p \leq .05$. We used a paired *t*-test to compare parents' and children's report of topics discussed. To test whether

there were age-group differences in children's report of physician discussion of each topic, we used logistic regression with age group as the independent variable and the 14–16-year-old adolescent group as the reference category. To test whether there were site differences in parents' and children's report of physician discussion of each topic, we used logistic regression with site as the independent variable and the county hospital-based pediatric asthma clinic as the reference category.

To determine the sociodemographic and disease characteristics associated with children's report of number of topics discussed, β coefficients and p -values were calculated using general linear regression. Specifically, we used linear regression to examine the bivariate relation between the independent variables (child age, gender, parent age, parent race, education, household income, payor type, disease duration, symptom severity, and number of outpatient asthma visits) and topics discussed defined as a continuous dependent variable. Only parameters with $p < .20$ in the bivariate analysis were included in the multivariate linear regression model.

We also used linear regression to examine the bivariate association between children's report of topics discussed and their adherence to daily controller medications defined as a continuous outcome variable.

RESULTS

Participants

Participants were 125 children and their parents/primary caregivers. Children's average age was 11.3 years (SD: 2.3; range: 8–16 years); 62.4% were male. Thirty percent of parents reported their ethnicity as Hispanic. In terms of racial description, 32% of parents described themselves as white and 34% as black. Based on parents' report of symptoms, 73% of children met criteria for persistent asthma. Table 1 displays additional demographic and disease data.

Children's and Parents' Report of Having Received Asthma Education

Whereas children reported an average of 5.6 (SD: ± 3.5 ; inter-quartile range: 3–8) topics discussed, parents reported an average of 8.7 (SD: ± 4.9 ; inter-quartile range: 5–13) topics discussed ($p < .01$). Proportionately more parents than children reported physician discussion across all topics. Across all 16 topics, the majority of children indicated no direct education by their physicians. The average proportion of children reporting physician discussion of a given topic was 34.7%, with a low of 25.6% reporting discussion about the goals in asthma management and a high of 51.2% reporting education regarding use of a metered dose inhaler. The youngest group, 8–10-year-olds, reported significantly fewer topics discussed relative to the 11–13-year-olds and 14–16-year-olds ($p < .05$). Older children were more likely to report receiving education for specific asthma topics. We found significant age-group differences in

TABLE 1.—Child, parent, and disease characteristics ($N = 125$).

	<i>N</i>	%
Child characteristics		
Age (years)		
Mean ($\pm$ SD)	11.3 (± 2.3)	
Median (range)	11 (8–16)	
Male gender	78	62.4
Parent characteristics		
Age (years)		
Mean (SD)	42.9 (± 8.2)	
Median (range)	42 (27–63)	
Relationship to child		
Mother	112	89.6
Other relative	13	11.4
Ethnicity		
Hispanic	37	30.0
Race		
White	35	32.4
Black	37	34.3
Other	36	33.3
Declined	17	
Education		
High school graduate/GED or less	29	24.0
Vocational school or college education	92	76.0
Declined	4	
Household income relative to FPL ^a		
Below FPL	24	22.9
At or above FPL	81	77.1
Declined	20	
Mean number dependents ($\pm$ SD)	3.7 (± 1.4)	
Insurance type		
Private	41	33.3
Public	71	57.7
Other	11	8.9
Declined	2	
Site		
Community pediatric group practice	29	23.2
County hospital pediatric asthma clinic	36	28.8
Academic medical center general pediatric clinic	60	48.0
Disease and treatment characteristics		
Mean years since diagnosis ($\pm$ SD)	7.9 (± 3.6)	
Asthma visits in the last year		
Mean $\pm$ SD	3.4 (± 3.9)	
Median (range)	3 (0–25)	
Symptoms ^b		
Persistent	91	72.8
Intermittent	34	27.2

Notes: ^a2009 Federal Poverty Guidelines for the 48 Contiguous States and the District of Columbia, US Department of Health & Human Services. Available at: <http://aspe.hhs.gov/poverty/09poverty.shtml>

^bPersistent asthma was defined based on parent report of the child having had more than two ER visits in the past year, and/or nighttime symptoms more than two times in the past month, and/or daytime symptoms more than two times per week, and/or use of a daily asthma controller medication.

