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ORIGINAL ARTICLE

Pediatrician Perceptions of an Outpatient Antimicrobial Stewardship Intervention

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OBJECTIVE. Inappropriate antibiotic prescribing commonly occurs in pediatric outpatients with acute respiratory tract infections. Antimicrobial stewardship programs are recommended for use in the hospital, but less is known about whether and how they will work in the ambulatory setting. Following a successful cluster-randomized trial to improve prescribing for common acute respiratory tract infections using education plus audit and feedback in a large, pediatric primary care network, we sought to explore the perceptions of the intervention and antibiotic overuse among participating clinicians.

METHODS. We conducted a qualitative study using semistructured interviews with 24 pediatricians from 6 primary care practices who participated in an outpatient antimicrobial stewardship intervention. All interviews were transcribed and analyzed using a modified grounded theory approach.

RESULTS. Deep skepticism of the audit and feedback reports emerged. Respondents ignored reports or expressed distrust about them. One respondent admitted to gaming behavior. When asked about antibiotic overuse, respondents recognized it as a problem, but they believed it was driven by the behaviors of nonpediatric physicians. Parent pressure for antibiotics was identified by all respondents as a major barrier to the more judicious use of antibiotics. Respondents reported that they sometimes “caved” to parent pressure for social reasons.

CONCLUSIONS. To improve the effectiveness and sustainability of outpatient antimicrobial stewardship, it is critical to boost the credibility of audit data, engage primary care pediatricians in recognizing that their behavior contributes to antibiotic overuse, and address parent pressure to prescribe antibiotics.

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Although the overall rate of antibiotic prescribing for acute respiratory tract infections (ARTIs) in ambulatory pediatrics has decreased over the past 2 decades,¹ unnecessary use is a persistent problem.² Antibiotic overuse contributes to the development of antibiotic-resistant organisms,³ which sicken more than 2 million people per year in the United States leading to at least 23,000 deaths.⁴ Encouraging the judicious use of these agents in ambulatory pediatrics is paramount to both prolonging the utility of antibiotics and improving the quality of care delivered to children.

Antimicrobial stewardship is a quality improvement intervention that aims to optimize antibiotic use via a set of coordinated activities, including prospective audit and feedback of prescribing behavior, formulary restrictions, and prior approval.⁵ Antimicrobial stewardship programs have been shown to improve patient outcomes, shorten length of stay, reduce antibiotic resistance, and save money in the inpatient

setting.⁶ However, there is a knowledge gap about whether and how the principles of antimicrobial stewardship translate into the ambulatory setting.

We recently undertook a cluster-randomized trial of an outpatient antimicrobial stewardship intervention to improve antibiotic prescribing for common ARTIs in a large, pediatric primary care network. Intervention sites received a 1-hour educational session followed by quarterly audit and feedback reports of individual provider prescribing via the electronic health record (EHR) for 1 year. The intervention significantly improved adherence to antibiotic prescribing guidelines for common bacterial ARTIs.⁷

Interventions aimed at changing clinical practice should be accompanied by an assessment of the opinions of those whom the intervention targets to design improvement strategies sensitive to the everyday reality of clinical practice and the beliefs of clinicians whose behavior is targeted.⁸ This is

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especially true of interventions aimed at improving antibiotic use, which rely heavily on clinician's perceptions of the risk and benefits of antibiotics,⁹ the competing demands of health-care delivery in time-pressured environments,¹⁰ and the social norms that shape decision-making about medications, known as "prescribing etiquette."¹¹

Qualitative research methods are well suited to uncover social factors in complex healthcare environments that influence the success and sustainability of quality improvement interventions.¹² To help inform the design of antimicrobial stewardship interventions in ambulatory pediatrics, we conducted a semistructured interview study to explore the perceptions of primary care pediatricians about (1) their experiences participating in an outpatient antimicrobial stewardship intervention and (2) antibiotic overuse.

METHODS

Design, Sample, and Recruitment

We conducted in-depth, semi-structured interviews with pediatricians working in a large hospital-affiliated network of primary care practices in Pennsylvania and New Jersey between April and July 2012. This network has a mean practice volume of 25,220 visits per year, and 23% of children in the network receive coverage through the Children's Health Insurance Program or Medicaid. Participants were selected for inclusion if they were prescribing clinicians who were not trainees and worked in 1 of the 18 practices that had participated in our cluster-randomized trial.

We recruited interview respondents from all 9 practices from the treatment arm of the trial and 1 control practice. Although we were primarily interested in the attitudes of clinicians who participated in the intervention, we included 1 control practice to determine whether attitudes toward antibiotic use differed in intervention versus control sites. Participants were enrolled over a 4-month period until saturation of key themes was achieved.¹³ To recruit interview respondents, we e-mailed the practice manager and medical director of each site to ask whether their clinicians would be interested in participating.

