Communication During Pediatric Asthma Visits and Self-Reported Asthma Medication Adherence

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KEY WORDS

adherence, asthma, pediatric, communication

ABBREVIATIONS

GEE—generalized estimating equation
SDM—shared decision-making

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WHAT'S KNOWN ON THIS SUBJECT: Little is known about how communication during pediatric asthma visits is associated with child control medication adherence 1 month after the visit.

WHAT THIS STUDY ADDS: When providers asked for caregiver input into the asthma treatment plan during the visit, caregivers reported significantly higher child medication adherence to control medications 1 month later.

abstract

OBJECTIVE: Our objectives were to examine how certain aspects of provider-patient communication recommended by national asthma guidelines (ie, provider asking for child and caregiver input into the asthma treatment plan) were associated with child asthma medication adherence 1 month after an audio-taped medical visit.

METHODS: Children ages 8 through 16 with mild, moderate, or severe persistent asthma and their caregivers were recruited at 5 pediatric practices in nonurban areas of North Carolina. All medical visits were audio-tape recorded. Children were interviewed 1 month after their medical visits, and both children and caregivers reported the child's control medication adherence. Generalized estimating equations were used to determine if communication during the medical visit was associated with medication adherence 1 month later.

RESULTS: Children (n = 259) completed a home visit interview ~1 month after their audio-taped visit, and 216 of these children were taking an asthma control medication at the time of the home visit. Children reported an average control medication adherence for the past week of 72%, whereas caregivers reported the child's average control medication adherence for the past week was 85%. Child asthma management self-efficacy was significantly associated with both child- and caregiver-reported control medication adherence. When providers asked for caregiver input into the asthma treatment plan, caregivers reported significantly higher child medication adherence 1 month later.

CONCLUSIONS: Providers should ask for caregiver input into their child's asthma treatment plan because it may lead to better control medication adherence. *Pediatrics* 2012;130:627–633

Asthma is the most common chronic condition among US children.[1,2] In the United States, asthma affects >6 million children and accounts for an estimated 20 billion dollars in health care costs annually.[3] The clinical practice guidelines of the National Asthma Education and Prevention Program of the National Heart Lung and Blood Institute encourage physicians to discuss medications with patients at every follow-up asthma visit.[3] The guidelines also emphasize the importance of jointly determining the goals of treatment with the patient and family.[3] Moreover, the 2001 US Institute of Medicine report endorsed patient-centered care and recommended that health care professionals implement the shared decision-making (SDM) model in clinical settings.[4,5]

More recently, the concept of "patient-centered" approaches have been introduced as an effective way to involve and motivate the patient. In a study of adult asthma patients, a SDM approach was compared with traditional clinician decision-making. It was found that the SDM intervention resulted in better adherence to controller medications and better clinical outcomes.[6]

However, little is known about the relationship between provider-patient communication during pediatric asthma visits and its association with child- and caregiver-reported control medication adherence.[7,8] Apter et al[7] found that poor patient ratings of patient-provider communication about asthma were related to poor adherence to inhaled steroids. Chambers et al[8] discovered that regular inhaled corticosteroid use was related to whether patients perceived themselves as actively involved in treatment decisions during medical visits. A limitation of these previous studies is that they relied on subjective patient reports of medical visit communication rather than objective data, such as audio-tape recordings of the visits.[7,8]

Our previous work demonstrated that providers rarely asked for child or caregiver input into the child's asthma treatment plan during audio-taped pediatric medical visits.[9] This current article examines how certain aspects of provider-patient communication that are recommended by the national asthma guidelines (ie, number of control medication questions the provider asks, the total number of medication questions asked by children, and the provider asking for child and caregiver input into the asthma treatment plan) are associated with child asthma medication adherence 1 month after the audio-taped visit.

