Communication Practices and Antibiotic Use for Acute Respiratory Tract Infections in Children

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ABSTRACT

PURPOSE This study examined relationships between provider communication practices, antibiotic prescribing, and parent care ratings during pediatric visits for acute respiratory tract infection (ARTI).

METHODS A cross-sectional study was conducted of 1,285 pediatric visits motivated by ARTI symptoms. Children were seen by 1 of 28 pediatric providers representing 10 practices in Seattle, Washington, between December 2007 and April 2009. Providers completed post-visit surveys reporting on children's presenting symptoms, physical examination findings, assigned diagnoses, and treatments prescribed. Parents completed post-visit surveys reporting on provider communication practices and care ratings for the visit. Multivariate analyses identified key predictors of prescribing antibiotics for ARTI and of parent visit ratings.

RESULTS Suggesting actions parents could take to reduce their child's symptoms (providing positive treatment recommendations) was associated with decreased risk of antibiotic prescribing whether done alone or in combination with negative treatment recommendations (ruling out the need for antibiotics) [adjusted risk ratio (aRR) 0.48; 95% CI, 0.24-0.95; and aRR 0.15; 95% CI, 0.06-0.40, respectively]. Parents receiving combined positive and negative treatment recommendations were more likely to give the highest possible visit rating (aRR 1.16; 95% CI, 1.01-1.34).

CONCLUSION Combined use of positive and negative treatment recommendations may reduce the risk of antibiotic prescribing for children with viral ARTIs and at the same time improve visit ratings. With the growing threat of antibiotic resistance at the community and individual level, these communication techniques may assist frontline providers in helping to address this pervasive public health problem.

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INTRODUCTION

Antibiotic prescribing for childhood acute respiratory tract infections (ARTIs), including acute otitis media, pharyngitis, sinusitis, bronchitis, and upper respiratory infection, is common in the United States.[1-3] In the outpatient setting, more than 50% of children diagnosed with ARTIs receive antibiotic prescriptions.[1,3] Considering that the estimated US prevalence of pediatric bacterial ARTIs is 27%,[3] this represents substantial antibiotic overuse nationwide. Unwarranted use of antibiotics is associated with increased resistance among bacteria that commonly cause ARTIs, posing risks to both individuals and communities.[4-7]

Provider-parent communication during visits for viral ARTIs often drives unwarranted antibiotic prescribing.[8,9] During such visits, providers use 2 main communication formats when recommending treatment:

- Positive treatment recommendations—explanations of what parents can do to help their child's symptoms (for instance, "You can give her a teaspoonful of honey just before bedtime until the cough clears up.")
- Negative treatment recommendations—explanations of the inappropriateness of antibiotics for their child's infection (for instance, "What we have here is just a virus, so antibiotics won't help.")[10]

A recent qualitative study of parents attending ARTI visits revealed that they expect advice on symptomatic treatment and feel frustrated by recommendations that no treatment is needed.[11] In consonance with these qualitative findings, we previously reported that using negative treatment recommendations significantly increases the likelihood that parents will question non-antibiotic treatment plans.[8] We also found that giving parents a contingency plan (that is, a follow-up plan that includes the possibility of future antibiotic treatment if the child does not improve) is associated with increased visit satisfaction.[12]

During viral ARTI visits, parent questioning of the treatment plan is often interpreted by providers as indicating an expectation for antibiotics.[8,9] Perceived expectations of antibiotics often change provider decision making into provider-parent negotiation and increase the odds of unwarranted antibiotic prescribing.[9,13] Thus, for viral ARTI visits, delivering positive treatment recommendations and contingency plans may increase parent acceptance of non-antibiotic treatment plans, decrease unwarranted antibiotic prescribing, and enhance visit satisfaction.

The main objective of this study was to examine whether use of positive and/or negative treatment recommendations and contingency plans is associated with antibiotic prescribing rates for viral ARTIs and parent care ratings for these visits.

METHODS

We approached 61 eligible pediatric providers from 13 Puget Sound Pediatric Research Network practices in the Seattle, Washington, area over a 4-month period regarding study participation. Twenty-eight providers from 10 practices agreed to participate (46%) and a subsample of 10 providers each agreed to have 10 study visits videotaped.