Data Collection

Before beginning data collection, we created a semi-structured, open-ended interview guide based on a review of the literature on antibiotic prescribing in ambulatory pediatrics and discussions among the research team. The interview guide included 2 sections (see Table A1 in the Appendix). The first section was designed to elicit clinician attitudes and beliefs about antibiotic overuse in general, barriers to more judicious use of antibiotics in the primary care setting, and perceptions of parental pressure to prescribe antibiotics. The second section included a series of questions specific to the antimicrobial stewardship intervention, including opinions about the educational session, the quarterly audit and feedback report, and agreement with the key principles of the

intervention (eg, not to prescribe antibiotics for viral illness and to use narrow spectrum antibiotics for sinusitis, pneumonia, and group A streptococcal pharyngitis).

The majority of interviews (15) were conducted in-person at each participating clinic, typically in an empty examination room or office area. Because of scheduling constraints, 9 interviews were conducted over the telephone. All interviews were, with permission, recorded. Interviews were conducted by a sociologist (J.E.S.) and a pediatric infectious diseases physician (K.A.F.), both of whom had previous experience conducting qualitative interviews with physicians. Each respondent was asked the same set of questions from the interview guide, with the interviewer probing and redirecting the conversation to elicit more in-depth data or clarify points as necessary.¹⁴ Our study protocol, consent process, and interview guide were approved by the Children's Hospital of Philadelphia institutional review board.

Data Analysis

All audio files were transcribed and uploaded to NVivo 10 qualitative data analysis software¹⁵ for management and analysis. One author (J.E.S.) with extensive experience in qualitative data analysis coded all interview transcripts using a modified grounded theory approach.^{16,17} First, she read through all transcripts in a process of open coding, recording the most salient themes in the interviews to be further refined and used during the second stage of axial coding, where she began to generate descriptions of higher-order patterns seen emerging in the data. After the preliminary code list was developed, she reviewed all interview transcripts line by line to determine which codes fit the concepts suggested by the data. J.E.S. frequently consulted with the other authors to discuss code definitions and to refine the interpretation of emerging patterns in the data.

RESULTS

During the study period, we approached 9 intervention practices. The practice manager and medical director at 4 of these practices declined to participate because of scheduling and time constraints. At the remaining 5 sites, 21 of 36 eligible clinicians agreed to participate; 15 clinicians declined to participate because of scheduling constraints. At the single control clinic, 3 of 6 eligible clinicians agreed to participate. We ceased recruiting from control clinics, because we found that general attitudes toward antibiotic overuse did not differ between intervention and control sites. A total of 24 interviews ranging in length from 10 to 31 minutes (mean, 19 minutes) were conducted. Fifteen respondents were women. The majority of respondents had been in practice between 10 and 30 years (mean, 16 years). Three respondents had been in practice less than 10 years, whereas 5 had been in practice longer than 30 years. The majority of respondents attended allopathic medical schools (20 respondents). We present our results organized by 3 key themes: perceptions of the anti-

TABLE 1. Themes Identified in the Data with Illustrative Verbatim Comments from Interview Respondents

Category	Theme	Illustrative quotation
Perception of intervention	Most respondents ignored or were skeptical of audit reports	(1) "I did not read my audit reports because honestly, I didn't really care. To me, it was just another piece of paper. It didn't impress me at all. They [the study team] gave you a number describing your behavior but they had no deeper understanding of what was really going on." [E1]
		(2) "I questioned the credibility of the audit reports. Because sometimes there were situations where kids clinically will look like they have strep but their rapid test will be negative. They are leaving to go someplace and I'll put them on an antibiotic for 48 hours until we get the culture back and call them and then stop it. But that kind of scenario is not reflected in the audit reports. So you get dinged for a scenario like that even though you did the right thing." [C3]
Perception of antibiotic prescribing guidelines	Admission of "gaming" behavior	(3) "I feel there wasn't enough flexibility in the report cards, that if you chose to use a broad spectrum antibiotic or you chose an antibiotic where your primary diagnosis suggests maybe you didn't need one, there wasn't any place for you to capture why you didn't follow the guideline even though you thought it was justified... It tends to undermine your feeling of credibility towards the audit process." [E5]
		(4) "I didn't understand the audit reports. I thought they were out of left field. Because I don't really prescribe a lot of antibiotics. So the only thing I can think of is that the ICD-9 code from EPIC was interpreted as something else." [C3]
		(5) "There were examples of children who would come in with a cough and I put that as the first diagnosis. And I prescribed an antibiotic because I thought a sinus infection was possibly there. But I wasn't giving the antibiotic for the cough; I was giving it for the potential sinus infection. But it looked like in the audit data that the antibiotic was given for the cough. ...So, I got in the habit in cases like that of just putting a diagnosis of sinusitis on my list, even if it wasn't a confirmed sinus infection because I wanted to make sure the reports accurately reflected my intention." [D2]
		(6) "I think prescribing guidelines are ok, but I don't like ones that are strictly incorporated into practice. I like guidelines to a point, but I don't think anything can trump clinical judgment and experience. You should feel free to deviate from guidelines when you feel you need to." [E1]
		(7) "I think prescribing guidelines can certainly be helpful, but I think the problem with a lot of the guidelines is the people who are creating them are not getting sufficient input from a people who would actually use them. I think sometimes guidelines are created more from a research point of view than from a clinical point of view. Sometimes they could be more practical in terms of application." [B3]
		(8) "I think prescribing guidelines in general are hugely useful and I wish more people would use them... But I think imposing them on people is going to be real dicey. ... Our goal really should be to get people to buy into them and realize why they are so good, as opposed to imposing them on people from the top down, because that will have a negative backlash. So you really have to sell it. Especially in the outpatient world people do what works well, but also what's easiest. So if you explain to them that not only is the evidence there that using the appropriate antibiotics is better for the patient, in addition, following these guidelines makes it easier for you because you are going to know exactly what to order, and your staff is going to know what you're doing and your partners are going to know what you were thinking when you did what you did because you are following a guideline. It just makes what you do more transparent to all involved. I think selling it is important." [C4]

