

# Ruling Out the Need for Antibiotics

## Are We Sending the Right Message?

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**Objectives:** To examine the relationships among physician-parent communication practices, physicians' perceptions of parental expectations for antibiotic treatment, and inappropriate antibiotic prescribing for viral upper respiratory tract infections.

**Design:** Cross-sectional study of pediatric encounters motivated by cold symptoms between October 1, 2000, and June 30, 2001. Each encounter was videotaped. Physicians completed a postvisit survey that measured whether they perceived the parent as expecting antibiotics. Coded communication variables were merged with survey variables. Multivariate analyses identified key predictors of parent-physician communication practices, physician perceptions of parents' expectations for antibiotics, and inappropriate antibiotic prescribing for viral conditions.

**Setting:** Twenty-seven pediatric practices in Los Angeles, Calif.

**Participants:** Thirty-eight pediatricians and 522 consecutively approached parents of children with cold symptoms.

**Main Outcome Measures:** Physicians' perceptions of parental expectations for antibiotics, inappropriate antibiotic prescribing, and parental questioning of non-antibiotic treatments.

**Results:** Physicians were 20.2% more likely to perceive parents as expecting antibiotics when they questioned the physician's treatment plan ( $P = .004$ ; 95% confidence interval, 6.3%-34.0%). When physicians perceived parents as expecting antibiotics, they were 31.7% more likely to inappropriately prescribe them ( $P < .001$ ; 95% confidence interval, 16.0%-47.3%). Parents were 24.0% more likely to question the treatment plan when the physician ruled out the need for antibiotics ( $P = .004$ ; 95% confidence interval, 7.7%-40.3%).

**Conclusions:** Parental questioning of the treatment plan increases physicians' perceptions that antibiotics are expected and thus increases inappropriate antibiotic prescribing. Treatment plans that focus on what can be done to make a child feel better, rather than on what is not needed, ie, antibiotics, may decrease inappropriate antibiotic prescribing.

*Arch Pediatr Adolesc Med.* 2006;160:945-952

**I**NAPPROPRIATE ANTIBIOTIC PRESCRIBING for viral upper respiratory tract infections (URIs) is common.<sup>1-7</sup> Nearly one third of patients diagnosed as having the common cold receive an antibiotic prescription, and prescribing for bronchitis and other viral illnesses is estimated to be as high as 60%.<sup>2</sup> Based on the prevalence of bacterial infections, 55% of antibiotic prescriptions for acute respiratory illnesses in 1998 were in excess of expected prescribing rates.<sup>2</sup> Although a number of recent studies indicate that antibiotic prescribing may have peaked in the early 1990s,<sup>6,8-10</sup> evidence suggests that declining prescribing rates are primarily driven by decreased rates of office visits for respiratory tract infections.<sup>6</sup> For patients presenting with URIs, physicians' rates of prescribing show a relatively modest and uneven decrease,<sup>6</sup> together with

increased reliance on broad-spectrum agents.<sup>10,11</sup> The inappropriate use of antibiotics has led to increased resistance among many strains of bacteria that commonly infect children and adults,<sup>12-19</sup> posing risks to the individual and the community.<sup>18,20-24</sup>

Upper respiratory tract infections are the most common reason that parents seek medical care for their children.<sup>25</sup> Results from the National Ambulatory Medical Care Survey show that acute respiratory conditions account for approximately 75% of children's antibiotic prescriptions.<sup>6</sup> Although 50% to 70% of parents report a pre-visit expectation that their child will be given antibiotics,<sup>5,26</sup> 65% to 70% of these infections are viral and thus cannot effectively be so treated.<sup>27-32</sup>

Previous research has shown associations between patient-parent reports of an expectation for antibiotics and physician

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prescribing,<sup>33-39</sup> but physician perceptions of parental expectations have been demonstrated to be a stronger predictor of actual prescribing behavior.<sup>5,26,33-35</sup> Similarly, although physicians commonly cite parent pressure as a reason for prescribing,<sup>40-44</sup> recordings of actual encounters between parents and physicians show that explicit demands or requests for antibiotics are relatively infrequent.<sup>45,46</sup> Nevertheless, previous research<sup>47</sup> has identified a number of indirect parental communication behaviors that are associated with physician perceptions of parental expectations, although that research was limited by a small physician sample and a homogeneous parent sample.

This study has the following 2 main objectives: (1) to test the relationships between previously identified parental communication practices<sup>47</sup> and physician perceptions of parental expectations for antibiotics using a larger and more heterogeneous sample of physicians and parents and (2) to investigate the relationship between new qualitatively identified physician communication practices<sup>48-50</sup> and parental questioning of nonantibiotic treatments for URI.

