

Discussions About Antibiotics During Adolescent Asthma Visits: Implications for Providers

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Abstract

Children with asthma are exposed to antibiotics more frequently than their peers. The quality of provider-patient discussion about antibiotics is unknown. In this secondary data analysis, we reviewed existing transcripts of audiotaped adolescent asthma visits using a standardized coding sheet to analyze the quality of communication about antibiotics. Of 539 transcripts, we identified 12 discussions about antibiotics. No patient or parent requested antibiotics. In most cases, discussion was limited to assessment of drug allergies and preferred formulation. In 5 cases (42%), the prescribed antibiotic was not named. We propose a set of communication elements that should be included whenever antibiotics are prescribed, classified into (a) Essential, such as the drug name and dosing schedule; (b) Encouraged, such as expected response to therapy; or (c) Situational, such as discussion of alternatives to antibiotics. Future research should further explore the quality of antibiotic-related conversations among different groups of providers and patients.

Keywords

physician-patient communication, primary care, asthma, antibiotics

Introduction

Children with asthma are at significantly greater risk of antibiotic exposure than their peers. In a Belgian study, underlying asthma in a child increased the odds of receiving antibiotics by approximately 90%.¹ In the United States, antibiotics are prescribed in 16% of all visits for asthma without a diagnosis code justifying prescription, with macrolides the most commonly prescribed agent.² In these large database studies, the reason for this overprescribing of antibiotics is unclear. Children with asthma have high rates of health care utilization, including primary care visits, emergency department visits, and hospitalizations,³ and compared with children without asthma, children with asthma are at risk of more severe illness due to an acute respiratory infection.^{4,5} Nonetheless, the vast majority of infectious triggers of asthma exacerbation are viral infections, which do not require antibiotic therapy.⁶

Overprescribing of antibiotics, defined as prescribing an antibiotic when none is indicated or use of an excessively broad-spectrum agent, contributes to antibiotic resistance⁷ and infections with *Clostridium difficile*, which now affects children at a rate of 24 infections per

100 000 children per year.⁸ Overprescribing of antibiotics also exposes patients to excess risk of adverse events. Physicians' perception of parental desire for antibiotics significantly increases the likelihood of antibiotic prescribing for a likely viral illness, but those perceptions are often not aligned with actual parental desire.⁹ Even when parents do have a previsit expectation for antibiotics that is not met by the physician, provision of a contingency plan was associated with higher postvisit satisfaction scores.¹⁰ Prescribers cite perceived patient or family desire for antibiotics as a driver of antibiotic prescribing,¹¹ and they may admit to prescribing antibiotics to save time.¹² These findings demonstrate that the quality of communication between parents and physicians has a substantial impact on the propensity to prescribe antibiotics that may not be indicated.

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Beyond adherence, prescriber-patient communication may also have an effect on medication safety. Prescribers may assess for drug allergies and provide warnings about common or severe adverse effects and potential warning symptoms. While most classes of antibiotics used routinely in ambulatory care are generally considered safe, antibiotics account for 56% of all emergency department visits for adverse drug effects in children younger than age 6 and 32% for children aged 6 to 19 years.¹³ In addition to the adverse effect potential common to all classes of drugs, use and overuse of antibiotics has important public health implications because of the risks of *Clostridium difficile* infection and antibiotic resistance.

Because of the increased risk of antibiotic exposure in children with asthma and the lack of knowledge about prescriber-patient counseling about antibiotics, we undertook a secondary data analysis to assess the quality of communication about antibiotics during pediatric visits focused on asthma management.

Methods

Participants

This study used existing baseline and 6-month follow-up transcripts from a study of the impact of an intervention aimed at improving patient-prescriber communication about asthma.¹⁴ Forty-six providers from 4 pediatric primary care practices, 1 academic and 3 private, in North Carolina agreed to participate in the study. Two clinics were in rural areas and 2 were in suburban areas. Of the 46 providers who agreed to participate, 40 enrolled patients. Participants were enrolled from June 2015 to November 2016. Clinic staff referred interested and potentially eligible families to a research assistant, who obtained informed consent, child assent, and assessed eligibility. Patients were eligible if they were ages 11 to 17 years; spoke and read English or Spanish; had persistent asthma; were present for an acute or follow-up asthma visit or a well-child visit; and had previously visited the clinic at least once for asthma. Persistent asthma was defined according to National Heart, Lung, and Blood Institute guidelines: experiencing asthma-related daytime symptoms more than twice a week; asthma-related nighttime symptoms more than twice a month; or receiving one or more long-term controller therapies for asthma.¹⁵ For eligible, willing patients, a research assistant obtained caregiver informed consent and patient assent. Patients and caregivers each received US\$25 for their time. This study was approved by the University of North Carolina Institutional Review Board.