Perception of antibiotic overuse Antibiotic overuse is a problem, but not in my practice

(9) “Antibiotic overuse is a big problem, but pediatricians are probably the least offenders. Family practitioners, internists, ER doctors and the staff at urgent care or minute clinics, those are the greatest offenders.” [F2]

(10) “I think the ER physicians or the family doctors contribute to the problem the most. Pediatricians are pretty conservative. We often have families come in where mom says ‘I’ve had a cough for three days. I went to the family doctor and he put me on antibiotics and now my child is coughing. I think they have the same thing I have, so they need antibiotics too.’” [D2]

Barriers to more judicious use of antibiotics Parent pressure for antibiotics

(11) “Sometimes you are even pressured or bullied into prescribing. You try your best to explain to [the parents] that what their child has is viral, but they get angry. They feel that unless they leave the practice with a script in hand, you didn’t do a good job.” [F1]

(12) “Parents pressure you for a lot of reasons. Usually it has to do with their past experience with that particular child. They say things like ‘every time he has fluid behind his ears it becomes an ear infection.’ Or they don’t want to come back in and pay another co-pay, or they can’t take more time off of work. Or they push you for an antibiotic stronger than what you would normally choose because the child, for instance, failed amoxicillin a year ago.” [B2]

(13) “Sometimes I give in to parental pressure because I understand. Working mom has kids in day care who are sick all of the time. They have to get to work. They want their kids better. You have to take a different approach for each case. You try not to come across as dictatorial because they will turn off to you right away...You don’t want them to leave feeling gyped or that they didn’t get the best care. It’s a psychological... not a game, but you have to feel out each patient. It is very challenging. That is why medicine is an art. Also, parents who don’t feel like they are getting what they want from our practice will move on and find a different practice.” [E1]

(14) “If you had to graph our antibiotic use [by the calendar], pre-weekend, pre-holiday, pre-birthday, pre-bar mitzvah, pre-Disney, there is a definite increase in antibiotic use. But whenever I do this I make sure to tell the patient that if we are doing this, this is to prevent what could happen in 4 or 5,000 times, but it is essentially not going to change [your course of illness] and it doesn’t mean you can now go hang out with grandma, because it is not changing anything that you have. So, there are peaks and valleys in terms of antibiotic use depending on what is happening in the patient’s life.” [C6]

NOTE. ICD-9, *International Classification of Diseases, 9th Revision*.

microbial stewardship intervention, perceptions of antibiotic overuse, and parent pressure as a major barrier to the more judicious use of antibiotics. Specific quotations that demonstrate key themes (listed in Table 1) are referenced by a letter-number combination to indicate the corresponding practice (letter) and respondent (number). Additional quotations are included in the expanded table (Table A2) in the Appendix. We also include frequencies indicating how many respondents in our sample expressed a particular theme during their interview.

Theme 1: Perceptions of the Intervention and Antibiotic Prescribing Guidelines

Among the respondents from intervention sites, many (6 of 21) admitted that they ignored or did not remember receiving their quarterly audit and feedback reports (quotation 1 in Table A1). Of the 15 respondents who read the audit reports, 9 said that they did not believe the reports and were skeptical of data integrity. The reasons given for distrust of feedback data included respondent uncertainty about the origin of the data (despite this information being provided at study initiation and in each feedback report); belief that patient encounters were improperly coded or documented in the EHR (quotation 4); and belief that the audit could not capture the complexity of a patient's situation in cases in which the provider felt that an antibiotic prescription was appropriate, even if it did not appear to be clinically indicated according to the information available to the study team (quotations 2–3). One respondent reported adding bacterial diagnoses to patient encounters for ARTIs to avoid a feedback report that showed poor performance (quotation 5).

