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Fidelity Evaluation of the Dialogue Around Respiratory Illness Treatment (DART) Program Communication Training

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Author Contributions

Dr. Mangione-Smith conceptualized and designed the study, obtained funding, assisted with study execution, analyzed and interpreted the data, drafted the initial manuscript, and provided study supervision.

Dr. Zhou assisted with study design, performed statistical analysis of the data, and drafted the initial manuscript.

Drs. Heritage, Robinson, and Stout contributed to development of the DART intervention communication content, assisted with study design and execution, interpreted the data, and critically revised the manuscript.

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Mr. Burges, Mr. Hedrick, and Ms. Warren contributed to development of the DART intervention communication content and implementation of the program in the participating practices, critically revised the manuscript and provided administrative, technical, and material support.

Drs. Shone, Wright and Ms. Steffes assisted with study design and execution, data acquisition for the PROS practices, critically revised the manuscript, and provided administrative, technical, and material support.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Abstract

Objective.—To evaluate communication training content fidelity included in a multifaceted intervention known to reduce antibiotic over-prescribing for pediatric acute respiratory illnesses (ARTIs), by examining the degree to which clinicians implemented the intended communication behavior changes.

Methods.—Parents were surveyed regarding clinician communication behaviors immediately after attending 1,026 visits by children 6 months to < 11 years old diagnosed with ARTIs by 53 clinicians in 18 pediatric practices. Communication outcomes analyzed were whether clinicians: (A) provided *both* a combined (positive + negative) treatment recommendation *and* a contingency plan (full implementation); (B) provided *either* a combined treatment recommendation *or* a contingency plan (partial implementation); or (C) provided *neither* (no implementation). We used mixed effects multinomial logistic regression to determine whether these 3 communication outcomes changed between baseline and the time periods following each of 3 training modules.

Results.—After completing the communication training, the adjusted probability of clinicians fully implementing the intended communication behavior changes increased by an absolute 8.1% compared to baseline (95% Confidence Interval [CI]: 2.4%, 13.8%, p=0.005).

Conclusions.—Our findings support the fidelity of the intervention's communication training content.

Practical Implications.—Clinicians can be trained to implement communication behaviors that may aid in reducing antibiotic over-prescribing for ARTIs.

1. Introduction

Several randomized clinical trials have demonstrated intervention effectiveness for reducing antibiotic prescribing for acute respiratory tract infections (ARTIs) [1–8]. Successful interventions have been multifaceted and sustained improvement more likely when interventions included clinician communication training [3, 8, 9]. According to the Medical Research Council [10], multifaceted complex interventions should include analyses of intervention fidelity [11–13]. A key aspect of intervention fidelity is 'receipt,' or the degree to which those receiving the intervention have understood it and display the behavior change intended [11].

This study evaluates the receipt fidelity of the communication training included in the Dialogue Around Respiratory Illness Treatment (DART) program [14]. The DART program intervention trial decreased overall and inappropriate antibiotic prescribing for ARTIs by 7% and 40%, respectively [15]. While the DART program is multifaceted, it is unique in that its central intervention component focuses on two specific evidence-based communication behaviors that are discussed and modeled in different formats (i.e., online tutorials, webinars, and booster video vignettes).

The first communication behavior involves delivering a combined, two-part treatment recommendation that includes a *negative recommendation*, i.e., ruling out the need for antibiotics (e.g., "What we have here is a really bad cold, so nothing an antibiotic will help."), and a *positive recommendation*, i.e., suggesting actions that parents can take to reduce their child's symptoms (e.g., "Giving her an extra pillow at night can help with draining the congestion"). Providing both negative and positive treatment recommendations (versus one or none) is associated with decreased inappropriate antibiotic prescribing [16].

The second communication behavior involves ending visits with a contingency plan for what parents can do if their child gets worse or shows no improvement over the following 2–3 days (e.g., "Definitely call me if she starts having high fevers. I don't expect that to happen, but that's what you should watch for."). Providing two-part, negative and positive treatment recommendations and contingency plans is positively associated with parents' increased visit-satisfaction [16, 17].