METHODS

Participants

The study was approved by the University of North Carolina Institutional Review Board. Providers were recruited at 5 pediatric practices in North Carolina, and consent was obtained. The providers were told that the study focused on communication during pediatric asthma visits. Children and their caregivers of these participating providers were recruited. Children were eligible if they (1) were ages 8 through 16 years, (2) were able to speak English, (3) could read the assent form, (4) had been seen at the clinic at least once before, (5) were present at the visit with an adult caregiver (parent or legal guardian) who could read and speak English and who was at least 18 years of age, and (6) had mild, moderate, or severe persistent asthma. Persistent asthma was defined as experiencing asthma-related daytime symptoms more than twice a week, asthma-related nighttime symptoms more than twice a month, or receiving 1 or more long-term controller therapies for asthma.[7,8]

Clinic staff referred potentially eligible patients who were interested in learning more about the study to a research assistant. The research assistant explained the study, obtained caregiver consent and child assent, and administered the eligibility screener.[9] Providers and families were told that the study was examining communication during pediatric visits. All of the medical visits were audio-tape recorded. A home visit was conducted 1 month later, during which children were interviewed and caregivers completed self-administered questionnaires.

Audio-Tape Coding

Each medical visit audio-tape was transcribed verbatim and then coded by 2 research assistants. To assist with coding asthma-related communication, the research assistants used a detailed coding tool that contained code definitions and example quotations. The 2 research assistants coded 20 of the same transcripts throughout the study period to assess intercoder reliability. More detail about how the communication variables were coded is provided below in the Measures section.

Measures

Demographic and Sociodemographic Characteristics

The caregiver screening instrument assessed children's medication use. The research assistants showed caregivers a list of asthma medications and asked them to indicate which one(s) the child was taking. Responses were dichotomized based on whether the caregiver reported that the child was taking a controller medication versus not taking a controller medication. Using data from the study's eligibility screening instrument, asthma severity was classified as mild versus moderate/severe by a research assistant based on the caregiver's report of the child's recent symptoms and medication use.[7–9] Our eligibility screening instrument used the primary asthma severity classification system that was in use when the study was designed

and conducted.[7–9] More detail about the asthma severity classification system is provided by Sleath et al.[9]

A variety of demographic and sociocultural factors were examined as potential confounders. For descriptive purposes, child self-reported race was re-coded into 4 categories: white, African American, Native American/American Indian, or other. However, for the bivariate and multivariable analyses, child race was re-coded into a dichotomous variable (white versus nonwhite). The child's insurance status, which was reported by the caregivers, was measured by using the following categories: none, private insurance, Medicaid, the State Children's Health Insurance Program, and other. Caregivers also reported the number of years the child had asthma, which was measured as a continuous variable and the number of control medications the child was taking at the home visit. Due to skewness of the data, for the multivariable analysis, number of control medications was recoded into 1 vs 2 or more control medications.

Caregiver self-reported education was measured in years. Child-reported asthma management self-efficacy was measured at the home visit by using a 14-item scale (α = .87).[10] We calculated the mean asthma management self-efficacy score as a continuous measure for each child; higher scores indicate greater self-efficacy. Child-reported outcome expectations for asthma medications was measured as a continuous variable by using an adapted version of Holden's 5-item outcome expectations scale.[11] The scale had a reliability of 0.64, and higher scores represent more positive outcome expectations for asthma medicines. We calculated the mean outcomes expectations score as a continuous measure for each child. Length of the medical visits was measured in seconds.

Communication During Visits

The coders also recorded the number of medication questions asked by the child, whether the provider included child input into the asthma management treatment plan, whether the provider included caregiver input into the asthma management treatment plan, and the number of questions the provider asked about control medications.

Two research assistants coded 20 of the same transcripts throughout the study period to assess intercoder reliability. Interrater reliability varied between 0.88 and 1.0 for the following communication variables: (1) the total number of medication questions asked by children was 0.96, (2) whether the provider asked for child input into the asthma management treatment plan was 0.88, (3) whether the provider asked for caregiver input into the asthma management treatment plan was 1.0, and (4) the number of provider questions about control medications was 0.95.