## METHODS

### STUDY DESIGN

We conducted a nested cross-sectional study of 522 pediatric encounters clustered among 38 pediatricians (approximately 15 encounters per physician) in 27 community pediatric practices in Los Angeles County, California. Details regarding recruitment of the physician and parent samples have been reported elsewhere.<sup>5</sup> For parents to be eligible, children had to present with respiratory tract infection symptoms (cough, nasal congestion, ear pain, or throat pain). The child had to be between the ages of 6 months and 10 years and to not have taken antibiotics during the preceding 2 weeks. The parent had to be able to speak and read English, and the visit had to occur between October 1, 2000, and June 30, 2001.

As previously reported, 38 of the 59 invited eligible pediatricians agreed to participate (64.4% participation rate), 1 to 4 from each of the 27 practices.<sup>5</sup> Of the 678 parents invited to participate, 570 agreed (84.1%). Twenty-seven participating parents were later determined to be ineligible because their children did not have an eligible diagnosis (eg, earwax impaction or gastroenteritis), yielding a sample of 543 participating parents of 651 invited eligible parents (eligible participation rate, 83.4%). Twenty-one encounters were not conducted in English, thus yielding a sample of 522 complete encounters for the present communication analysis.

All physician and parent participants gave written informed consent. All study procedures were reviewed and approved by the general campus institutional review board of the University of California—Los Angeles.

### DATA COLLECTION PROCEDURES

Before the visit, parents completed a self-administered questionnaire. Each pediatric visit was then videotaped. After the visit, physicians completed a self-administered questionnaire. A detailed list of survey variables collected can be found in our previous report.<sup>5</sup> For the purposes of the present study, the following diagnoses were coded as viral: bronchitis, bronchiolitis, croup, viral pharyngitis, viral pneumonia, viral stomatitis, and viral URI. Oral and injectable antibacterial drugs were considered antibiotics for analysis purposes. Inappropriate anti-

biotic prescribing was defined as the prescription of antibiotics for a viral respiratory diagnosis.

Parental expectations for antibiotic treatment were assessed by responses to the following question, "How necessary do you think it is for the physician to prescribe an antibiotic for your child?" This item was scored on a 5-point scale (response options: definitely necessary, probably necessary, uncertain, probably unnecessary, and definitely unnecessary). Responses were dichotomized such that the first 2 ratings were labeled "antibiotics expected," whereas the other ratings were labeled "antibiotics not expected."

Physician perceptions of parental expectations for antibiotics were measured by physicians' responses to the statement, "At the beginning of this visit, this parent expected me to prescribe an antibiotic." This item was scored on a 5-point Likert scale (response options: strongly agree, somewhat agree, uncertain, somewhat disagree, and strongly disagree). Responses were dichotomized such that the first 2 ratings were labeled "physician perceives a parental expectation for antibiotics," whereas the other ratings were labeled "physician perceives no parental expectation for antibiotics."

## COMMUNICATION CONDUCT

The qualitative method of conversation analysis was used to analyze the videotaped data.<sup>51-53</sup> Both of the conversation analysts (T.S. and J.H.) were initially blinded as to whether antibiotics were prescribed for a given encounter. Through conversation analysis, we identified 3 relevant communication practices that constituted our interaction analysis coding scheme. Two trained research assistants each coded approximately half of the 522 videotaped encounters, and one of us (R.M.-S.) coded a 15% random sample of the encounters to test interrater reliability of the coding scheme, as measured by the  $\kappa$  statistic. The communication behaviors we focused on emerge in the problem presentation and counseling phases of the visit. We examined whether (1) the parent offered a candidate bacterial diagnosis during the presentation of the child's illness to the physician, (2) the physician's treatment recommendation explicitly ruled out the need for antibiotics, and (3) the parent questioned the physician's treatment recommendation. These communication behaviors are summarized and exemplified in **Table 1** and the eFigure (available at: <http://www.archpediatrics.com>). Weighted  $\kappa$  statistics calculated to examine interrater reliability for coding the 3 communication behaviors revealed moderate to near-perfect agreement beyond that of chance: 0.84, 0.77, and, 0.55 respectively.<sup>54</sup>

## ANALYTIC METHODS

For all analyses, the physician-parent encounter, clustered within physicians in practices, was the unit of analysis. All multivariate analyses corrected for this hierarchical structure. We tested the bivariate relationships between our hypothesized categorical predictor and outcome variables using the  $\chi^2$  test of independence.