Our main objective for this study was to evaluate the receipt fidelity of DART's communication program content by examining whether or not clinicians changed their communication behaviors as intended.

2. Methods

This study was approved by the participating organizations' institutional review boards (IRBs) and the Western IRB (See study protocol at ClinicalTrials.gov; Identifier: NCT02943551).

The DART intervention trial [15] was a cluster-randomized, stepped-wedge, clinical trial that allowed enrolled clinicians (i.e., pediatricians and pediatric nurse practitioners) to receive the intervention through staggered implementation across 19 United States primary care pediatric practices. Between 9/1/2016 and 1/30/2017, clinicians were recruited from the American Academy of Pediatrics Pediatric Research in Office Settings network [18] (n=11 practices from 9 states) and the NorthShore University Health System (n=8 practices in the Chicago, IL area). Practices were the unit of randomization and were allocated by random permutation to 4 wedges. Written informed consent was obtained from clinicians (n=57) prior to practice randomization. Enrolled clinicians received intervention modules according to their practice-assigned wedge (Figure 1).

The DART program communication content is evidence-based [16, 17, 19–21] with the training focused on two communication behaviors derived from formative research using Conversation Analysis [22] (1) the delivery of a treatment recommendation involving both negative and positive components (see introduction), and (2) a contingency plan. The training includes a 25-minute online tutorial, a 40-minute webinar, and three booster video-vignette sessions (recapping communication best practices followed by questions testing clinicians' understanding) delivered in 3 modules over an 11-month period (Figure 1).

In participating practices, between 12/1/2016 and 4/30/18, survey data were collected anonymously from eligible parents of children presenting for ARTI visits during four time periods: a baseline (pre-intervention) period and three post-intervention periods occurring after clinicians completed each DART program module. Parents were eligible if their child was seen by an enrolled clinician, was 6 months to < 11 years old, had not received antibiotics in the previous two weeks, and was diagnosed during the visit with > 1 of 5 targeted ARTIs: acute otitis media, bronchitis, pharyngitis, sinusitis, or upper respiratory infection. Eligible parents completed surveys on tablet computers immediately after their child's visit. Survey questions assessed parent/child demographics and clinician communication behaviors using the Provider Communication Behavior Inventory (PCBI; Table 1) [16].

During the study, 1,288 eligible surveys were obtained from 18 of the 19 participating practices (range: 8–178). Four (7%) of the 57 enrolled clinicians had no eligible surveys. The 90th percentile for number of surveys obtained per clinician was 39. To avoid having a small number of clinicians overrepresented in the data, for clinicians with ≥ 39 surveys (5/53, 9%), we randomly selected 39 surveys for analysis. This yielded 1,026 surveys for analysis (80% of those collected, Figure 2).

The main study outcome was the frequency with which clinicians gave a two-part treatment recommendation *and/or* a contingency plan during the treatment phase of ARTI visits as captured from parent post-visit surveys (Table1). From survey data, we constructed three, mutually exclusive communication-outcome categories: (A) clinician provided both a combined (positive + negative) treatment recommendation *and* a contingency plan (full implementation of communication behavior changes); (B) clinician provided *either* a combined treatment recommendation *or* a contingency plan (partial implementation); or (C) clinician provided *neither* a combined treatment recommendation *nor* a contingency plan (no implementation).

The primary intention-to-treat analysis included all study clinicians who had any surveys completed (53/57, 93%). Eligible surveyed visits were the unit of analysis. We conducted mixed effects multinomial logistic regression with robust standard errors to account for clustering within practices. We examined how each clinician's probability of using specific communication behaviors (outcome categories A, B, or C, above) varied from the baseline period (pre-intervention) to three post-intervention periods corresponding to when clinicians completed each of three intervention modules. For ease of interpretation, we report average marginal effects (AMEs) for all the predictors. An AME captures the average difference in the probability of using specific communication behaviors (outcome categories A, B, or C) when a predictor variable changes from the reference level to a different level, e.g., from the baseline period to the post-module 1 period[23, 24].