SD, standard deviation; GED, general equivalency diploma; FPL, federal poverty level.

report of physician discussion on four topics. Relative to 14–16-year-olds, fewer 8–10-year-olds reported discussion about the effects of smoking ($p < .05$) and about the difference between asthmatic and normal airways ($p < .01$). Relative to 14–16-year-olds, more 11–13-year-olds reported discussion of how different medications work ($p < .01$); and fewer 8–10-year-olds ($p < .01$) but more 11–13-year-olds ($p < .05$) reported discussion about how

TABLE 2.—Proportion of parents and children reporting asthma education received from physicians: Children's age-group differences by topic.

Topics of asthma education	Parents N = 125 (%)	Children N = 125 (%)	Age 8–10 years n = 50 (%)	Age 11–13 years n = 50 (%)	Age 14–16 years (reference) n = 25 (%)
<i>In the past, (if parent) has your child's doctor ever . . . ? (if child) has your doctor ever . . . ?</i>					
1. Reviewed with you how to use a metered dose inhaler	76.0	51.2	42.0	56.0	60.0
2. Discussed with you how to manage an asthma attack	75.2	36.8	34.0	38.0	40.0
3. Advised you regarding the effects of smoking	53.6	39.2	30.0*	38.0	60.0
4. Asked you about problems taking asthma medications	46.4	36.8	30.0	44.0	36.0
5. Discussed with you what happens during an asthma attack	69.6	32.8	26.0	40.0	32.0
6. Provided you with take-home educational materials	54.4	33.6	28.0	38.0	36.0
7. Discussed with you how different medications work	55.2	36.0	26.0	50.0**	28.0
8. Reviewed with you peak flow meter use	44.0	33.6	26.0	40.0	36.0
9. Asked you about worries you have about medications	48.8	31.2	26.0	38.0	28.0
10. Taught you how to recognize a change in asthma symptoms	52.0	27.2	12.0**	40.0*	32.0
11. Discussed with you the difference between asthmatic and normal airways	55.2	32.8	18.0**	40.0	48.0
12. Discussed with you allergen control measures	52.0	31.2	26.0	32.0	40.0
13. Provided you with a written medication plan	51.2	34.4	30.0	36.0	40.0
14. Discussed with your child/you the child's feelings about asthma	32.8	36.0	40.0	36.0	28.0
15. Talked with you about goals in management	49.6	25.6	18.0	26.0	40.0
16. Provided you with written guidelines on when to call the doctor or when to go to the emergency department	56.8	36.8	34.0	46.0	24.0
Mean % children reporting adequate education (SD)	54.5 (11.1)	34.7 (5.7)	27.9** (7.7)	39.9 (6.9)	38.0 (10.5)
Number of topics discussed adequately					
Mean ($\pm$ SD)	8.7($\pm$ 4.9)**	5.6 ($\pm$ 3.5)	4.5 ($\pm$ 3.4)*	6.4 ($\pm$ 3.3)	6.1 ($\pm$ 3.5)
Median (IQR)	9 (5–13)	5 (3–8)	4 (2–7)	6.5 (5–8)	6 (3–9)

Notes: SD, standard deviation; IQR, inter-quartile range.

* $p \leq .05$, ** $p \leq .01$.

to recognize a change in symptoms. Table 2 provides further details.

Site Differences in Children's and Parents' Report of Having Received Asthma Education

The three practice sites comprised a general pediatrics clinic at an academic medical center, a county hospital-based pediatric asthma clinic, and a community pediatric group practice.

Site differences in the average number of topics that *children* reported discussing with their physicians (5.1 ($\pm$ 3.4) to 6.1 ($\pm$ 3.6) topics) were not significant. There were, however, several site differences at the topic level. For example, significantly more children reported discussion of the use of a metered dose inhaler at the community pediatric group practice (58.6%, $p < .05$) and general pediatric academic medical center (58.3%, $p < .05$) as compared to the county hospital-based pediatric asthma clinic (33.3%). On the other hand, significantly fewer children at the community pediatric group practice (37.9%, $p < .05$) and at the academic center general pediatrics clinic (25.0%, $p < .001$) relative to the county hospital-based pediatric asthma clinic (63.9%) reported discussion about the effects of smoking.

Whereas site differences were not observed for children's report of average number of topics discussed with physicians, significant site differences were observed

for average number of topics that *parents* reported as having been discussed. The highest average number of topics was reported by parents whose children were patients at the county hospital-based pediatric asthma clinic (11.1 ($\pm$ 4.8)); the lowest average number of topics was reported by parents whose children were seen at the community pediatric group practice (6.8 ($\pm$ 4.2)). At the academic medical center general pediatrics clinic, parents reported discussion of, on average, 8.3 ($\pm$ 4.8) topics. There were also significant site differences at the topic level. For example, significantly fewer parents of children from the community pediatric group practice (24.1%, $p < .001$) and the academic medical center general pediatrics clinic (48.3%, $p < .01$) than at the county hospital-based pediatric asthma clinic reported that they had received written medication plans (77.8%). Table 3 provides detailed site differences in both children's and parents' report, by topic.