Bivariate relationships were examined between each of a common set of candidate predictor variables and (1) parental expectations for antibiotics and (2) physician perceptions of parental expectations. The predictor variables included parental communication practices as summarized in Table 1, symptoms, whether antibiotics had previously been prescribed for a cold or sore throat, and child, parent, and physician demographics. Predictor variables having significant bivariate relationships ( $P < .05$ ) with these outcome variables were retained for multivariate models. The final models included (1) parents who were not initially offered antibiotics for their child and who did not question the treatment plan and (2) parents

**Table 1. Communication Conduct**

Speaker	Communication Behavior	Definition	Example	Frequency
Parent	Candidate diagnosis at problem presentation	Parent presents child's problem by suggesting a bacterial diagnosis	"He's had a terrible sore throat, so I thought maybe it was strep."	31/522 (5.9%)
Parent	Questioning the treatment plan	Parent questions the treatment plan or states a preference for a treatment other than the one the physician recommended	After a suggestion to use over-the-counter cough medicine, a parent questions the treatment being recommended (eg, "The Robitussin just isn't working."), or after a recommendation of over-the-counter medication the parent asks, "So, you don't think he needs any antibiotics?"	52/325 (16.0%)*
Physician	Recommendation against antibiotic treatment	Physician's treatment plan includes a recommendation against the use of an antibiotic	"I think we're in good shape here." "I don't think he needs antibiotics because it wouldn't work." or "We can make him more comfortable, but there's no antibiotic that will touch it."	48/297 (16.2%)†

\*Excludes cases in which the parent did not question the treatment plan but did receive antibiotics because, for the purposes of this analysis, this parental communication practice was only relevant in cases where antibiotics were not initially suggested as part of the treatment plan.

†Includes only those cases in which the initial diagnosis was nonbacterial, ie, viral or other (eg, asthma).

who were not initially offered antibiotics for their child but did question the treatment plan. This latter group of parents was included regardless of whether they successfully negotiated with the physician to ultimately obtain antibiotics for their children. We excluded from these analyses 204 cases (39.1%) in which both of the following exclusion criteria were met: (1) physicians recommended antibiotics as part of their initial treatment plan and (2) parents did not question the treatment plan. In other words, we excluded cases in which parents did not need to negotiate with the physician to obtain a prescription for antibiotics because the physician's initial treatment recommendation already included antibiotics. This yielded a subsample of 318 encounters for analysis in which physician-parent communication had reasonable potential to influence physician perceptions and ultimately to lead to inappropriate antibiotic prescribing.

Bivariate relationships were also examined between a set of candidate predictor variables and prescribing antibiotics for a viral condition. This set of predictor variables included parental expectations for antibiotic treatment, physician perceptions of parental expectations, symptoms, duration of illness, parent anxiety level (extremely or very worried vs somewhat or not very worried about the child's illness), history of chronic illness, past experience with the physician regarding antibiotic treatment for colds and sore throat, physical examination findings, the physician's level of diagnostic uncertainty, presence of a local influenza epidemic, patient load for the day (slow, average, very busy, or extremely busy), day of the week, whether the child could attend day care when sick, length of the relationship with the child's physician, and child, parent, and physician demographics. Predictor variables having significant bivariate relationships ( $P < .05$ ) with prescribing antibiotics for a viral condition were retained for the multivariate model.

Parental questioning of nonantibiotic treatment recommendations was modeled using a subset of variables, including physician and parent demographics and 2 physician communication variables that were significant in bivariate analyses ( $P < .05$ ).

Because of the strong confounding of the parent's race/ethnicity and socioeconomic status (SES) in the sample, independent estimates of race/ethnicity and SES in multivariate models were not well identified, and large standard errors resulted when both were included simultaneously. Thus, we constructed a combined variable with 8 mutually exclusive categories having sufficient sample size for precise estimates. These categories included very low SES with any race/ethnicity (65 of 74 parents in this category were Hispanic), low SES with His-

panic ethnicity, low SES with other race/ethnicity, medium SES with white race (reference group), medium SES with Hispanic ethnicity, medium SES with African American race, medium SES with Asian race, and high SES with any race/ethnicity (60 of 105 parents in this category were non-Hispanic white).

All multivariate models were logistic regressions that allowed independent practice-site intercepts. These intercept effects were not reported for individual sites, but their magnitudes were summarized to assess the importance of unmeasured site characteristics. For each model, odds ratios and 95% confidence intervals (CIs) were estimated for all predictor variables. Multivariate adjusted proportions with 95% CIs were then calculated to estimate the marginal effects of each significant predictor variable, holding all other independent variables constant. These proportions estimate the change in the probability of the outcome associated with a change in a single predictor.

## RESULTS

Parents in the sample were on average 34 years of age, with a median annual income of approximately \$40 000. Of the 522 parents, 86.0% were female, 52.9% were Hispanic, and 68.4% had attended at least some college (**Table 2**). As previously reported,<sup>5</sup> 27 (71.1%) of the participating physicians were male, 27 (71.1%) were non-Hispanic white or Asian (Table 2), and 16 (42.1%) were aged 40 to 65 years.