Audiotaping and Coding of Study Visits

Eligible medical visits were audiotaped. An individual patient could have up to 2 visits, at baseline and at a 6-month follow-up visit. Audiotape recordings were transcribed verbatim with identifiers removed. There were 356 patients with at least 1 completed visit, of whom 183 (51.4%) returned to clinic for a 6-month follow-up visit, for a total of 539 transcripts reviewed. To assess the quality of conversations, a detailed coding sheet was developed that included a list of discussion items that might be considered components of a thorough discussion about antibiotics. Items focused on the specific antibiotic recommended, reported symptoms and signs for which antibiotics may be indicated, diagnostic testing, and named clinical diagnosis related to antibiotic decision-making, and discussion of related topics such as drug allergies, formulation, dosing schedule, duration of antibiotic course, expected response to therapy, and potential adverse events. Each transcript was reviewed by 1 of 3 trained research assistants to identify encounters in which a new antibiotic was specifically discussed or recommended. Visits in which a parent asked about antibiotics and did not receive them were included. Conversations about prior antibiotic use, such as follow-up from a recent emergency department visit in which antibiotics were prescribed, were not included in the study.

Each completed coding sheet was transcribed into a secure Research Electronic Data Capture (REDCap) database.¹⁶ Analysis was conducted with REDCap and Stata v13 (Stata Corp, College Station, TX).

Interrater Reliability

The 3 research assistants coded the same 28 transcripts to assess interrater reliability. The interrater reliability was conducted with SPSS 24 (IBM SPSS, Armonk, NY). The interrater reliability for (a) whether an antibiotic was recommended was 0.95, (b) whether the specific diagnosis was given by the provider was 0.92, (c) whether the infection was early/more extensive than apparent was 0.90, (d) whether the provider asked about or explained at least one area about antibiotics was 0.95, and (e) whether the patient or caregiver asked about at least one area about antibiotics was 0.90. The interrater reliability could not be calculated for whether the caregiver requested an antibiotic; however, all coders agreed 100% of the time that this communication did not occur.

Results

Characteristics of the participating patients and providers are described previously.¹⁴ Of the 539 transcripts

assessed, we identified 15 encounters in which antibiotics were discussed. In 3 encounters (20%), antibiotics were discussed in the context of a possible bacterial diagnosis, such as streptococcal pharyngitis or *Helicobacter pylori* infection, that was not made during the visit. In these cases, discussion of the potential antibiotic therapy was highly limited. Therefore, we analyzed the remaining 12 visits in which antibiotics were discussed in the context of the acute visit. One patient was included twice, at visits separated by 5 months; therefore, there was a total of 11 patients. The mean age of the included patients was 13.3 years, with a range of 11 to 17 years. Six of the patients were male (55%). Four patients were white (36%), 4 were Native American (36%), 2 were African American (18%), and 1 was Hispanic (9%). Findings are summarized in Table 1. Seven providers were represented among the 12 included visits, with 1 provider accounting for 4 included visits and 2 providers accounting for 2 each; the other 4 included providers had a single visit in this study.

The most common symptoms were cough in 5 encounters, ear pain in 4, chest or side pain in 3, and sore throat in 3. No patient or caregiver reported the presence of fever. The most common diagnosis was acute otitis media in 5 encounters (41.7%); the most commonly recommended antibiotic was amoxicillin in 3 encounters (25%). During 5 encounters (41.7%), the recommended antibiotic was not named by the provider. During 4 encounters (33.3%), the diagnosis requiring antibiotics was not named by the provider. During 4 encounters, the provider suggested that antibiotics might help in case there was an early bacterial infection or an infection that was more extensive than clinically apparent. No caregiver requested antibiotics during any visit.