Support for antibiotic prescribing guidelines was mixed. Many respondents (10 of 24) said that they liked guidelines up to a point, but they disliked the idea of having the guidelines strictly dictate their practice or decision-making (quotation 6). A small number of respondents (4 of 24) expressed a lack of enthusiasm for guidelines created by academic pediatricians, because they felt that these guidelines are not created with an appreciation for the reality of work in community pediatrics (quotation 7). One respondent suggested that it was important to “sell” guidelines, instead of simply imposing them from the top down, to avoid a backlash, to increase acceptance, and to boost integration into practice (quotation 8).

Theme 2: Perceptions of Antibiotic Overuse

All respondents strongly agreed that antibiotic overuse by physicians is a major problem and driver of antibiotic resistance. However, the majority (20 of 24) felt that it was not a significant problem among primary care pediatrics and was instead driven by the behaviors of nonpediatric practitioners who treat children, such as urgent care, emergency department, or family medicine providers (quotations 9–10). In-

dependent, for-profit urgent care centers, referred to as “quickie clinics,” were mentioned repeatedly (by 17 of 24 respondents) as overprescribers of antibiotics. As one respondent suggests, “in our area there are a lot of urgent care centers and just about 100% of the people that go to them for anything like a head cold to a sore throat to a fever end up with an antibiotic, so it is very distressing” (respondent A1). Some respondents (7 of 24) reported that the prescribing behavior of nonpediatric physicians made their job harder by encouraging parents to expect antibiotics for their child even when it was not appropriate (quotation 10).

Theme 3: Parental Pressure as a Major Barrier to More Judicious Use of Antibiotics

All respondents reported that parental pressure for antibiotics was the primary barrier to improving antibiotic use in their practice. The majority of pediatricians in our sample (22 of 24) felt that they faced a strong “culture of expectation” for antibiotics by parents (quotations 11 and 12). Respondents suggested that this pressure was driven by a host of factors, including a parent's past experience with their child's response to antibiotics (quotation 12), experience with their own adult medical care (quotation 10), and a desire to leave the office visit with something tangible (quotation 11). Some respondents (3 of 24), all from the same practice in an affluent community, said that they noticed a small but growing group of parents resisting the use of antibiotics. They suggested that this might be attributable to increased education, media coverage of antibiotic resistance, and a growing segment of young parents who are “minimalist” when it comes to medical care and are broadly concerned about giving their child any drug or intervention.

The majority of respondents (20 of 24) suggested that they sometimes “caved” to parental pressure for antibiotics when they are not clinically indicated for social reasons, including wanting to please the parent lest they go to other practices that would prescribe antibiotics (quotation 13) or to provide comfort to anxious parents. Many respondents (13 of 24) suggested that they took into account the social context of the patient's life when making antibiotic prescribing decisions. Events that would impact the ability to keep a follow-up appointment, such as upcoming travel, family celebrations, or the flexibility of parent work schedules, were all mentioned by respondents as factors that may influence them to prescribe an antibiotic even if it is not clinically indicated (quotations 13 and 14). Parental pressure for antibiotics was made worse by the busyness of the clinic during respiratory viral season, and most respondents (18 of 24) said that they simply do not have time to argue with parents about antibiotics. As one respondent suggested, “honestly, I think some patients do get antibiotics just because we are running behind when we don't have time to explain to parents why they aren't necessary” (respondent E4).

DISCUSSION

Following a successful antimicrobial stewardship intervention, we assessed the attitudes and beliefs of primary care pediatricians regarding (1) audit and feedback of antibiotic prescribing and (2) antibiotic overuse. In general, practitioners reported mixed feelings about antibiotic prescribing guidelines, and those who received prescribing audit and feedback reports expressed skepticism regarding the accuracy and utility of the data. Although the majority of physicians in our study believed that antibiotic overuse was an important issue, many felt that other medical specialties that treat children contributed most to this problem. Despite this, pediatricians acknowledged parent pressure as a significant barrier to their own judicious antibiotic prescribing.

The primary aim of this study was to understand pediatrician perceptions toward an antimicrobial stewardship intervention that has shown initial success in reducing antibiotic prescribing rates. Interestingly, one of the key features of this intervention, audit and feedback of individual clinician antibiotic prescribing behavior, was primarily viewed with skepticism. The majority of respondents reported that they ignored their prescribing feedback reports or, if they did engage with them, were deeply skeptical and did not trust that the data accurately captured their performance. This is an interesting finding given the general success of our intervention. Explanations that might reconcile this apparent contradiction include the possibility that only a small subsample of providers drove the improvement in antibiotic use or, despite questioning the data, being “watched” was enough to change behavior.¹⁸ It is also possible that gaming behavior (altering behavior to improve the appearance of a performance measure without actually modifying the behavior targeted for improvement) might have affected the results of the intervention.¹⁹ This, however, did not appear to be the case given that coding rates for viral versus bacterial infections did not meaningfully change at the practice level during the study period.⁷ Although the gaming behavior mentioned by one respondent in this qualitative study did not impact the outcomes of the intervention, it should be considered as a possible unintended consequence of using audit and feedback to improve prescribing behavior.