Factors Associated with Children's Report of Topics Discussed

A subset of children ($n = 22$) and their parents were excluded from the multivariate regression model because of missing data primarily in race and income categories, leaving a sample of 103 children and their parents. Parents with missing data were less likely to have graduated high school ($p < .05$).

TABLE 3.—Site differences in proportion of parents and children reporting asthma education received from physicians.

Topics of Asthma Education	Parents			Children		
	County			County		
	Community pediatric group practice <i>n</i> = 29 (%)	hospital-based pediatric asthma clinic (reference) <i>n</i> = 36 (%)	General pediatrics clinic at academic medical center <i>n</i> = 60 (%)	Community pediatric group practice <i>n</i> = 29 (%)	hospital-based pediatric asthma clinic (reference) <i>n</i> = 36 (%)	General pediatrics clinic at academic medical center <i>n</i> = 60 (%)
<i>In the past, (if parent) has your child's doctor ever . . . ? (if child) has your doctor ever . . . ?</i>						
1. Reviewed with you how to use a metered dose inhaler	75.9	75.0	76.7	58.6*	33.3	58.3*
2. Discussed with you how to manage an asthma attack	69.0	86.1	71.7	27.6	50.0	33.3
3. Advised you regarding the effects of smoking	51.7	72.2	43.3**	37.9*	63.9	25.0***
4. Asked you about problems taking asthma medications	34.5*	63.9	41.7*	41.4	30.6	38.3
5. Discussed with you what happens during an asthma attack	58.6*	83.3	66.7	24.1	38.9	33.3
6. Provided you with take-home educational materials	44.8*	69.4	50.0	31.0	30.6	36.7
7. Discussed with you how different medications work	51.7	69.4	48.3*	27.6	33.3	41.7
8. Reviewed with you peak flow meter use	34.5	44.4	48.3	20.7*	50.0	30.0*
9. Asked you about worries you have about medications	31.0*	61.1	50.0	34.5	22.2	35.0
10. Taught you how to recognize a change in asthma symptoms	31.0**	63.9	55.0	31.0	25.0	26.7
11. Discussed with you the difference between asthmatic and normal airways	41.4*	69.4	53.3	41.4	25.0	33.3
12. Discussed with you allergen control measures	41.4	63.9	50.0	37.9	27.8	30.0
13. Provided you with a written medication plan	24.1***	77.8	48.3**	17.2**	50.0	33.3
14. Discussed with your child/you the child's feelings about asthma	13.8***	61.1	25.0***	34.5	41.7	33.3
15. Talked with you about goals in management	34.5**	66.7	46.7	13.8*	36.1	25.0
16. Provided you with written guidelines on when to call the doctor or when to go to the emergency department	44.8**	77.8	50.0**	31.0	47.2	33.3
Mean % children reporting adequate education (±SD)	42.5*** (±15.9)	69.1 (±10.0)	51.6*** (±12.2)	31.9 (±10.8)	37.9 (±11.7)	34.2 (±7.9)
Number of topics discussed adequately						
Mean ± SD	6.8 ± 4.2***	11.1 ± 4.8	8.3 ± 4.8**	5.1 ± 3.4	6.1 ± 3.6	5.5 ± 3.5
Median (IQR)	6 (4–10)	13 (10–14)	8 (4–13)	5 (2–8)	6 (4–9)	5 (2–8)

Note: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

In unadjusted bivariate analyses, older child age ($\beta = 0.46$ (SE: 0.15); $p < .01$); black parents ($\beta = 1.50$ (SE: 0.75); $p = .05$); having public health insurance ($\beta = 1.37$ (SE: 0.71); $p = .06$); persistent symptoms ($\beta = 2.24$ (SE: 0.77); $p < .01$), and more outpatient asthma visits ($\beta = 0.26$ (SE: 0.08); $p < .01$) were each associated with children reporting more topics discussed with physician.