Clinicians most commonly initiated discussion about medication allergies ($n = 5$) and preferred formulation ($n = 4$). Dosing schedule was addressed in only 3 encounters, and duration of the antibiotic course was mentioned in only 3 encounters. The clinician discussed the possibility of a viral versus bacterial infection in a single encounter. In only one encounter did the clinician explain the expected response to antibiotics, and no clinician discussed signs of treatment failure. Discussions of possible adverse events and strategies to prevent adverse events occurred in only a single encounter. Concerns about antibiotic resistance were not discussed during any encounter, nor did any provider specifically instruct the family to complete the entire prescribed course. The median number of topics addressed by the clinician was 2 (range: 0-7). During 2 episodes, none of the specified topics was addressed. Relevant examples are provided in Table 2.

Table 1. Communication About Antibiotics (N = 12).

Measure	Number (%)
Antibiotic recommended	
Amoxicillin	3 (25%)
Amoxicillin-clavulanate	1 (8%)
Azithromycin	2 (17%)
Cefdinir	1 (8%)
Antibiotic not named	5 (42%)
Reason for antibiotic treatment	
No specific diagnosis given by provider	5 (42%)
Early/more extensive infection than apparent	4 (33%)
Caregiver requests antibiotic	0 (0%)
Did provider ask about or explain the following:	
Bacterial vs viral infection	1 (8%)
Expected response to antibiotics	1 (8%)
Signs of treatment failure	0 (0%)
Backup plan for treatment failure	1 (8%)
Medication allergies	5 (42%)
Antibiotic resistance	0 (0%)
Recent antibiotic exposure	2 (17%)
Preferred formulation (ie, pill vs liquid)	4 (33%)
Taste of medication	1 (8%)
Pill size	3 (25%)
Dosing quantity	2 (17%)
Dosing schedule	3 (25%)
Duration	4 (33%)
Importance of finishing course	0 (0%)
Possible adverse events	1 (8%)
Mitigation or prevention of adverse events	1 (8%)
Management of adverse events	0 (0%)
Any of the above	10 (83%)
Did the patient or caregiver ask about:	
Antibiotic resistance	0 (0%)
Backup plan for treatment failure	1 (8%)
Dosing quantity	0 (0%)
Dosing schedule	0 (0%)
Duration	0 (0%)
Necessity of antibiotics	0 (0%)
Preferred formulation	3 (25%)
Taste of medication	0 (0%)
Possible adverse events	0 (0%)
Prevention of adverse events	0 (0%)
Management of adverse events	0 (0%)
Any question asked	4 (33.3%)

Questions asked by patients and caregivers were uncommon, occurring in only 4 encounters (33.3%). Most often, the questions were about formulation of the

Table 2. Excerpts From Transcripts During Discussions of Antibiotics.²

Examples of Inadequate Communication About Antibiotics

Discussion Area	Excerpt
Antibiotics for infection that is early or more extensive than currently apparent.	Clinician: “And I also want to get you some antibiotics, and we’ll put you on an antibiotic that’ll be pretty good for lung and ear infection just in case you had a little pneumonia down there.” Clinician: “So, we’ll use amoxicillin twice a day for 10 days for the ear, and that also covers a lower respiratory infection, so if this were trying to turn into something else—I don’t hear any crackles like a pneumonia, but it would cover.”
No mention of indication	Clinician: “Uh, have you had any recent cough and bringing up sputum? Have you been coughing out mucus at all in the last month?” Patient: “Yeah.” Clinician: “What color has it been?” Patient: “Sometimes clear, sometimes, like, greenish, yellowish.” [later in visit] Clinician: “So, I’m sending 4 prescriptions—ProAir, Motrin, the Z-pack, which is an antibiotic, and steroids.”
Limited discussion of the indication for antibiotics, schedule, formulation, and so on.	Clinician: “You’re wheezing right now so I’m going to go ahead and put him on some oral steroids for the next few days, okay. And I want to go ahead and do an antibiotic as well, called Zithromax.” Caregiver: “Do you have any more of those spacers here?”
Antibiotic not named	Clinician: “And see, [the headaches] could be just coming from all that stuff, because you have a lot of drainage from that ear.” Patient: “Uh huh.” Clinician: “So I’m going to give you some drops to use, but I’m going to put him on an antibiotic by mouth, too, okay?” Caregiver: “Okay.”