Audit and feedback strategies have been demonstrated to improve the performance of clinicians in a variety of domains,²⁰ including antibiotic prescribing.^{21,22} However this strategy is most effective when clinicians are motivated to change their behavior²³ and believe that the issue targeted for change is a true problem that can be fixed.²⁴ Our findings underscore how important this is, both to encourage sustainable change and to avoid unintended consequences that can arise as a result of audit systems, such as gaming. Future interventions in pediatric primary care settings should secure clinician confidence in the measurement system and prescribing guidelines before implementation to boost credibility of audit data, increase motivation to change, and reduce dys-

functional behavior. As one of our respondents suggests, “selling” an antimicrobial stewardship intervention and the guidelines it is based on may be a crucial first step in securing engagement that will promote a sustainable improvement in antibiotic prescribing. Future research should examine how techniques like social marketing²⁵ can help improve the uptake of antimicrobial stewardship interventions.

Previous research has shown that clinicians often frame the problem of antibiotic resistance as a “theoretical” or public health issue far removed from the everyday choices they make for their patients.²⁶⁻²⁹ Contrary to this literature, respondents in our study universally believed that antibiotic resistance was a distressing problem that did affect their patients. However, they located responsibility for antibiotic overuse outside of their own practice. If clinicians do not perceive that their behavior contributes to antibiotic overuse, they may lack the motivation needed to change and be less responsive to improvement efforts. Indeed, this perception may have been a factor that influenced our respondents to be skeptical of their prescribing audit reports; they did not believe that they overprescribed antibiotics. Reports showing otherwise were doubted or discredited. In exploring pediatrician perceptions about the factors that drive antibiotic overuse, we uncovered widespread concern about the prescribing behaviors of clinicians working at for-profit urgent care centers, a relatively new development in the US healthcare landscape. The contribution of these facilities to the overuse of antibiotics has not been assessed at a population level and should be considered in future research.

Although respondents felt that other, nonpediatrician specialties were primarily responsible for antibiotic overuse, they also reported specific barriers that prevent them from more judicious antibiotic prescribing for ARTIs in their own practice. The most frequent barrier cited was parent pressure, consistent with previous research.³⁰ When pediatricians perceive parents as expecting antibiotics for their child, they are more likely to inappropriately prescribe them.^{31,32} This is particularly problematic because parent-reported expectations do not often correlate with pediatrician perceptions.³³ Even when parents do not make a verbal request for antibiotics in a clinic visit, pediatricians still perceive an expectation for antibiotics.³⁴

The consistency of reported parental pressure as a barrier to the more judicious use of antibiotics, even within the context of a stewardship intervention highlighting updated American Academy of Pediatrics treatment recommendations and given emerging evidence that parents are becoming more informed about antibiotic overuse,³⁵ suggests that this enduring and deeply held perception should be addressed in interventions to improve prescribing behavior. Teaching pediatricians communication techniques for managing parent expectations for antibiotics^{32,34,36} or designing interventions that target both clinicians and parents^{37,38} have been impactful. A combination of approaches is likely to be most fruitful.

because previous research suggests that parental education alone is not enough to change prescribing behavior.³⁹

There are several limitations to our study. First, because of our recruitment of relatively mature pediatricians (most had been in practice longer than 10 years) in 1 primary care network in the eastern United States, our findings may not be generalizable to the entire population of US pediatricians. However, these practices and clinicians are part of a large primary care network across urban, suburban, and rural locations that serves patients of diverse racial and socioeconomic status. Second, our sample size is relatively small. Despite this, we interviewed enough pediatricians to reach thematic saturation, which suggests that increasing our sample size would not have produced a deeper understanding of the themes we had already discovered. Third, although we approached 9 practices, only 5 agreed to participate. It is possible that the pediatricians we interviewed possessed systematically different characteristics that influenced their willingness to participate compared with those not interviewed. Fourth, the interviews were conducted within a year of the conclusion of the intervention, which might have influenced respondent's perceptions of the study. Despite these limitations, we are confident that insights provided by the pediatricians in our study may help improve the design, effectiveness, and sustainability of antimicrobial stewardship interventions in other ambulatory settings.