In a multivariate model that included child age, parent age, parent race, parent education, insurance type, disease duration, symptom severity, and number of doctor office visits, only increasing child age ($\beta = 0.46$ (SE: 0.17); $p = .01$), persistent symptoms ($\beta = 1.59$ (SE: 0.80); $p = .05$), and increasing number of outpatient asthma visits ($\beta = 0.19$ (SE: 0.08); $p < .05$) remained significant (Table 4). This multivariate model accounted for 28% of

the variance in number of topics that children reported physicians had discussed fully with them ($F = 4.20$, $p < .001$).

The Relation between Children's Report of Asthma Education Received and Medication Adherence

We examined the bivariate association between children's report of asthma education received from physicians and parents' report of children's adherence to daily controller medications. The mean percentage adherence was 83% (SD: 20). The association between the number of topics discussed and parent-reported adherence was not significant ($\beta = 0.69$ (SE: 1.90); $p = .72$).

TABLE 4.—Sociodemographic and disease characteristics associated with children's report of asthma education received from physicians ($N = 103$ with complete data).

	Unadjusted bivariate associations				Adjusted multivariate regression			
	β	SE β	95% CI	p -Value	β	SE β	95% CI	p -Value
Child characteristics								
Age	0.46	0.15	0.16–0.76	.002	0.46	0.17	0.13–0.79	.01
Male gender	0.18	0.75	–1.30–1.67	.81				
Parent characteristics								
Age	0.08	0.05	–0.02–0.17	.10	0.06	0.05	–0.03–0.15	.22
Black race	1.50	0.75	0.01–2.98	.05	0.92	0.86	–0.78–2.62	.29
High school graduate/GED or less	1.87	0.89	–0.10–3.65	.04	1.34	0.96	–0.56–3.24	.16
Household income below FPL ^a	0.43	0.91	–1.38–2.24	.64				
Public health insurance	1.37	0.71	0.04–2.79	.06	0.27	0.85	–1.43–1.96	.76
Site								
Academic medical center general pediatric clinic	Reference							
County hospital pediatric asthma clinic	0.46	0.87	–1.27–2.19	.60				
Community pediatric group practice	–0.41	0.91	–2.21–1.39	.65				
Disease & treatment characteristics								
Years since diagnosis	0.17	0.10	–0.02–0.36	.08	–0.07	0.10	–0.28–0.14	.51
Persistent symptoms ^b	2.24	0.77	0.70–3.77	.004	1.59	0.80	0.003–3.18	.05
Number of outpatient asthma visits in the last year	0.26	0.08	0.10–0.43	<.002	0.19	0.08	0.02–0.35	.03
Percent adherent to daily regimen	1.39	1.96	–2.55–5.32	.48				
R^2						0.28		
F						4.20		<.001

Notes: ^a2009 Federal Poverty Guidelines for the 48 Contiguous States and the District of Columbia, US Department of Health & Human Services. Available at: <http://aspe.hhs.gov/poverty/09poverty.shtml>

^bPersistent asthma was defined based on parent report of the child having had more than two ER visits in the past year, and/or nighttime symptoms more than two times in the past month, and/or daytime symptoms more than two times per week, and/or use of a daily asthma controller medication.

β , beta coefficient; SE, standard error; CI, confidence interval; GED, general equivalency diploma; FPL, federal poverty level; R^2 , coefficient of determination; and F , value of the F -statistic.

DISCUSSION

This study provides new details on the range and type of asthma education messages that children and parents report that they receive from physicians. Parents reported physician discussion of significantly more topics, on average, than children. Whereas the proportion of children who reported receiving asthma education ranged from 25.6% (on the topic of goals in asthma management) to 51.2% (use of metered dose inhaler), the proportion of parents who reported receiving asthma education ranged from 32.8% (child's feelings about asthma) to 76% (use of a metered dose inhaler). The low to moderate rates of receiving asthma education reported by parents are consistent with previous research (7,8). These percentages are also notably consistent with national data showing that only 47% of physicians report providing asthma education (2). These results suggest that a considerable proportion of parents and children either may not be receiving, or may not recall receiving, information from their physicians about the fundamentals of asthma management.

The disparity between parents' and children's report of receiving asthma education from physicians reflect previous research on physician–parent–patient communication. Previous research has suggested that children are largely disregarded in verbal interactions in the pediatric

medical consultation (9–11). In fact, one study (9) found that only 10% of verbal interactions included children. Importantly, these studies focused on *observer* analysis of physician–parent–patient interactions. To our knowledge, our study is unique in its focus on children's *subjective* experience of these interactions. Based on data from our sample, children may perceive themselves as more included than previous research would suggest. Although the child does not directly participate, the physician–parent discussion appears to have salience for the child perhaps because it concerns the child's medical condition.