Visit Data

Data were collected from parents of children aged 6 months to 10 years who were seen by participating providers for a chief complaint of ARTI symptoms including cough, nasal congestion, sore throat, ear pain, and ear tugging. Providers supplied data on these visits as well. Data were collected between December 1, 2007, and April 30, 2009, on up to 60 eligible visits to each participating provider. Parents of potentially eligible children were approached before their visit; only those who could read English or Spanish were enrolled. Parents of children who had received antibiotics within the previous 2 weeks or who had already participated were ineligible. Parents and providers gave written informed consent to participate. All study procedures were reviewed and approved by the Seattle Children's Research Institute Institutional Review Board.

Measures

Parent Post-Visit Survey

Participating parents completed a post-visit survey immediately after their child's visit with the provider. Using this self-administered survey in English or Spanish, we collected information on family demographics, including parent age, sex, race, ethnicity, education level, household income; child health status, age, and sex; whether the provider spoke the parent's preferred language; how parents rated the care provided; and parent responses to the Provider Communication Behavior Inventory (PCBI).

Provider Communication Behavior Inventory (PCBI).

For the PCBI, after their child's visit, parents indicated dichotomously whether the provider used positive treatment recommendations, used negative treatment recommendations, and offered parents a contingency plan.

To test the validity of the PCBI, we videotaped 10 encounters for each of 10 participating providers during the study period. Videotapes were coded using a previously developed interaction analysis coding scheme.[8] We compared the coded encounters with parent reports of provider communication behaviors on the PCBI. To assess level of agreement, we determined the sensitivity and specificity of parent PCBI reports for correctly identifying when the 3 communication behaviors of interest occurred, treating videotape codes as the gold standard.

Parent Care Ratings

We assessed parent care ratings using the 10-point Consumer Assessments of Healthcare Providers and Systems (CAHPS) global rating of care measure: "Using any number from 0 to 10 where 0 is the worst possible care and 10 is the best possible care, what number would you give the care you got from your child's doctor at this visit?"[14]

Provider Post-Visit Checklist

Immediately after each study visit, providers completed a post-visit checklist (Supplemental Appendix 1, http://www.annfammed.org/content/13/3/221/suppl/DC1). On the checklist, the providers indicated the child's presenting symptoms, their physical examination findings, their assigned diagnosis, and their treatment choices. In a prior study using the same provider post-visit checklist,[15] we found >90% agreement between the checklist and medical record documentation for both diagnosis assigned and medications recommended or prescribed.

Constructing Variables

The primary visit outcomes of interest were antibiotic prescribing rates for viral ARTIs and parent care ratings for these visits. The primary predictors, based on parent PCBI responses, were provider use of positive treatment recommendations, negative treatment recommendations, and contingency plans.

Diagnoses

Bacterial diagnoses on the provider post-visit checklist included acute otitis media, otitis externa, bacterial pneumonia, mycoplasma, streptococcal pharyngitis, and sinusitis. Viral diagnoses included bronchitis, bronchiolitis, croup, otitis media with effusion, viral pharyngitis, viral pneumonia, stomatitis, and viral upper respiratory infection. All cases of bronchitis were considered viral illnesses based on expert consensus that bronchitis is rarely bacterial in children.[16]

Antibiotic Prescribing

A child was coded as receiving antibiotics if the provider checked "antibiotic" or "antibiotic prescription provided, but parent told not to fill before further contact" (indicating a 'safety-net' or 'delayed' antibiotic prescription) on the post-visit checklist. While some studies have considered provision of a safety-net prescription an alternative to avoiding unwarranted antibiotic prescribing, we considered this practice an acceptable approach only for acute otitis media.[17] For children assigned viral diagnoses, safety-net antibiotic prescriptions were considered unwarranted prescribing, since some of these prescriptions would ultimately be filled.[18]

Parent Care Ratings

To be consistent with prior research on parent and patient experience,[19-21] we dichotomized parent care ratings into high- and lower-rated visit experience using the "top-box" scoring method.[22,23] That is, we dichotomized responses in analyses to ratings of 10 vs ratings of 0-9.

Communication Variables

A provider was classified as giving a positive treatment recommendation when the parent answered "yes" to the following PCBI item: "Did the doctor tell you things you can do to make your child feel better, for example, home remedies you might try?" Providers were classified as giving a negative treatment recommendation if the parent responded "yes" to the following PCBI item: "Did the doctor tell you antibiotics won't help your child get better?" Providers were scored as having given the parent a contingency plan in any of these 3 cases:

- First, the parent could respond "yes" to the item, "Did the doctor say he or she might give your child antibiotics later if your child doesn't get better in the next couple of days?"
- Second, the parent could respond "yes" to *both* of the following survey items: "Did the doctor ask you to come back if your child isn't doing better in the next day or 2?" and "Did the doctor say he or she might give your child antibiotics if you need to come back?"
- Finally, the parent could respond "yes" to *both* of the following items, "Did the doctor ask you to call on the phone if your child isn't doing better in the next day or two?" and "Did the doctor say he or she might call in a prescription for antibiotics to the drug store if you call because your child isn't doing any better?"