3. Results

Overall, 53 clinicians (47 pediatricians, 6 nurse practitioners) from 18 practices had eligible surveys during at least one of the four study time-periods and were included in the analysis. A total of 1,026 eligible ARTI visits were included in analyses (Figure 2). Across the study time-periods, demographic characteristics of the sampled children and their parents were similar except for annual household income (Table 2).

Intention-to-treat analyses indicated that, after completion of intervention module 3, the adjusted probability of using communication-outcome category ‘A’ (full implementation) increased by an absolute 8.1% compared to baseline (95% Confidence Interval [CI]: 2.4%, 13.8%, p=0.005; Table 3 and supplementary Figure 3), while the probability of using communication-outcome category ‘C’ (complete failure to implement) decreased by 9.9% (95% CI: −16.1%, −3.6%, p=.002). There was no change in the probability of using communication-outcome category ‘B’ (partial implementation). Using all eligible surveys in analyses did not change the reported results (not shown).

4. Discussion and Conclusions

4.1 Discussion

Previously, we demonstrated that the DART program significantly reduced both overall and inappropriate outpatient antibiotic prescribing for ARTIs experienced by children 6 months to < 11 years old [15]. While the DART program was multifaceted, it centrally involved an effort to change clinician communication behaviors. Specifically, we trained clinicians to deliver a two-part, negative plus positive treatment recommendation and to offer a contingency plan. Current findings support the receipt fidelity of the DART program’s communication content, with parent surveys recording that clinicians significantly increased their use of both behaviors during visits, and significantly decreased their use of none of these behaviors during visits. Clinicians’ use of one of the two behaviors increased marginally, but not significantly.

This study has several limitations. First, we were unable to audio/videotape visits and depended on parent reports of clinician communication behaviors. However, bias in over or under-reporting would be expected to occur non-differentially across the baseline and post-intervention periods. Second, parent reports of communication behaviors were only collected for a sub-sample of the ARTI visits included in the main DART intervention trial [15], and data on prescribing for the sampled visits could not be linked to parent reported communication behaviors due to the anonymity of the surveys. Thus, although observation of the DART communication behaviors increased, the sampled visits in this study may not have corresponded to visits where antibiotics were not prescribed. This sub-sample was also a convenience sample and may be biased and not representative of the entire study population.

4.2 Conclusion

Despite these limitations, our findings support the receipt fidelity of the DART program's communication training content. Such content involved the ordered placement of specific wording during visits, as recommended by conversation analysis [22].

4.3 Practice Implications

Clinicians can be trained to implement and increase the frequency of two specific communication behaviors that, in past observational studies, were associated with decreased inappropriate antibiotic prescribing for ARTIs and increased visit satisfaction.[16, 17] Broad implementation of the DART program may support ongoing pediatric outpatient antibiotic stewardship.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data Sharing Statement:

Deidentified data limited to anonymous survey data will be shared. No protected health information for study participants will be shared. Data will be provided as a CSV file with a data dictionary defining all variables included in the file and will be transferred using a secure file transfer protocol. Additional tools will not be made available. The data will be made available upon publication of the primary studies to researchers who provide a detailed methodologically sound proposal and data use agreement. Proposals should be submitted to Dr. Mangione-Smith (Rita.M.Mangione-Smith@kp.org).

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Highlights

- Pediatric antibiotic over-prescribing for acute respiratory illnesses is common
- Clinician communication is associated with inappropriate antibiotic prescribing
- Communication training can successfully change clinician communication behaviors