Child's Control Medication Adherence

Child and caregiver reports of the child's medication adherence was measured by using the Brief Medication Questionnaire, which was developed by Svarstad et al.[12] Child and caregiver reports of the child's adherence were calculated by using the following formula: adherence = (number of doses reported using during the past week divided by the number of prescribed doses) multiplied by 100. If the child was taking >1 control medication, an overall percent adherence variable was created by adding together the reported adherence for each control medication and dividing it by the number of control medications the child was using. Adherence data were collected at both the office visit and home visit.

Statistical Analyses

All analyses were conducted by using SPSS (SPSS Inc, Chicago, IL). First, we present descriptive statistics for all of the variables. Second, we examine bivariate relationships between the variables by using correlation coefficients, *t* tests, or Pearson χ^2 statistics. Only children who completed a home visit and who were taking at least 1 control medication were included in the adherence analyses (N = 216).

Next, we used generalized estimating equations (GEEs) to predict the following: (1) the child's self-reported adherence for the past week at the home visit and (2) the caregiver's report of the child's adherence for the past week at the home visit. We controlled for the following variables because they have been associated with medication adherence in previous studies: child age, gender, race, years with asthma, severity of asthma, caregiver education, child self-efficacy, and child outcome expectations. Additionally, for the child model, we controlled for the child's medication adherence at the office visit, and for the caregiver model, we controlled for the caregiver's report of the child's medication adherence at the office visit. Each GEE also included 4 communication variables: (1) the number of medication questions asked by the child, (2) whether the provider asked for child input into the asthma management treatment plan, (3) whether the provider asked for caregiver input into the asthma management treatment plan, and (4) the number of questions the provider asks about control medications.

RESULTS

The 5 participating clinics were primary care pediatric practices. Forty-one providers agreed to participate in the study. Two providers refused to participate for a participation rate of 95.3%. Eighty-eight percent of the families approached agreed to participate in the study. Two hundred ninety-six patients had useable audio-tape data, and these patients were seen by 35 of the 41 providers who agreed to

participate in the study. Four of the 35 providers were nurse practitioners or physician assistants, and they saw 17 of the participating children. Fifty-one percent of the providers were women. Twenty-seven of the providers were white, 2 were American Indian, 3 were African American, 1 was Asian, and 2 classified their race as other. Providers ranged in age from 30 to 70 years (mean = 44.8 years, SD = 9.4).

The current article focuses on the 259 of 296 children (88%) who completed a home visit interview ~1 month after their audio-taped medical visit. Table 1 presents the child and caregiver demographic characteristics. Child age ranged from 8 to 16 years (mean age = 11.1 years, SD = 2.4). Approximately 30% of the sample was African American; 50.6% of the sample was male. Seventy-one percent of the children had moderate/severe persistent asthma. Child self-efficacy scores ranged from 2 to 5 (mean = 4.05, SD = 0.62). Child outcome expectation scores ranged from 3.6 to 9 (mean = 7.9, SD = 1.1). Eighty-three percent of the children were taking 1 or more control medications (N = 216).

TABLE 1 Child and Caregiver Demographic Characteristics (N = 259)

	% (M)
Child age	
Mean (SD), range	11.1 (2.4), 8–16 y
Child gender	
Boy	50.6 (131)
Girl	49.4 (128)
Child race	
White	61.4 (159)
African American	29.7 (77)
Native American/ American Indian	10.8 (28)
Other	5.0 (13)
Asthma severity	
Mild persistent	28.6 (74)
Moderate/severe persistent	71.4 (185)
Years living with asthma	
Mean (SD), range	6.12 (3.9), 0–16 y
Caregiver age	
Mean (SD), range	40.9 (8.6), 26–80 y
Caregiver gender	
Man	13.2 (34)
Woman	86.8 (224)
Caregiver education in years	
Mean (SD), range	12.7 (2.5), 2–20 y
Insurance type	
None	1.2 (3)
Private	27.2 (70)
Medicaid	52.9 (136)
State Children's Health Insurance Program	16.3 (42)
Other	2.3 (6)
Number of control medications	
None	16.6 (43)
1	47.8 (124)
2	25.1 (65)
≥3	1.2 (3)
Missing	9.3 (24)