### PARENTAL EXPECTATIONS FOR ANTIBIOTICS

Of the 318 parents involved in encounters in which the physicians did not recommend antibiotics as part of their initial treatment plan and who either did or did not question the treatment plan, 203 (63.8%) reported an expectation for antibiotic treatment, whereas physicians perceived such an expectation in 70 (22.0%) of the 318 encounters. Parents who expected antibiotics were more likely to use a candidate diagnosis during the initial presentation of their child's problem (Table 1), with the rate of parental expectations for antibiotics 27.0% higher (93.1% vs 66.1%) in those who used candidate diagnoses than those who did not (**Table 3**;  $P = .02$ ; 95% CI,

**Table 2. Parent and Physician Demographics\***

Demographic Characteristics	No. (%) of Subjects	
	Parents (n = 522)	Physicians (n = 38)
Female	449 (86.0)	11 (28.9)
Race/ethnicity		
White (non-Hispanic)	144 (27.6)	16 (42.1)
Hispanic	276 (52.9)	5 (13.2)
African American	63 (12.1)	3 (7.9)
Asian	39 (7.5)	11 (28.9)
Other	0	3 (7.9)
Education		NA
Less than high school	81 (15.5)	
High school graduate	84 (16.1)	
Some college	231 (44.3)	
Bachelor's degree or more	126 (24.1)	
Income		NA
<\$20 000	96 (18.4)	
\$20 000-\$40 000	169 (32.4)	
\$41 000-\$80 000	155 (29.7)	
>\$80 000	102 (19.5)	

Abbreviation: NA, not applicable.

\*The physician demographic data have been presented previously in Mangione-Smith et al.<sup>5</sup>

4.6%-49.4%). However, no significant association was found between parents questioning the treatment plan and their expectations for antibiotics. Parents who reported that they were very anxious about their child's illness before the visit were 29.3% more likely to expect antibiotics for their child (Table 3;  $P = .001$ ; 95% CI, 12.3%-46.3%). Hispanic parents with low SES were 20.7% more likely to expect antibiotics for their child's illness than were non-Hispanic white parents with medium SES (Table 3;  $P = .02$ ; 95% CI, 3.0%-38.5%). Parents of chronically ill children and parents attending visits with male physicians were significantly less likely to expect antibiotics (Table 3).

### PHYSICIAN PERCEPTIONS OF EXPECTATIONS

Adjusted results indicated that physicians were 9.3% more likely (25.6% vs 16.3%) to perceive a parent as expecting antibiotics if the parent offered a candidate bacterial diagnosis during the presentation of their child's problem (Table 3;  $P = .02$ ; 95% CI, 1.8%-16.9%). Physicians were also 20.2% more likely to perceive an expectation for antibiotics if the parent questioned the physician's treatment plan (Table 3;  $P = .004$ ; 95% CI, 6.3%-34.0%). Hispanic parents with medium SES were 14.3% less likely to be perceived as expecting antibiotics when compared with non-Hispanic white parents with medium SES (Table 3;  $P = .02$ ; 95% CI, -26.6% to -2.0%), after controlling for other predictors, including these 2 parental communication behaviors.

### INAPPROPRIATE ANTIBIOTIC PRESCRIBING

Antibiotics were prescribed in 41 (15.8%) of 260 cases with viral diagnoses. Multivariate models showed that when phy-

**Table 3. Multivariate-Adjusted Probabilities of Parental Expectations for Antibiotics and Physician Perceptions of Parental Expectations for Antibiotics\***