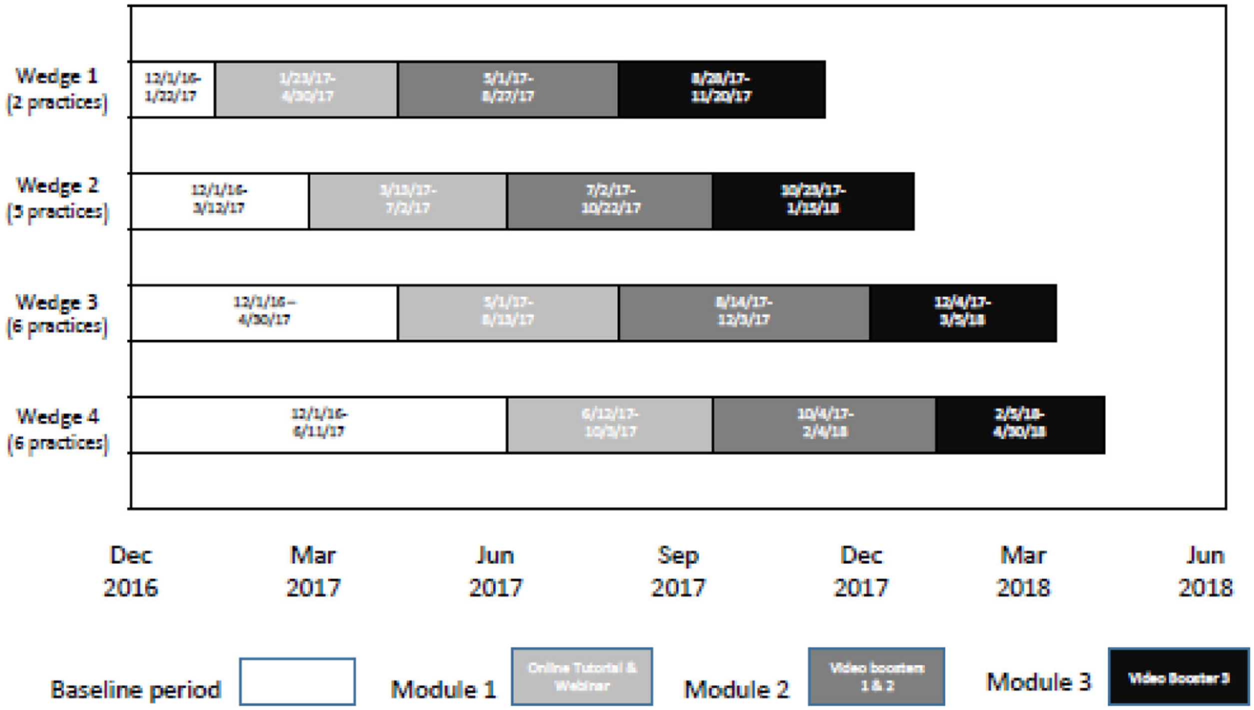

Figure 1.
Study intervention and timing

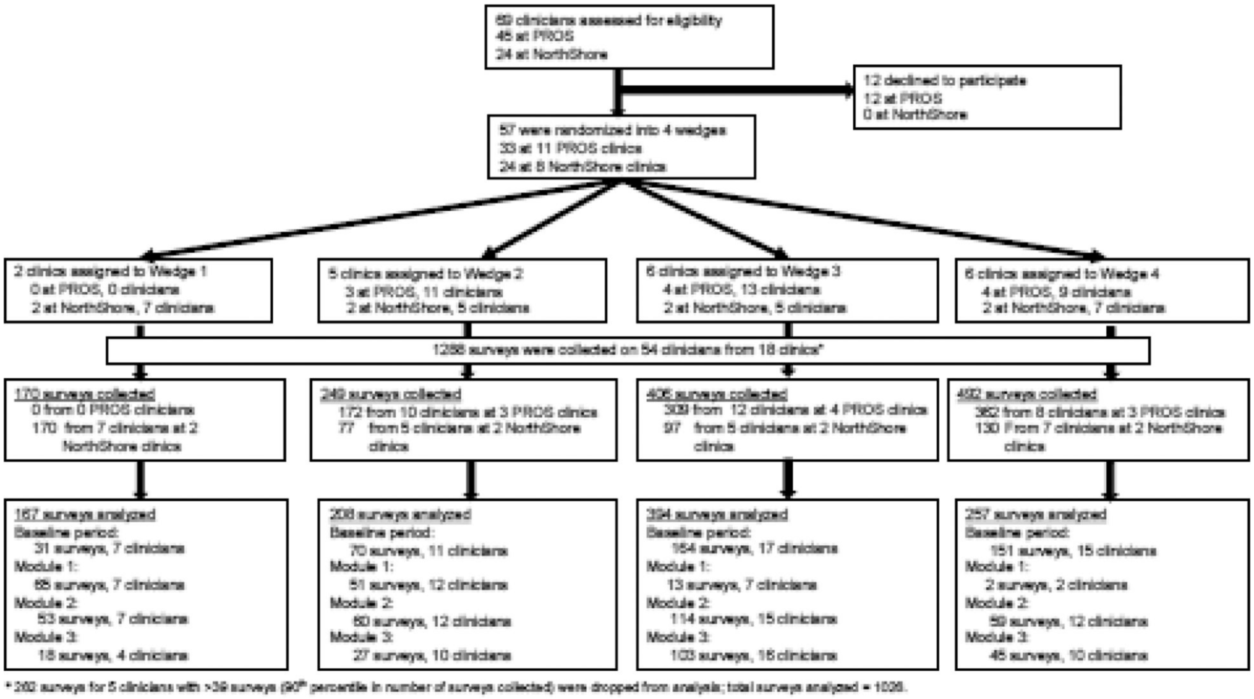

Figure 2.
Study flow diagram

Table 1.

PCBI* survey items assessing parent reports of clinician communication behaviors used during acute respiratory tract infection visits

Clinician Communication Behavior	PCBI Survey Items Used to Assess Occurrence of Communication Behaviors
Negative Treatment Recommendation	Did the doctor tell you antibiotics will NOT help your child get better? • Yes • No • Not sure
Positive Treatment Recommendation	Did the doctor tell you things you can do to make your child feel better, for example, giving Tylenol for fevers or running a humidifier in your child's bedroom at night? • Yes • No • Not sure
Contingency Plan: Visit-Based	Did the doctor ask you to come back if your child isn't doing better in the next day or two? • Yes • No • Not sure **If you answered Yes:** Did the doctor tell you what to watch for so that you would know when to bring your child back in to be rechecked? For example, telling you to come back if your child has high fevers, or a cough that is lasting too many days? • Yes • No • Not sure
Contingency Plan: Telephone-Based	Did the doctor ask you to call on the phone if your child isn't doing better in the next day or two? • Yes • No • Not sure **If you answered Yes:** Did the doctor tell you what to watch for so that you would know when to call about your child to get more help? For example, telling you to call if your child has high fevers, or a cough that is lasting too many days? • Yes • No • Not sure

*PCBI = Provider Communication Behavior Inventory

Table 2.

Sample demographics and parent reports of clinician communication behavior outcomes during pediatric visits for acute respiratory tract infections (ARTI), by study time period