Example of Clear, Thorough Communication About Antibiotics

Discussion Area	Excerpt
Possible adverse events and mitigation	Clinician: “So I will send your refills and I will see if I have any more Advair to give you. Now do you like pills or liquid for your antibiotic?” Patient: “Liquid” Clinician: “Okay. And the Augmentin can give you a little upset stomach so you want to make sure you drink lots of water, eat some yogurt. That’s good to help with your stomach upset.”

medication, that is, liquid or pill. Neither patients nor parents asked about the necessity of antibiotics, possible adverse events, dosing schedules, or duration of antibiotic courses.

Discussion

In this secondary data analysis, we analyzed discussions about antibiotics during adolescent asthma visits. Despite the very small number of visits involving a discussion of antibiotics, we found that conversations about antibiotics are very limited in scope. In nearly half of the visits, the antibiotic was not named. While patient demand for antibiotics is often cited as a reason for overuse of antibiotics,¹¹ in no visit in the entire sample did a parent request antibiotics, suggesting that, at least in this setting and population, request for

antibiotics by a patient or parent is not common. Most counseling about antibiotics was limited to drug allergies and preferred preparation. Patients and families rarely asked questions about antibiotics, and most questions were limited to a discussion of liquid versus a pill formulation.

In one third of visits with an antibiotic recommendation, the prescriber suggested that the antibiotic would be effective if the infection were more severe than evident at the time of the visit, such as the statement, “just in case you had a little pneumonia down there.” This type of communication suggests to patients and families that antibiotics are a safety net against a lurking severe infection rather than a targeted intervention against a specific infection. Similarly, in nearly half of visits with an antibiotic prescription, the specific diagnosis prompting antibiotics was not named, forgoing an opportunity

Table 3. Recommended Communication Elements During Antibiotic Prescription.

Classification	Element	Justification(s)
Essential	Diagnosis and/or indication	• Enhance patient/parent understanding of condition • Encourages provider to justify that antibiotics are truly needed
	Assessment of allergies	• Patient safety
	Antibiotic name	• Patient safety
	Dosing schedule	• Patient/parent understanding of medical care
	Adverse events	• Identify and address potential barriers to adherence • Patient safety • Inform patient/parent so they can report possible significant side effects
	Duration	• Encourage adherence
Encouraged	Invite questions	• Provide opportunity for patient/family to seek clarification
	Expected response to therapy	• Promote vigilance for treatment failure
	Contingency plans	• Empower the patient/family to act if expected improvement is not observed
Situational	Explanation of bacterial vs viral infection	• Educate the patient/family about indications for antibiotics
	Teach back	• Ensure comprehension of treatment plan
	Management of adverse events	• Empower patient/family • Potentially avert unnecessary visits
	Taste, palatability, formulation	• Ensure adherence
	Alternatives to antibiotics	• Education of patient/family • Provide patient-oriented care

for the prescriber to educate the patient and family about proper indications for antibiotics.

There is no standard set of recommended advice for clinicians to provide to patients when antimicrobials are prescribed. One practical model may be the patient counseling standards for pharmacists in the Omnibus Budget Reconciliation Act (OBRA) of 1990. Under OBRA, pharmacists must *offer* to discuss: name and description of medication, route of administration, dose and dosage form, duration of therapy, special directions and precautions related to administration, common and serious side effects, self-monitoring techniques of drug therapy, proper storage, refill information, and appropriate action in case of missed dose.¹⁷ While certain aspects of these counseling requirements, such as proper storage, fall outside of usual prescriber-patient counseling, items such as name of medication and duration of therapy clearly should be routinely discussed. It is possible that prescribers expect that the pharmacist will provide adequate counseling. However, in many states, including North Carolina, the pharmacist's duty to counsel is limited to an offer and can be satisfied with the statement, "Counseling is available from our pharmacist on this prescription."¹⁸ In this context, the prescriber has an obligation to provide counseling and invite questions.