Characteristics of the Clinical Encounter	Change in Probability, % (95% CI)	
	Parent Expecting Antibiotics†	Physician Perceives an Expectation for Antibiotics‡
Parent offers a candidate diagnosis during problem presentation	27.0 (4.6 to 49.4)	9.3 (1.8 to 16.9)
Parent questions the physician's treatment recommendation	-6.2 (-16.7 to 4.3)	20.2 (6.3 to 34.0)
Child or parent reports fever	-0.2 (-1.2 to 0.8)	-3.8 (-13.0 to 5.5)
Child or parent reports that child has ear pain	11.1 (-4.2 to 26.4)	-5.5 (-25.9 to 14.9)
Child presents with $\geq 2$ symptoms	11.8 (-11.6 to 35.2)	9.6 (-2.7 to 21.9)
Child has been sick for <2 d	1.5 (-7.9 to 10.9)	-0.8 (-4.3 to 2.7)
Child has any chronic condition	-15.3 (-25.1 to -5.5)	-4.9 (-12.4 to 2.6)
Antibiotics previously prescribed for cold	20.7 (-3.9 to 45.2)	8.3 (-2.6 to 19.2)
Antibiotics previously prescribed for sore throat	14.6 (-35.5 to 64.1)	-1.1 (-3.0 to 0.8)
Parents with high SES§	-29.3 (-79.3 to 20.7)	4.1 (-17.4 to 25.5)
Parents with medium SES§		
Hispanic	13.6 (-2.0 to 29.2)	-14.3 (-26.6 to -2.0)
African American	5.3 (-3.9 to 14.5)	26.3 (-12.5 to 65.1)
Asian	11.7 (-12.7 to 36.1)	11.8 (-6.7 to 30.3)
Parents with low SES§		
Hispanic	20.7 (3.0 to 38.5)	1.9 (-4.7 to 8.4)
Non-Hispanic	14.2 (-12.5 to 40.8)	NA
Parents with very low SES§	10.8 (-7.0 to 28.6)	0.4 (-0.3 to 1.1)
Parent has known physician for $\geq 1$ y	10.5 (-58.0 to 78.9)	4.1 (-11.5 to 19.7)
Parent is anxious about the child's current illness	29.3 (12.3 to 46.3)	3.9 (-8.7 to 16.6)
Physician age <45 y¶	-1.0 (-11.5 to 9.6)	-6.3 (-39.7 to 27.1)
Physician age >65 y¶	-23.1 (-73.1 to 26.9)	-2.1 (-13.4 to 9.1)
Physician is male	-14.9 (-28.8 to -1.1)	6.3 (-6.3 to 19.0)

Abbreviations: CI, confidence interval; NA, not applicable; SES, socioeconomic status.

\*Analysis excludes cases in which antibiotics were recommended as part of the initial treatment plan

†Base rate is 64%.

‡Base rate is 22%.

§Analysis is relative to non-Hispanic white parents with medium SES. The SES group definitions are as follows: high, education greater than a bachelor's degree and annual income of \$40 000 to \$80 000 or more than \$80 000; low, high school education and annual income less than \$40 000; very low, less than a high school education and annual income less than \$40 000; and medium, all others.

||None of the 16 parents in this group were perceived as expecting antibiotics. This perfect prediction precluded their inclusion in this multivariate model.

¶Analysis is relative to physicians aged 45 to 65 years.

sicians perceived a parent as expecting antibiotics, they were 31.7% more likely (33.7% vs 2.0%) to inappropriately prescribe them (Table 4;  $P < .001$ ; 95% CI, 16.0%-47.3%). In addition, when physicians reported the presence of rhonchi or wheezing on examination, the probability that they would inappropriately prescribe an-

**Table 4. Multivariate-Adjusted Predictors of Prescribing Antibiotics for Viral Conditions**

Predictor Variable	Change in Probability of Physician Inappropriately Prescribing Antibiotics, % (95% CI)*
Parent expects to receive antibiotics	3.7 (-25.5 to 33.0)
Physician perceives parent as expecting antibiotics	31.7 (16.0 to 47.3)
Child presents with $\geq 2$ symptoms	1.8 (-0.7 to 4.3)
Child has been sick for <2 d	2.5 (67.1 to -72.0)
Abnormal appearance of the tympanic membranes	4.3 (-29.7 to 38.4)
Rhonchi or wheezing on lung examination	20.7 (7.4 to 34.1)
Presence of purulent rhinorrhea	25.8 (-10.1 to 61.85)
Erythematous pharynx in a patient with sore throat	11.7 (-11.0 to 34.3)
Patient febrile at home and in physician's office	12.7 (-4.6 to 30.0)
Parents with high SES†	-0.2 (-0.5 to 0.1)
Parents with medium SES†	
Hispanic	4.4 (-1.3 to 10.1)
African American	-3.4 (-8.1 to 1.3)
Asian	-2.2 (-7.7 to 3.3)
Parents with low SES†	
Hispanic	-4.9 (-22.8 to 12.9)
Non-Hispanic	25.4 (5.6 to 45.1)
Parents with very low SES†	24.2 (3.5 to 44.9)
Parent is anxious about the child's current illness	11.8 (1.5 to 22.1)

Abbreviations: CI, confidence interval; SES, socioeconomic status.

\*Base rate is 16%.