Demographics	Baseline	Module 1[c]	Module 2[c]	Module 3[c]	P-value[b]
Number of children/parents	416	131	286	193	
Child Age	N(%)[a]	N(%)	N(%)	N(%)	
6–12 months	53 (12.7)	14 (10.7)	41 (14.3)	22 (11.4)	0.64
13–23 months	58 (13.9)	17 (13.0)	39 (13.6)	24 (12.4)	
2–5 years	172 (41.3)	58 (44.3)	135 (47.2)	93 (48.2)	
6–10 years	133 (32.0)	42 (32.1)	71 (24.8)	54 (28.0)	
Child Sex					
Male	211 (50.7)	74 (56.5)	139 (48.6)	82 (42.5)	0.08
Child Health Status					
Excellent	180 (43.3)	58 (44.3)	116 (40.6)	80 (41.5)	0.24
Very good	150 (36.1)	46 (35.1)	107 (37.4)	56 (29.0)	
Good	46 (11.1)	17 (13.0)	31 (10.8)	20 (10.4)	
Fair/Poor	7 (1.7)	3 (2.3)	8 (2.7)	8 (4.1)	
Missing	33 (7.9)	7 (5.3)	24 (8.4)	29 (15.0)	
Parent Age					
<25 years	28 (6.7)	6 (4.6)	23 (8.0)	17 (8.8)	0.09
25–34 years	136 (32.7)	40 (30.5)	111 (38.8)	67 (34.7)	
35–44 years	201 (48.3)	72 (55.0)	103 (36.0)	85 (44.0)	
≥45 years	47 (11.3)	12 (9.2)	46 (16.1)	22 (11.4)	
Missing	4 (1.0)	1 (0.8)	3 (1.0)	2 (1.0)	
Parent Race					
White	316 (76.0)	104 (79.4)	221 (77.3)	149 (77.2)	0.64
Black / African American	21 (5.0)	9 (6.9)	13 (4.5)	6 (3.1)	
Asian	25 (6.0)	5 (3.8)	17 (5.9)	6 (3.1)	
American Indian or Alaska Native	1 (0.2)	0	4 (1.4)	3 (1.6)	
Native Hawaiian and Pacific Islander	1 (0.2)	0	1 (0.4)	0	
Mixed race[d]	46 (11.1)	12 (9.2)	25 (8.7)	25 (13.0)	
Missing	6 (1.4)	1 (0.8)	5 (1.8)	4 (2.1)	
Parent Hispanic Ethnicity	78 (18.8)	25 (19.1)	51 (17.8)	51 (26.4)	0.28
Parent Education					
High School or Less	82 (19.7)	30 (22.9)	70 (24.5)	59 (30.6)	0.05
Some College or Bachelor’s Degree	191 (45.9)	55 (42.0)	121 (42.3)	87 (45.1)	
> Bachelor’s Degree	139 (33.4)	45 (34.4)	91 (31.8)	42 (21.8)	
Missing	4 (1.0)	1 (0.8)	4 (1.4)	5 (2.6)	
Household Annual Income					