Physicians have admitted to prescribing antibiotics in order to save time during visits,¹² and the amount of time

required to explain why antibiotics may not be necessary has been reported as a driver of antibiotic overuse, though the true effect is marginal.^{19,20} If antibiotic prescribing were accompanied by the expectation of a reasonable discussion of indication, risks, and anticipated benefits of the medication, this perceived barrier might disappear.

While there is no literature to guide recommendations about the necessary elements of a discussion about antibiotics, it is self-evident that many of the discussions we observed were inadequate. In Table 3, we present a list of discussion elements that might be considered Essential, Encouraged, or Situational, along with justifications. In this formulation, "Essential" suggests that *every* antibiotic prescription should be accompanied by discussion of these elements. "Encouraged" suggests that clinicians should generally provide counseling on these elements when able, but this is not absolutely essential. Finally, "Situational" suggests that discussion of these elements should occur when relevant to the specific scenario. For example, discussion about preferred formulation can likely be skipped when the provider knows that the patient is able to swallow pills, and discussion about alternatives to antibiotics is unnecessary when antibiotics are unequivocally indicated. The intent of this proposed framework is foremost to encourage meaningful discussion about risks and benefits, as

should occur prior to any medical intervention. A secondary intent is to provide an opportunity for prescribers to educate patients and families about proper indications for antibiotics and downsides of their use.

Patient adherence to antibiotics is poorly studied, but available studies suggest that incomplete adherence is common, with one Spanish study finding that 45% of patients demonstrated “excellent” or “acceptable” adherence, with dosing schedule the best predictor of adherence.²¹ Poor adherence to antibiotics may result in treatment failure and, in theory, may also contribute to the global problem of antibiotic resistance. Reports of interventions to improve antibiotic adherence are similarly scant, but a Maltese study of structured pharmacy-based counseling demonstrated greater adherence among patients receiving the counseling.²² The impact of prescriber-patient communication on antibiotic adherence has not been studied. Future studies should assess whether failure to communicate key instructions such as dosing schedule and duration of antibiotic course have an impact on adherence.

There are several important limitations to consider. The number of visits including a meaningful discussion of antibiotics was smaller than anticipated. The patients all belonged to a selected group of adolescents with asthma, so these observations may not generalize to other age groups or to patients without asthma. It is conceivable that the clinicians, aware that their discussion of asthma medications was being observed, may have placed more focus on asthma-related discussions during this study, displacing usual discussions of other medications. We also did not have access to diagnosis codes or prescribing information, so we were unable to identify the actual diagnosis or indication for antibiotics when this information was not discussed, and we are unable to determine if antibiotics were appropriate for any individual patient. We also do not have access to any diagnostic testing results, such as tests for streptococcal pharyngitis.

In spite of these limitations, the results of this secondary analysis are informative. While the clinicians and patients knew they were being recorded, the stated purpose of the study was to assess communication about asthma. Therefore, modification of behavior under observation (the Hawthorne effect) likely played a limited role in antibiotic discussions. In addition, children with asthma are at greater risk for antibiotic exposure than their peers,^{1,2} making this an important population to study.

When antibiotics were recommended, we observed very limited counseling from clinicians about anticipated benefits, risks, dosing schedule, and related topics. Patients rarely asked questions about antibiotics, suggesting opportunities for patient empowerment as an antibiotic stewardship approach. Further observation of

patient-provider communication in different contexts regarding antibiotics is warranted. In addition, no standards for patient education about antibiotics by prescribers exist. We developed a suggested set of discussion elements that should be addressed with each antibiotic prescription. Because communication patterns differ by provider and by clinical scenario, future research should assess the quality of antibiotic-related communication with different groups of providers and patients. If our findings are confirmed during additional investigations, a reasonable next step would be engagement with prescribers and patients and their families to further develop communication priorities.

Author Contributions

ZW conceived the study, developed data collection tools, analyzed data, and wrote the manuscript. DMC was an investigator for the original study, contributed to the development of this study, and critically edited the manuscript. RS developed data collection tools, analyzed data, and edited the manuscript critically. BLS conceived the study, oversaw the collection, analysis, and interpretation of data, and edited the manuscript critically. All authors approved the final manuscript draft as written.

Declaration of Conflicting Interests

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