Children asked medication questions during 13% of visits (range, 0–6 questions; mean = 0.20; SD = 0.64). Providers asked for child input into the asthma management plan during only 7.8% of the visits. Providers asked for caregiver input into the asthma management plan during only 9% of the visits. Providers asked questions about control medications during 66.8% of visits (range, 0–16 questions; mean = 2.4; SD = 2.9)

Adherence

Table 2 presents the distribution of child- and caregiver-reported adherence. Children reported an average control medication adherence for the week before the home visit of 72.4% (SD = 32.9; range, 0–100). Caregivers reported an average child control medication adherence for the week before the home visit of 84.7% (SD = 26.1; range, 0–100). The average child reported control medication adherence was 12% lower than the average caregiver-reported adherence. However, caregiver- and child-reported control medication adherence were highly correlated (Pearson correlation = 0.64, P = .00).

Table 3 presents the GEE results predicting child-reported control medication adherence during the past week. Children taking more than 1 control medication reported being significantly more adherent than children taking just 1 control medication. Children with higher asthma management self-efficacy reported being significantly more adherent than children with lower asthma management self-efficacy. Children with longer lengths of visits were significantly more adherent. The total number of control medication questions the provider asked during the visit was significantly related to child-reported adherence in the bivariate analysis (Pearson correlation = 0.18, P = .01) but did not remain significant in the adjusted GEE analysis.

Table 4 presents the GEE results predicting caregiver-reported child control medication adherence during the past week. Caregivers reported significantly higher adherence for younger children and children who had higher asthma management self-efficacy scores. Caregivers reported significantly higher child adherence if the

TABLE 2 Child and Caregiver Reported Control Medication Adherence Reported During the Past Week

Reported Adherence	Child (N = 216), % (N)	Caregiver (N = 216), % (N)
0	8.8 (19)	2.8 (6)
1%–10%	0.5 (1)	0 (0)
11%–20%	1.9 (4)	2.8 (6)
21%–30%	5.1 (11)	1.9 (4)
31%–40%	0.9 (2)	0.9 (2)
41%–50%	5.6 (12)	0.9 (2)
51%–60%	6.9 (15)	4.6 (10)
61%–70%	5.6 (12)	2.3 (5)
71%–80%	5.1 (11)	6.0 (13)
81%–90%	11.6 (25)	7.4 (16)
91%–99%	11.1 (24)	7.9 (17)
100%	32.9 (71)	47.2 (102)
Missing	4.2 (9)	15.3 (33)

TABLE 3 GEE Predicting Child Reported Control Medication Adherence During the Past Week at the Home Visit (N = 165)

Independent Variables	β Coefficient (95% Confidence Interval)
Child-reported medication adherence at office visit	0.22 (0.08 to 0.36)**
Years living with asthma	−0.47 (−1.61 to 0.66)
Child asthma severity	4.96 (−4.20 to 14.12)
Child taking >1 controller medication	7.87 (0.26 to 15.48)*
Child age	−0.64 (−2.47 to 1.19)
Child gender	3.23 (−4.55 to 11.01)
Child race	−7.85 (−19.36 to 3.66)
Caregiver education (in years)	−1.09 (−2.99 to 0.80)
Child asthma management self-efficacy	9.36 (2.32 to 16.39)**
Number of asthma medication questions the child asks	−3.70 (−12.62 to 5.21)
Provider asked for child input into asthma treatment plan	−2.53 (−16.20 to 11.13)
Provider asked for caregiver input into asthma treatment plan	4.87 (−5.87 to 15.60)
Number of control medication questions the provider asks	0.49 (−0.69 to 1.67)
Child asthma outcome expectations	0.35 (−3.53 to 4.23)
Length of visit	0.01 (0.00 to 0.02)*

*$P < .05$; ** $P < .01$.

provider asked for the caregiver's input into the asthma treatment plan during the medical visit. Caregivers reported lower child adherence if the provider asked for child input into the asthma treatment plan during the medical visit.