Analytic Methods

For all analyses, visits for viral ARTIs were the units of analysis (n = 794). To account for the correlation among observations due to clustering within providers and practices, we applied generalized estimating equations (GEE) with sandwich estimators for standard errors on coefficient estimates.[24] In addition, the 2 primary outcomes—antibiotic prescribing and parent ratings for the visit—were binary variables. Therefore, to facilitate interpretation, we conducted relative risk regressions by specifying the Poisson family and log link function in the GEE. To further address the possible over-dispersion or under-dispersion issue that often comes with Poisson variance assumption, we included a time-variant scale parameter in the specification of the variance and allowed it to be estimated from data.[25]

The relative risk regression model was used to examine the relationship between use of the 3 communication practices and antibiotic prescribing for viral ARTIs. This model included a 4-level communication variable to indicate the presence of only a positive treatment recommendation (1,0), the presence of only a negative treatment recommendation (0,1), the presence of both types of treatment recommendations (1,1), and the absence of both types of treatment recommendations (0,0; the omitted comparison group in all analyses). The model also included a dichotomous indicator of whether a contingency plan was provided, as well as patient and parent demographics found to be associated with antibiotic prescribing for viral ARTIs in a prior study.[26]

We constructed a second relative risk regression model based on GEE to examine the relationships between use of the 3 communication practices and parent care ratings for their child's visit. We entered the same treatment recommendation and contingency plan variables described for the first model and whether the child was prescribed an antibiotic. For consistency with earlier studies using Consumer Assessment of

Healthcare Providers and Systems (CAHPS) global rating scores as outcomes,[27-30] we included the following covariates in the model: child health status, sex, and age, parent sex, age, education level, annual income, race, ethnicity, preferred language, provider sex, and whether the provider spoke the parent's preferred language. All analyses were performed using STATA version 12.1 (StataCorp, LP).[31]

RESULTS

Sample Characteristics

During the 16-month data collection period, we recruited 1,284 parents whose children were having visits for ARTI symptoms with participating providers, 90 of whom were not eligible because their children did not receive bacterial or viral ARTI diagnoses based on the provider post-visit checklist. Parents were primarily white, non-Hispanic, and highly educated. The mean age for children was 4.2 years (SD 3.0 years), with the majority having excellent or very good health status (Table 1).

Viral ARTI Visit Characteristics

During this sample of viral ARTI visits, exclusive use of positive treatment recommendations was more common than either exclusive use of negative treatment recommendations or the combination of both types of treatment recommendations (Table 2). Overall, antibiotics were prescribed during 34% (409/1,194) of all ARTI visits (bacterial and viral combined), but only during 5% of viral ARTI visits (42/794). Parent care ratings during visits for viral ARTIs were high, with approximately two-thirds of them rating their child's visit "10" on the CAHPS rating scale (Table 2).

Table 1. Parent and Child Sample Characteristics (N = 1,194)

Characteristics	N (%)
Parents	
Female	999 (84%)
Race[a]	
White only	936 (78%)
Asian only	174 (15%)
Black only	33 (3%)
Other	45 (4%)
Hispanic ethnicity	85 (7%)
Annual household income >$60K	926 (78%)
Education[b]	
<High school	27 (2%)
High school graduate	68 (6%)
<4 Years of college	233 (20%)
>4 year college degree	863 (72%)
Mean age in years	37.7; SD 7.0
Primary language spoken at home not English	134 (11%)
Children	
Female	583 (49%)
Health status excellent or very good	1,014 (85%)
Mean age in years	4.2; SD, 3.0

SD = standard deviation.

[a]Race missing for 6 participating parents; other race = Native Hawaiian or Pacific Islander, American Indian, and mixed race.

[b]Education missing for 3 participating parents.