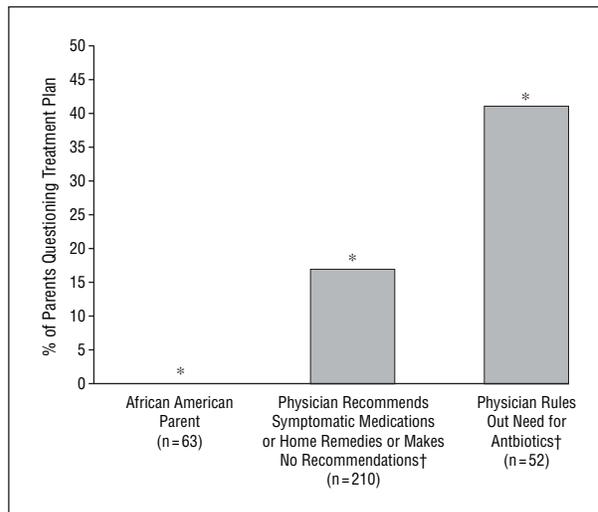
†Analysis is relative to non-Hispanic white parents with medium SES. The SES group definitions appear in a footnote to Table 3.

antibiotics increased by 20.7% (Table 4;  $P = .002$ ; 95% CI, 7.4%-34.1%). Parents who reported that they were very anxious about their child's illness before the visit were also significantly more likely to receive an inappropriate antibiotic prescription for their child's viral illness (Table 4). Children of non-Hispanic parents with low SES and all children of parents with very low SES were significantly more likely to receive an inappropriate antibiotic prescription than were children of white parents with medium SES (Table 4). Inappropriate prescribing was not associated with actual parental expectations for antibiotics after controlling for these other factors.

#### PARENTAL QUESTIONING OF PHYSICIAN NONANTIBIOTIC TREATMENT RECOMMENDATIONS

Among parents who received nonantibiotic treatment recommendations for their children, none of the 40 African American parents but 53 of the 285 non-African American parents questioned the physician's treatment plan ( $P = .02$ ). This perfect prediction did not allow the inclusion of race/ethnicity in subsequent logistic regressions, so subsequent multivariate modeling was restricted to non-African American parents.

Adjusted results showed that the only additional significant predictor of parents questioning a nonantibi-



**Figure.** Covariate-adjusted frequencies for parents questioning the physician's treatment plan. Adjustments include child age, parental socioeconomic status, and physician age. The analysis excludes parents who received antibiotics without questioning the treatment recommendation.

\* $P < .01$  for all subgroup comparisons.

†Includes only non-African American parents.

otic treatment plan was the physician's ruling out the need for antibiotics when discussing his or her treatment recommendations (Table 1). Parents were 24.0% more likely to question the physician's treatment plan when physicians exclusively ruled out the need for antibiotics or when their treatment plan consisted of ruling out antibiotics in combination with positive treatment recommendations for symptomatic medications or home remedies (Figure; 41.4% vs 17.4%;  $P = .004$ ; 95% CI, 7.7%-40.3%). This increase in the probability of parents questioning the treatment plan occurred whether the statement ruling out the need for antibiotics was positioned before or after any positive treatment recommendations provided by the physician.

#### COMMENT

Inappropriate antibiotic prescribing is primarily driven by physicians' perceptions that parents expect an antibiotic for their child.<sup>5,26</sup> In the present study, we hypothesized that these perceptions would be positively associated with a variety of parental communication practices, including the use of candidate diagnoses and parental questioning of physicians' diagnoses and treatment recommendations.<sup>47-50</sup> Our results indicate that physician perceptions of parental expectations for antibiotic treatment are strongly related to both candidate diagnoses being offered and parental questioning of non-antibiotic treatment recommendations. Although the offering of candidate diagnoses was also associated with a preexisting parental expectation for antibiotic treatment, questioning the physician's treatment plan was not. Instead, parental questioning of the treatment plan was strongly associated with the physician communication practice of ruling out the need for antibiotics. Qualitative analyses of these exchanges suggested that these rule-out statements may motivate such questioning because

they seem to delegitimize the parent's decision to seek medical help for the child's condition.<sup>48</sup> These effects may be aggravated when attempts are made to reassure a parent by minimizing the significance of symptoms, or when recommendations for nonprescription medicines are vaguely described.<sup>48-50</sup>

Positively framed treatment recommendations for symptomatic treatments or home remedies were met with significantly more parent alignment with the proposed treatment plan. Parents who did not question the treatment plan were significantly less likely to be perceived by the physician as expecting antibiotics. Thus, our study suggests that the use of positively framed treatment recommendations may indirectly reduce inappropriate antibiotic prescribing by ultimately decreasing the frequency with which physicians perceive parents as expecting antibiotics.