DISCUSSION

When controlling for important demographic characteristics and baseline medication adherence, we found that provider-patient communication during a medical visit was associated with caregiver-reported child medication adherence 1 month later. We also found that child asthma management self-efficacy was significantly associated with both child- and caregiver-reported control medication adherence. Self-efficacy is 1 of the key constructs in social cognitive theory.[13] According to social cognitive theory, individuals with higher levels of self-efficacy to perform a certain behavior such as using medications are more likely to undertake the behavior.[14,15] This finding suggests it is important for health care providers to work with children and caregivers to improve their self-efficacy or self-confidence in managing their asthma. One way providers can improve asthma management self-efficacy is to model positive medication behaviors. For example, if children or their caregivers have smart phones, providers could show them how to use a medication reminder application.

Another important finding is that if providers asked for caregiver input into their child's asthma management treatment plan, caregivers reported higher child medication adherence 1 month later. This finding suggests it is important for providers to ask for caregiver input into their child's asthma management treatment plan because it might be easier for them to follow a plan for which they have had input. In fact, the National Heart, Lung, and Blood Institute guidelines[3] specifically emphasize teaching patients how to effectively manage their asthma as well as the importance of using a collaborative approach between providers, parents, and children to develop an appropriate asthma management plan for the child.

Research has revealed the importance of patient-centered approaches such as SDM.[4–6] However, we found that children were only asked for their input into treatment plans during 7.8% of visits and that parents were asked for their input during only 9% of visits. These low rates of SDM occurred even though providers were aware that the medical visit was being recorded to examine communication during pediatric asthma visits. A recent study revealed that SDM increased adherence to controller medications and better clinical outcomes for adult asthma patients as opposed to clinician decision-making.[6] These findings support the importance of identifying patient preferences and goals to shape treatment plans. Future research should examine how to improve SDM during pediatric asthma visits.

Another interesting finding was that caregivers reported lower child adherence at the home visit if the provider asked for child input during the medical visit that occurred ∼1 month earlier. Child age was not significantly

TABLE 4 GEE Predicting Caregiver Reported Control Medication Adherence During the Past Week at the Home Visit (N = 158)

Independent Variables	β Coefficient (95% Confidence Interval)
Parent-reported child medication adherence at office visit	0.09 (−0.02 to 0.21)
Years living with asthma	−0.28 (−1.02 to 0.45)
Child asthma severity	3.02 (−4.75 to 10.80)
Child taking >1 controller medication	1.37 (−4.93 to 7.67)
Child age	−1.69 (−3.04 to −0.34)*
Child gender	0.77 (−6.13 to 7.67)
Child race	0.21 (−6.99 to 7.34)
Caregiver education (in years)	−0.50 (−1.77 to 0.76)
Child asthma management self-efficacy	18.92 (12.72 to 25.12)***
Number of asthma medication questions the child asks	−1.90 (−8.77 to 4.98)
Provider asked for child input into asthma treatment plan	−8.82 (−16.76 to −0.87)**
Provider asked for caregiver input into asthma treatment plan	9.01 (3.65 to 14.37)***
Number of control medication questions the provider asks	0.20 (−1.03 to 1.43)
Child asthma outcome expectations	1.40 (−2.16 to 4.96)
Length of visit	0.01 (−0.01 to 0.02)

*$P < .05$; ** $P < .01$; *** $P < .001$.

associated with whether providers asked for child input into the treatment regimen. Future research should determine whether this result can be replicated in other asthma populations.