It is unclear why as few as 12% of children aged 8–10 years and only 40% of 11–13-year-olds and 32% of 14–16-year-olds reported adequate physician teaching related to recognition of changes in asthma symptoms. Given that symptoms are subjectively experienced and that an adult may not always be present, it is critical to teach children to recognize changes in their symptoms and to seek treatment early. These data suggest that patients may not be receiving essential asthma messages at an age-appropriate time.

Our study also provided details on practice site differences in the extent to which physicians provide asthma education. The data suggest that, regardless of setting, physicians are talking more with parents than with children. Children did not differ significantly across rates in their report of the average number of topics discussed

with physicians, though the specific topics discussed varied by site. There were, however, significant site differences in parents' report of both the average number of topics discussed with physicians and the topics that had been discussed. Parents of children seen at the asthma specialty clinic reported discussion of more topics than at either the academic medical center general pediatrics clinic or the community group practice. These differences may reflect the broader scope of care in a general pediatric practice, as other topics may need to be discussed (e.g., immunizations, general safety, nutrition, sleep hygiene).

We sought to describe the children who reported receiving asthma education. Older child age, more severe symptoms, and more frequent outpatient visits remained significant in multivariate analyses. The more mature cognitive capabilities of the older adolescents may facilitate better recall, accounting for the age differences observed in report of physician discussion. Future research using larger, representative samples is warranted to clarify this issue.

The findings of this study must be interpreted with caution. The cross-sectional design precludes causal inference. We also used a relatively small sample that may limit generalizability of the results. However, we recruited a racially/ethnically diverse sample from three distinct types of settings: an academic medical center, a county hospital clinic, and private practices.

Our study is also limited by its use of only quantitative data; our findings lack qualitative detail. We can make no judgment on the way children interpreted the demands of the task or on the extent of their overall asthma knowledge. Further, our study did not control for other sources of asthma education such as school-based asthma education or asthma camp: it is possible that children conflated asthma education received from sources other than physicians.

In this study, we assessed only children's and parents' perception of asthma education received from physicians. We did not assess physicians' report for comparison with children's and parents' report. Regardless of physicians' report, children's and parents' report have validity with regard to receiving asthma education: the crucial question may not be whether physicians have/have not actually discussed a topic of asthma education; rather, the important question is whether the child/parent has understood and is applying such information to effectively manage the patient's asthma (6). In other words, even if a physician reports that he/she has provided asthma education, it is no guarantee that the child/parent has actually comprehended the information—or is able to apply it.

CONCLUSIONS

This study provides a preliminary look at *children's* perception of the asthma education received from physicians. Previous research has focused almost exclusively on physician report of delivery of asthma education (2). It is at least as salient, particularly given the twin objectives of enhancing patient-centered care and improving children's

asthma self-management, to ascertain children's perspective. Similarly, previous research on physician–parent–patient communication has focused on analysis of the structure (e.g., turn taking) and content of the office visit (10). Research is needed to better understand children's interpretation of physician–parent–patient interactions.

This study indicated that children may be receiving less-than-optimum levels of asthma education from physicians. Lack of physician training, limited time, and/or competing demands of the typical primary care visit may account for these low levels. Interventions may be needed to increase clinical efficiency (18), to develop systems within practices to leverage the expertise of allied health professionals (19), and to utilize community resources that provide asthma education (20). If physicians are providing asthma education and children are unable to access and use this information, then interventions may be needed to enhance physician communication style to facilitate children's health literacy (6).

Finally, children's chronic illness self-management is best conceptualized as a developmental process (21), with physicians as key agents in the process. The literature suggests that it may be helpful for physicians to view the office visit as “a developmental environment” (9) in which physicians promote children's active participation in the management of their disease (9–11). As important, physicians serve as models for parents who must ultimately transfer responsibility for chronic illness management to their children.

Previous studies have noted that in many cases, children assume self-management at an early age (12–16). The results of this study suggest that physicians may be missing a valuable opportunity to assertively include children in the medical consultation and promote the development of successful, ongoing asthma self-management over time in children and adolescents. Physicians have an invaluable teaching opportunity in the medical office visit and should consider capitalizing on this opportunity to build children's sense of self-efficacy and competence in their self-care.

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DECLARATION OF INTEREST

The authors report no competing interests. The authors alone are responsible for the content and writing of this paper.

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