APPENDIX

TABLE A1. Sample Questions from the Interview Guide

Topic	Sample questions
Section 1 (questions asked of all respondents)	
Attitudes toward antibiotic overuse	Do you think antibiotic overuse is a problem? If yes, how come? If no, how come? Do you think you can impact the problem of antibiotic overuse? If yes, in what ways?
Barriers to improving antibiotic use	What do you think are some of the barriers to improving antibiotic use in the primary care setting? How do these factors become barriers?
Parental pressure to prescribe antibiotics	In your experience, do parents perceive of antibiotic overuse as a problem? Do you ever feel pressure from parents to prescribe antibiotics? If yes, how do they pressure you? Do parents ever express concern about their child being prescribed antibiotics? Do they ever pressure you into not prescribing antibiotics?
Section 2 (questions asked of respondents from intervention sites only)	
Opinion about the education session	Did you find the educational session for the intervention helpful? Did you agree with the key guidelines of the intervention (not to prescribe antibiotics for viral illness and to use narrow spectrum antibiotics for sinusitis, pneumonia, and group A strep pharyngitis)?
Opinion about quarterly audit and feedback report	How did you feel about your personalized audit and feedback report? Did you review your report on a regular basis? Do you feel these reports had an impact on your prescribing behavior? How?

CONCLUSION

Interviews with primary care pediatricians who recently participated in an antimicrobial stewardship intervention revealed key barriers to the more judicious use of antibiotics for the treatment of ARTIs promoted via audit and feedback. These barriers include distrust of audit reports; a lack of belief that pediatricians overuse antibiotics, despite evidence to the contrary; and shared perception of parental pressure for antibiotics. These findings can inform future interventions aimed at improving antibiotic prescribing in ambulatory pediatrics.

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TABLE A2. Themes Identified in the Data with Illustrative Verbatim Comments from Interview Respondents

Category	Theme	Illustrative quotation
Perception of intervention	Most respondents ignored or were skeptical of audit reports	<p>Interviewer: "Do you recall getting the antibiotic prescribing feedback reports?" Respondent: 'Um, no, I don't. I'm sorry.' [F1]</p> <p>"I think a problem was that the data didn't capture those cases where I will give a prescription for an antibiotic but tell the parents to wait four to five days to see if their kid actually needs it. So it doesn't reflect what really happens." [D4]</p> <p>"I'm convinced our numbers were skewed. Our percentages were higher than what many of us thought we should be as far as prescribing of antibiotics, so we weren't quite sure how they were assembling their data, where they got the numbers from." [A1]</p> <p>"I had been assessed as overusing antibiotics and I wasn't sure why, so it would be nice to have some kind of explanation for why we were assessed in that manner. Because sometimes we put in a diagnosis, and I wonder if this is why, say, an ear infection and that went hand in hand with a cold, a URI, and otitis media, which you would treat with an antibiotic and a cold and we put both diagnoses, and whether we were dinged because it was a viral process that undermined the ear infection and then we treated the ear infection and that is why we were dinged?" [F3]</p>
Perception of antibiotic prescribing guidelines		<p>"If prescribing guidelines are well constructed, well thought out and have a degree of flexibility built into them, I think they have merit. I think there are very few of those that fit those criteria, though. Guidelines that involve practicing physicians [in their design] are much more in tune with the realities of practice than those that come strictly from academic centers, and particularly those that are directed to some degree by non-physicians, whether by PhD, or researchers or statisticians." [E5]</p>
Perception of antibiotic overuse	Antibiotic overuse is a problem, but not in my practice	<p>"I think it is very easy for families to go to a minute clinic and get what they want really fast without any indication and without a clear understanding of what is going on. We try to educate our families. But if they don't understand and their child is sick, they want a specific answer and will go somewhere else like the ER or a minute clinic and get antibiotics." [B4]</p> <p>"I'm not sure that antibiotic prescribing guidelines are clear to everyone. I know for our practice, we know exactly when to use them and we try really hard not to overdo it. I'm not sure how clear the guidelines are to ER physicians or the minute clinic providers." [D4]</p> <p>"I think antibiotic overuse is a problem and has been for a long time but I feel like a lot of it is propagated by family practice or general practitioners. We get tales from our parents all of the time of 'he never did a strep culture on me' or 'they [patient's family doctor] said I had bronchitis and they called me in Zithromax.' So we get lots of tales like that. It makes me feel like it not as much a pediatric issue as it is other areas [of medicine]." [F4]</p>
Barriers to more judicious use of antibiotics	Parent pressure for antibiotics	<p>"There was a new mother in our community who I knew from somewhere else and she had her first baby recently and I thought she would become a patient at our practice. But she said to me 'oh, we are going to this other practice because we know that if we walk in there, we can get an antibiotic right away.' I was surprised that she didn't want to come to our practice, but she said 'I will know when my kid is sick. So if I know my kid is sick, I don't want to wait it out.'" [C2]</p>

TABLE A2 (Continued)