Adjusted Associations Between Communication Practices and Outcomes

Exclusive use of positive treatment recommendations was associated with a 52% reduction in the risk of antibiotic prescribing for viral ARTIs [adjusted risk ratio (aRR) = 0.48; 95% CI, 0.24-0.95; $P = .04$; Table 3]; while using a combination of positive and negative treatment recommendations was associated with an 85% reduction in the risk of prescribing (aRR = 0.15; 95% CI, 0.06-0.40; $P < .001$; Table 3). Exclusive use of negative treatment recommendations and provision of contingency plans were not associated with antibiotic prescribing rates for viral ARTIs.

Combined use of positive and negative treatment recommendations was associated with a 16% greater probability of parents giving their child's visit the highest possible rating (10 vs 0-9; aRR = 1.16; 95% CI, 1.01-1.34; $P = .04$; Table 4). Exclusive use of positive or negative treatment recommendations and use of contingency plans were not associated with parent visit ratings. Receiving an antibiotic prescription was also not associated with visit ratings (Table 4).

PCBI Validity

Comparing parent reports of the 3 communication practices to coded videotapes of visits revealed that parents had 87% sensitivity and 79% specificity for correctly reporting when positive treatment recommendations

Table 2. Viral Acute Respiratory Infection Visit Characteristics (N = 794)

Visit Characteristics	N (%)
Communication practices	
Only positive treatment recommendations provided	383 (48%)
Only negative treatment recommendations provided	44 (6%)
Both positive and negative treatment recommendations provided	255 (32%)
Contingency plan provided	182 (23%)
Antibiotics prescribed	42 (5%)
Parent-rated care 10 on 0-10 rating scale	526 (66%)

Note: Viral diagnoses on the provider post-visit checklist included bronchitis, bronchiolitis, croup, otitis media with effusion, viral pharyngitis, viral pneumonia, stomatitis, and viral upper respiratory infection.

Table 3. Adjusted Associations Between Communication Practices and Antibiotic Prescribing for Viral Acute Respiratory Infections

Predictor Variable	Adjusted Risk Ratio[a]	95% CI	*P* Value
Communication practices			
Only positive treatment recommendations provided[b]	0.48	0.24-0.95	.04
Only negative treatment recommendations provided[b]	0.18	.02-1.43	.11
Both positive and negative treatment recommendations provided provided[b]	0.15	0.06-0.40	<.001
Contingency plan provided	1.66	0.65-4.23	.29

[a]Adjusted for provider sex, parent sex, age, race, ethnicity, education level, annual income, language spoken at home, child sex, age, and health status.
[b]Omitted comparison group = no treatment recommendation provided.

Table 4. Adjusted Associations Between Communication Practices During Encounters for Viral Acute Respiratory Infections and Parent Visit Ratings (10 vs 0-9)

Predictor Variable	Adjusted Risk Ratio[a]	95% CI	*P* Value
Communication practices			
Only positive treatment recommendations provided[b]	1.12	0.95-1.31	.18
Only negative treatment recommendations provided[b]	0.99	0.71-1.38	.94
Both positive and negative treatment recommendations provided[b]	1.16	1.01-1.34	.04
Contingency plan provided	0.99	0.87-1.14	.92
Antibiotic prescribed	1.13	0.95-1.34	.16

[a]Adjusted risk ratio adjusted for provider sex, whether provider spoke patient's preferred language, parent sex, age, race, ethnicity, education level, annual income, language spoken at home, child sex, age, health status.
[b]Omitted comparison group = no treatment recommendation provided.

occurred. Parent sensitivity for accurately reporting on negative treatment recommendations was only 60%; however, specificity was 81% and overall correct classification occurred in 80% of cases. Parents had a sensitivity of 100% and a specificity of 85% for correctly reporting on the occurrence of contingency plans.

DISCUSSION

With this study, we have identified key communication practices associated with decreased antibiotic prescribing for viral ARTIs. Given the previously established associations between using negative treatment recommendations, parent questioning of the treatment plan,[8] and parent-reported frustration with such encounters,[11] it is not surprising that exclusive use of negative recommendations during treatment discussions was rare (Table 2). Had this communication practice been used in isolation more frequently, we might have observed a relationship with decreased antibiotic prescribing; this would likely be at the expense of worse parent care ratings, however.[8,11] Treatment recommendations using a combination of positive and negative formats, while still relatively infrequent (Table 2), were associated with substantially decreased risk of antibiotic prescribing for viral ARTIs and with high parent visit ratings. To a lesser degree, we also found that exclusive use of positive treatment recommendations was associated with decreased risk of antibiotic prescribing for viral ARTIs, but when used in isolation had no association with parent visit ratings.