Parents who used candidate diagnoses when presenting their child's problem were more likely to expect and be perceived as expecting antibiotics. Because these presentations are the first event to occur in the visit, education about what would support the diagnosis proposed by the parent might best be addressed during this first phase of the visit, shortly after the parent has raised the issue. The physician might tell the parent what findings from the physical examination he or she will be focusing on to evaluate the suggested diagnosis, as well as address which of these findings would require antibiotic treatment. For example, if the parent offers "strep throat" as a candidate diagnosis, the physician could briefly explain that if the child has white spots on the tonsils this would raise his suspicion of streptococcus infection, and a throat culture or rapid test would be used to confirm the diagnosis. If the actual examination reveals only a red throat and the physician states that the tonsils do not have white spots on them, the parent has already been prepared for the possibility of a different diagnosis that may not require a test or antibiotics.<sup>55</sup>

Low-SES Hispanic parents were significantly more likely to expect antibiotics than were medium-SES white parents who were otherwise similar (20.7% more likely;  $P = .02$ ), but physicians did not perceive these higher expectations (1.9% more likely;  $P = .58$ ) (Table 3). The higher expectations of low-SES Hispanic parents did not translate into higher-level use of the 2 key parental communication practices we identified in this study as having the potential to influence physician perceptions and behavior; their use of these behaviors was similar to their use by parents in other SES and racial/ethnic groups (data not shown). This finding suggests that any additional unmeasured communication practices used by this group of parents to convey expectations for antibiotics are unlikely to have substantial effects on physician perceptions and behavior.

Physicians were significantly more likely to inappropriately prescribe antibiotics to children of all parents in the very-low-SES group ( $n = 74$ ; 87.8% Hispanic and 12.2% African American parents) and to children of parents in the low-SES group who were African American ( $n = 7$ ) or white ( $n = 6$ ). However, physicians did not perceive these parents as being more likely to expect antibiotics and, in fact, they were no more likely to expect antibi-

otics than were medium-SES white parents. The families in the very-low- and low-SES groups were primarily seen in high-volume safety-net clinics in East or South Central Los Angeles. Physicians providing care in these clinics may view the practice of prescribing inappropriate antibiotics as more efficient than explaining how to provide symptomatic over-the-counter treatments or home remedies to these families. However, 1 recent study does not support the presumed efficiency of such prescribing practices.<sup>56</sup> Using data from the National Ambulatory Medical Care Survey, Coco and Mainous<sup>56</sup> found that pediatric visits in which antibiotics were prescribed for colds and bronchitis were 3.6 seconds longer on average (14.24 vs 14.18 minutes;  $P > .05$ ) than were visits in which no antibiotics were provided.

This study has several limitations. First, it was conducted in Los Angeles, so the results may not be generalizable to different populations of parents and physicians in different geographic locations. We had a small physician sample ( $n = 38$ ), which underrepresented non-Hispanic white physicians (42.1%) and female physicians (28.9%). Second, it is possible that under normal circumstances, when these particular physicians are not being observed, pressure to prescribe antibiotics may be acted on more frequently. In a previous study<sup>57</sup> with a similar study design, a significant Hawthorne effect was observed on antibiotic prescribing patterns. It is our expectation that Hawthorne effects are more likely to cause us to underestimate the strength of associations between parental communication practices and physician perceptions and behavior than they are to cause the reverse. Finally, our results indicate that other unmeasured factors contribute to physician-perceived expectations for antibiotics and inappropriate antibiotic prescribing.

## CONCLUSIONS

Although many physicians may understandably wish to educate parents about the circumstances in which antibiotics are an appropriate treatment option, our results suggest that the final phase of the visit, when treatment recommendations are being made, may be an ineffective context in which to begin physician-initiated education for which the parent is unprepared. Although changing the way treatment recommendations are made (ie, avoiding statements that rule out the need for antibiotics) will not eliminate inappropriate prescribing in response to perceived parental expectations, changing physician communication in this regard will likely help to diminish the problem. Future interventions should consider alternative communication practices by which physicians can educate parents about the appropriateness of antibiotic medications early in the visit and prepare parents for the subsequent diagnosis and treatment recommendation. Because inappropriate antibiotic prescribing to children from families with low and very low SES does not appear to be primarily driven by physician-perceived pressure to prescribe, future work should examine the determinants of prescribing antibiotics to these children to better inform the development of interventions aimed at physicians caring for them.

Accepted for Publication: April 27, 2006.

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**Author Contributions:** Dr Mangione-Smith had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Mangione-Smith, Elliott, Stivers, and Heritage. *Acquisition of data:* Mangione-Smith and Stivers. *Analysis and interpretation of data:* Mangione-Smith, Elliott, Stivers, McDonald, and Heritage. *Drafting of the manuscript:* Mangione-Smith, Elliott, Stivers, and Heritage. *Critical revision of the manuscript for important intellectual content:* Mangione-Smith, Elliott, Stivers, and Heritage. *Obtained funding:* Mangione-Smith. *Administrative, technical, and material support:* Mangione-Smith, Elliott, Stivers, McDonald, and Heritage. *Study supervision:* Mangione-Smith and Heritage. **Funding/Support:** This study was supported by grant 039189 from the Robert Wood Johnson Foundation and grant KO2-HS13299-01 from the Agency for Healthcare Research and Quality.