Category	Theme	Illustrative quotation
		<p>“We have lots of parents who come in and they know what they want. They don’t care what we have to say. They want the antibiotic that they want because they know what is wrong with their child. And that is a huge barrier, especially in our practice, because it is a lot of man hours to try and teach these parents the reasons why we should do what we should do in certain circumstances.” [C4]</p> <p>“I was a hospitalist for a while and antimicrobial stewardship in the inpatient setting is much more black and white. Whereas in an outpatient setting there are so many variables. It’s more floating and flowing. For instance, you have a parent saying ‘we’re leaving in two days for Cape Cod. We haven’t had a vacation alone in six years’ and then you’re like ‘well, he does look a little red.’ [Laughter] You know, I’m a parent too so I understand.” [F4]</p> <p>“Sometimes I cave to parent pressure. It all depends on the circumstances, sometimes there are extenuating circumstances that will lead me to prescribe an antibiotic even if I’m not sure that it is clinically indicated. I guess most importantly would be a special needs child, or a child with a seriously ill family member at home or a person who is going out of town and wouldn’t have normal access to medical care while they are out of town.” [B2]</p> <p>“I think parents sometimes come in and they are dealing with a lot of stress in their lives. They’ve got children who are sick. A lot of times it comes out in the appointment that their father is dying in the hospital, or they have a big formal event coming up, a wedding coming up, a confirmation and there is something else going on besides demanding antibiotics and you’ve got to work with that.” [E2]</p> <p>“Sometimes you just don’t have time to argue with a parent. You just don’t. It can be a war zone. It’s the middle of winter, and the kid is outside throwing up in the hall, and the mom says ‘I need an antibiotic prescription.’ Most of the time you can reason with her. You say ‘look, we don’t need to treat this.’ And she says ‘but my neighbor says this. I have an uncle who’s a doctor and he said yes, I need it.’ They come up with a million reasons why they need it. And you just don’t have time.” [E2]</p>

NOTE. ER, emergency room; URI, upper respiratory infection.

REFERENCES

1. McCaig LF, Besser RE, Hughes JM. Trends in antimicrobial prescribing rates for children and adolescents. *JAMA* 2002;287(23):3096–3102.
2. Hersh AL, Shapiro DJ, Pavia AT, Shah SS. Antibiotic prescribing in ambulatory pediatrics in the United States. *Pediatrics* 2011;128(6):1053–1061.
3. Costelloe C, Metcalfe C, Lovering A, Mant D, Hay AD. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis. *BMJ* 2010;340:c2096.
4. Centers for Disease Control and Prevention (CDC). *Antibiotic Resistance Threats in the United States, 2013*. Atlanta, GA: CDC, 2013.
5. Fishman N. Antimicrobial stewardship. *Am J Infect Control* 2006;34(5 suppl 1): S55–63. Discussion S64–S73.
6. Dellit TH, Owens RC, McGowan JE Jr, et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. *Clin Infect Dis* 2007;44(2):159–177.
7. Gerber JS, Prasad PA, Fiks AG, et al. Effect of an outpatient antimicrobial stewardship intervention on broad-spectrum antibiotic prescribing by primary care pediatricians: a randomized trial. *JAMA* 2013;309(22):2345–2352.
8. Pronovost PJ. Navigating adaptive challenges in quality improvement. *BMJ Qual Saf* 2011;20(7):560–563.
9. Charani E, Edwards R, Sevdalis N, et al. Behavior change strategies to influence antimicrobial prescribing in acute care: a systematic review. *Clin Infect Dis* 2011;53(7):651–662.
10. Dixon-Woods M, Suokas A, Pitchforth E, Tarrant C. An ethnographic study of classifying and accounting for risk at the sharp end of medical wards. *Soc Sci Med* 2009;69(3):362–369.
11. Charani E, Castro-Sanchez E, Sevdalis N, et al. Understanding the determinants of antimicrobial prescribing within hospitals:

- the role of "prescribing etiquette." *Clin Infect Dis* 2013;57(2): 188–196.
12. Forman J, Creswell JW, Damschroder L, Kowalski CP, Krein SL. Qualitative research methods: key features and insights gained from use in infection prevention research. *Am J Infect Control* 2008;36(10):764–771.
 13. Strauss AL, Corbin JM. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 2nd ed. Thousand Oaks, CA: Sage, 1998.
 14. Weiss RS. *Learning from Strangers: The Art and Method of Qualitative Interview Studies*. New York: Free Press, 1994.
 15. NVivo 10 [computer program]. Victoria, Australia: QSR International, 2013.
 16. Bryant A, Charmaz K. *The SAGE Handbook of Grounded Theory*. Thousand Oaks, CA: Sage, 2007.
 17. Miles MB, Huberman AM, Class of 1924 Book Fund. *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, CA: Sage, 1994.
 18. Mangione-Smith R, Elliott MN, McDonald L, McGlynn EA. An observational study of antibiotic prescribing behavior and the Hawthorne effect. *Health Serv Res* 2002;37(6):1603–1623.
 19. Kelman S, Friedman JN. Performance improvement and performance dysfunction: an empirical examination of distortionary impacts of the emergency room wait-time target in the English national health service. *J Public Admin Res Theory* 2009; 19(4):917–946.
 20. Jamtvedt G, Young JM, Kristoffersen DT, O'Brien MA, Oxman AD. Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev* 2006(2): CD000259.
 21. Patel SJ, Larson EL, Kubin CJ, Saiman L. A review of antimicrobial control strategies in hospitalized and ambulatory pediatric populations. *Pediatr Infect Dis J* 2007;26(6):531–537.
 22. Ranji SR, Steinman MA, Shojania KG, Gonzales R. Interventions to reduce unnecessary antibiotic prescribing: a systematic review and quantitative analysis. *Med Care* 2008;46(8):847–862.
 23. Mugford M, Banfield P, O'Hanlon M. Effects of feedback of information on clinical practice: a review. *BMJ* 1991;303(6799): 398–402.
 24. Dixon-Woods M, Bosk CL, Aveling EL, Goeschel CA, Pronovost PJ. Explaining Michigan: developing an ex post theory of a quality improvement program. *Millbank Q* 2011;89(2):167–205.
 25. Evans WD. How social marketing works in health care. *BMJ* 2006;332(7551):1207–1210.
 26. Bjorkman I, Berg J, Roing M, Erntell M, Lundborg CS. Perceptions among Swedish hospital physicians on prescribing of antibiotics and antibiotic resistance. *Qual Saf Health Care* 2010; 19(6):e8.
 27. Brinsley K, Sinkowitz-Cochran R, Cardo D, Team CDCcPAR. An assessment of issues surrounding implementation of the Campaign to Prevent Antimicrobial Resistance in Healthcare Settings. *Am J Infect Control* 2005;33(7):402–409.
 28. Giblin TB, Sinkowitz-Cochran RL, Harris PL, et al. Clinicians' perceptions of the problem of antimicrobial resistance in health care facilities. *Arch Intern Med* 2004;164(15):1662–1668.
 29. Wester CW, Durairaj L, Evans AT, Schwartz DN, Husain S, Martinez E. Antibiotic resistance: a survey of physician perceptions. *Arch Intern Med* 2002;162(19):2210–2216.
 30. Bauchner H, Pelton SI, Klein JO. Parents, physicians, and antibiotic use. *Pediatrics* 1999;103(2):395–401.
 31. Mangione-Smith R, McGlynn EA, Elliott MN, Krogstad P, Brook RH. The relationship between perceived parental expectations and pediatrician antimicrobial prescribing behavior. *Pediatrics* 1999;103(4 Pt 1):711–718.
 32. Mangione-Smith R, Elliott MN, Stivers T, McDonald LL, Heritage J. Ruling out the need for antibiotics: are we sending the right message? *Arch Pediatr Adolesc Med* 2006;160(9):945–952.
 33. Stivers T, Mangione-Smith R, Elliott MN, McDonald L, Heritage J. Why do physicians think parents expect antibiotics? what parents report vs what physicians believe. *J Fam Pract* 2003; 52(2):140–148.
 34. Mangione-Smith R, McGlynn EA, Elliott MN, McDonald L, Franz CE, Kravitz RL. Parent expectations for antibiotics, physician-parent communication, and satisfaction. *Arch Pediatr Adolesc Med* 2001;155(7):800–806.
 35. Finkelstein JA, Dutta-Linn M, Meyer R, Goldman R. Childhood infections, antibiotics, and resistance: what are parents saying now? *Clin Pediatr (Phila)* 2014;53:145–150.
 36. Mangione-Smith R, Stivers T, Elliott M, McDonald L, Heritage J. Online commentary during the physical examination: a communication tool for avoiding inappropriate antibiotic prescribing? *Soc Sci Med* 2003;56(2):313–320.
 37. Schnellinger M, Finkelstein M, Thygeson MV, Vander Velden H, Karpas A, Madhok M. Animated video vs pamphlet: comparing the success of educating parents about proper antibiotic use. *Pediatrics* 2010;125(5):990–996.
 38. Taylor JA, Kwan-Gett TS, McMahan EM Jr. Effectiveness of an educational intervention in modifying parental attitudes about antibiotic usage in children. *Pediatrics* 2003;111(5 Pt 1):e548–e554.
 39. Wheeler JG, Fair M, Simpson PM, Rowlands LA, Aitken ME, Jacobs RF. Impact of a waiting room videotape message on parent attitudes toward pediatric antibiotic use. *Pediatrics* 2001; 108(3):591–596.