Based on the frequency of their respective use, it appears that pediatric providers in this study were more comfortable with making positive treatment recommendations than negative ones. This may be explained by their having been questioned by parents after providing negative treatment recommendations in past visits.[8,10] Prior qualitative work indicates that providing a negative treatment recommendation after a positive one, rather than in isolation or before a positive recommendation, appeared to have the highest likelihood of attaining parent acceptance of non-antibiotic treatment plans.[10] The current study lends support to these qualitative findings in that using a combination of positive and negative treatment recommendations was associated with an 85% decrease in risk of antibiotic prescribing during visits for viral ARTIs and significantly increased visit ratings. It is possible that parents see suggestions for symptomatic treatment (positive treatment recommendations) as similar to being given a prescription and thus do not feel they have left empty-handed as they might when only receiving a negative treatment recommendation. However, because we were unable to assess the order in which positive and negative treatment recommendations occurred, the importance of such sequencing is not yet clear.

Given the exceptionally low rate of antibiotic overuse in the current study (only 5% of patients with viral diagnoses were prescribed antibiotics) some patients with viral infections may have been assigned bacterial diagnoses in order to justify the decision to prescribe.[3,32] On the other hand, bacterial diagnoses were given in only 34% of study visits (400/1,194), which is relatively close to the 27% bacterial prevalence rate

expected for pediatric ARTIs and substantially below the 49% national rate of assigning bacterial diagnoses in pediatric ARTI visits.[3] While the Hawthorne effect may explain some of the presumed overdiagnosis of bacterial illness,[15] we hypothesize 2 additional reasons this might have occurred: diagnostic uncertainty and perceived parental pressure to prescribe antibiotics. In cases where the provider is faced with diagnostic uncertainty, use of a contingency plan may allow for the child's illness to evolve and be more clearly classified as viral or bacterial over the ensuing 2 to 3 days. In cases where the provider perceives parental expectations for antibiotics, use of a combination of negative and positive treatment recommendations may allow the provider to gain acceptance from the parent for a non-antibiotic treatment plan.

One study has shown the use of contingency plans to be associated with increased visit satisfaction while simultaneously avoiding antibiotic prescribing for viral illness.[12] We did not find this to be the case in the current study. One key difference in research design, however, is that the earlier study took parent pre-visit expectations for antibiotics into account.[12] In that study, receiving a contingency plan was only predictive of higher satisfaction among parents who had a pre-visit expectation for antibiotics. We did not assess parent pre-visit expectations for antibiotics, thus our study sample likely included both parents who did and those who did not expect to receive antibiotics, decreasing the likelihood of finding a relationship between receiving a contingency plan and care ratings. The current study was also conducted in a different geographic location with a different population of providers and parents; higher and less variable care ratings also limited power to detect differences in this outcome.

The PCBI appears to have good sensitivity and reasonable specificity for determining when positive treatment recommendations and contingency plans occur, but it performs less well in identifying visits where negative treatment recommendations occur. We know from prior work with videotaped encounters that negative treatment recommendations are far less common than positive ones,[8] so this may make them harder for parents to recall, especially if they occur in combination with a positive recommendation. For both positive treatment recommendations and contingency plans, specificity was lower than sensitivity, with parents tending to report these communication practices as having occurred when they were not observed on videotape. However, prior research related to positive treatment recommendations and parent visit satisfaction suggests that parent *perceptions* of communication may be more important than actual observed communication practices in terms of predicting positive reports of visit experience.[33]

This study has several limitations. First, the participating providers were from 1 geographic location and were relatively homogeneous in terms of their low prescribing rates for viral ARTIs (5% among study providers compared to 32% nationally).[3] Second, the parent population included primarily non-Hispanic whites with high social and economic status, limiting generalizability. Third, we were unable to objectively verify viral and bacterial diagnoses, which may have led to underestimation of antibiotic prescribing for viral illness. Fourth, due to the observational nature of the study, we have not established a causal link between use of these communication practices and final antibiotic prescribing decisions or care ratings. Fifth, this study was conducted between 2007 and 2009, and prescribing patterns for pediatric ARTI may have changed since then. However, antibiotic prescribing trends over the decade spanning 2001 to 2010 would suggest that this is unlikely.[3]

Conclusions

Despite these limitations, this study confirms the importance of how treatment recommendations are delivered during visits for viral ARTIs in terms of avoiding unwarranted antibiotic prescribing. It should inform the development of communication-based interventions focused on reducing antibiotic prescribing for viral ARTIs while maintaining positive care experiences for parents.

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