**Role of the Sponsor:** The funding agencies did not participate in the design or conduct of the study; in the collection, analysis, or interpretation of the data; or in the preparation, review, or approval of the manuscript.

**Additional Information:** The eFigure is available at: <http://www.archpediatrics.com>.

**Acknowledgment:** We thank Andrea Richardson, MPH, for her assistance with programming for analyses on this project.

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### Correction

**Incorrect Terminology.** In the article titled "Effectiveness of Child Safety Seats vs Seat Belts in Reducing Risk for Death in Children in Passenger Vehicle Crashes," by Elliott et al published in the June issue of the ARCHIVES (2006;160:617-621) the term *tow-away* was incorrectly changed to the term *two-way*. Thus, on page 617, in the "Participants" subsection of the "Abstract," the sentence should have read as follows: "Children in tow-away crashes occurring between 1998 and 2003." The same error occurred on page 621, left-hand column, lines 1 and 2. These should have read ". . . of the NASS CDS to obtain a representative sample of the full tow-away crash population may suffer from confounding. . . ." Further down on the same page and in the same column, the last sentence of that paragraph should have read as follows: "The restriction of NASS CDS to tow-away crashes and use of adjustment factors such as vehicle type, model year, age of driver, and, especially, survival status of the driver should reduce this confounding."

# Web-only material for POA60037

Rita Mangione-Smith, MD, MPH

## 1. Candidate Diagnosis

Case 36-32-08

*Mother:* I kinda think he's got a sinus infection because he's had like a lot of green. You know, it's like nonstop when he blows his nose. It feels like there's no end to his blowing, you know, and it's been a month that he's had this going on where he just sneezes up a big green.

*Physician:* Okay. Any fever?

## 2. Positive Treatment Recommendations

Case 32-29-11

*Physician:* The fact that she's really rubbing her nose a lot and has itchy eyes, those are all classic allergy symptoms. Over-the-counter medicines like Benadryl are very helpful. They block histamines, which cause a lot of the symptoms; a lot of the itchiness and the redness. So that's usually what we recommend starting with, unless it becomes a progressive problem with a lot of congestion and a lot of sneezing and itchy eyes. Then we can give her a preventative medicine, something like Flonase nasal spray.

*Mother:* Okay.

## 3. Negative (Rule-Out) Treatment Recommendation

Case 17-08-10

*Physician:* Um, what we're dealing with is a flu.

*Mother:* Mm hmm.

*Physician:* Um, a viral infection if you will. They're self-limited. There isn't a lot we can do. We can make him more comfortable.

*Mother:* Mm hmm.

*Physician:* But there's no antibiotic that's gonna touch it.

*Mother:* So, his throat looks OK?

Case 32-27-08

*Physician:* So, I think it's just one of the things that kids get; one thing after another sometimes.

*Mother:* Mm-kay.

*Physician:* Nothing serious here. Nothing that I can see. Nothing that an antibiotic would help.

*Mother:* Okay.

## 4. Parent Questions the Treatment Plan

Case 16-13-03

*Physician:* Uh yeah, it's a viral infection.

*Mother:* A viral infection.

*Physician:* See, the problem is, you know, you think, oh gosh he's got a sore throat and a fever; we should put him on an antibiotic. The trouble with this thing is it's only like a bad cold except they have usually 2 to 3 days of fever and usually flu symptoms, chills.

*Mother:* Uh-hum.

*Physician:* Uh, and usually they do just fine with just a good decongestant cough medicine.

*Mother:* Well I've been giving him a decongestant cough medicine and I really don't, I don't like antibiotics on him, but...

Case 32-28-03

*Physician:* I think from what you've told me, that this is probably a kind of virus infection that I don't think antibiotics will kill.

*Father:* Yeah, yeah. I had it. I had the symptoms 3 weeks ago.

*Physician:* I understand.

*Father:* And I was taking the over-the-counter stuff.

*Physician:* Good.

*Father:* Uh, cough syrup. It did nothing to take away my sore throat. My throat was really bad for awhile.

*Physician:* Mm hm.

*Father:* A whole week and I started antibiotics yesterday.

*Physician:* Right.

*Father:* And it seemed to take care of the problem.

Citing the **eFigure** for POA60037.

**eFigure.** Excerpts from transcripts to illustrate key communication behaviors. Blue shading indicates segments of conversations that illustrate the communication behavior of interest.