Children taking more than 1 control medication reported being significantly more adherent than children taking 1 control medication. A previous study revealed that teenagers were more willing to take medications when they felt ill.[6] Because children taking more than 1 control medication may experience more symptoms when not taking their medications, they may be more likely to adhere. Further research should explore this relationship to better understand patient adherence.

Caregivers reported that younger children were more adherent to their control medications than older children. This might be because caregivers are more actively involved in helping younger children take their control medications than older children. Providers should make sure to talk with older children directly about their control medication adherence to assess possible barriers to using them and to offer suggestions on how to improve adherence. Previous research has revealed nonadherence to be greatest among older children and adolescents due to 2 factors, including more risk-taking behaviors and onset of depressive symptoms.[6] Additionally, teenagers have reported that concerns with side effects, busy schedules, spending nights away from home, and the bad taste of inhaled corticosteroids can interfere with adherence. Thus, providers may want to engage older adolescent children in discussions of barriers to adherence.

Children and caregiver adherence were highly correlated, yet children reported an average adherence rate of 72% for the past week, and caregivers reported an average adherence rate of 85%. Previous research has revealed that both children and parents greatly over report their adherence to asthma medications.[16,17] In 1 study comparing self-reported adherence to electronic devices attached to participants' metered-dose inhalers, both caregivers and children significantly overreported their adherence.[16] The study revealed that parents were more likely to be outside the 25% accuracy range when compared with children. Although we cannot confirm whether child or caregiver reports of adherence are more accurate, our results suggest that children's adherence to asthma control medications is suboptimal.

The study is limited in generalizability in that it was conducted in 5 pediatric clinics in nonurban areas of North Carolina. Another limitation is that we do not know how many patients who the clinic staff referred chose not to talk with the research assistant. However, we could not ask the clinic staff to track these numbers because of the busyness of the clinic and our promise not to interrupt clinic flow. Another limitation is that we chose to audio-tape rather than video-tape the medical visits because it is less intrusive and fewer individuals mind being audio-taped as opposed to being video-taped. Additionally, we relied on child and caregiver self-reported control medication adherence, and the caregivers and children most likely overreported their adherence, which is often found with self-report measures. Overestimating adherence likely biased our results toward the null, making it more difficult to find significant associations between communication and adherence. Despite the limitations of the study, it presents new information on how provider-patient communication about asthma during pediatric visits from actual audio-taped visits is associated with child- and caregiver-reported adherence 1 month later.

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MANAGING CLUTTER: *My wife and I recently spent six nights in California. We spent the first three nights in a delightful small boutique hotel and the second three in a hotel run by a large chain. While we loved the boutique hotel, the chain hotel was almost as wonderful but for remarkably different reasons. The reason we liked the second room so much was that it was large, simply furnished (almost Spartan) and totally devoid of paper and clutter. My wife is perfect in most ways but has trouble parting with papers or anything our children have ever touched. I tease her that she can cover any surface and that, as the papers pile up, we will run out of room. According to an article in* The Wall Street Journal *(Health & Wellness: July 10, 2012), clutter is a common source of friction in a marriage—as common as issues related to sex or money. If the couple has very different views of clutter, the stress (whether from the clutter itself or trying to fix the problem) can undermine the relationship. Both men and women are equally likely to have clutter and certain household hotspots are common. For example, the foyer or entranceway may become a dumping ground for all sorts of stuff. Piles of books and magazines often dominate the living room. Kitchen counters, and almost all horizontal surfaces, are magnets for papers, gadgets, and things that might be useful in the near future. Bathrooms are often filled with various lotions, creams, soaps, and shampoos. Conquering clutter is not easy as the discussion can lead to a struggle over power, control, or priorities of family life. Handling differing views on clutter takes humor, patience, and understanding. As for me, I have accepted shoveling out the mudroom now and then and the piles of papers here and there. I insist in keeping one flat surface (the kitchen island) free of extraneous materials. When the amount of clutter build-up gets really bad, we go on vacation.*

Noted by WVR, MD