Demographics	Baseline	Module 1[c]	Module 2[c]	Module 3[c]	P-value[b]
< $30,000	56 (13.5)	7 (5.3)	50 (17.5)	39 (20.2)	<.01
$30,000 – $60,000	61 (14.7)	17 (13.0)	40 (14.0)	24 (12.4)	
> $60,000	216 (51.9)	87 (66.4)	133 (46.5)	77 (39.9)	
Missing	83 (20.0)	20 (15.2)	66 (22.0)	53 (27.4)	
Communication Behavior Outcomes[e] (Unadjusted)					
Category A	64 (15.4)	24 (18.5)	58 (20.3)	48 (25.0)	0.04
Category B	220 (52.9)	66 (50.8)	147 (51.4)	105 (54.7)	
Category C	132 (31.7)	40 (30.8)	81 (28.3)	39 (20.3)	
Missing	0 (0.0)	1 (0.8)	0 (0.0)	1 (0.5)	

[a]N(%): Number (percent); Different populations of parents/children are represented for each cross-sectional time-period

[b]P-value represents differences across the 4 time periods listed.

[c]Module 1 content: Two 25-minute online tutorials about best practices for both clinician communication behaviors and antibiotic prescribing; live or recorded 40-minute webinars on those same topics; individualized feedback report presenting antibiotic prescribing rates during ARTI visits in the baseline control period.

Module 2 content: Two 5-minute online booster video vignettes recapping communication best practices followed by knowledge questions; a second antibiotic prescribing feedback report, presenting prescribing rates during module 1.

Module 3 content: One 5-minute communication booster video vignette followed by knowledge questions; a third and a fourth antibiotic prescribing feedback report, presenting prescribing rates during modules 2 and 3, respectively.

[d]Mixed: More than one race

[e]Outcome Category A = Clinician *used both* a negative-positive combined treatment recommendation *and* a contingency plan
Outcome Category B = Clinician *used either* a negative-positive combined treatment recommendation *or* a contingency plan, but not both
Outcome Category C = Clinician *used neither* preferred communication behavior

Table 3.

Adjusted difference in probability of parents reporting clinician use of preferred communication behaviors during pediatric visits for acute respiratory tract infections (ARTI)

	Communication Behavior Outcome Category A[a]		Communication Behavior Outcome Category B[a]		Communication Behavior Outcome Category C[a]	
Predictors	**Adjusted Difference (95% CI)[b]**	**P-value**	**Adjusted Difference (95% CI)**	**P-value**	**Adjusted Difference (95% CI)**	**P-value**
Study Period						
Baseline	Referent		Referent		Referent	
Post Module [c] 1	2.1 (−6.0, 10.1)	.61	−1.3 (−13.4, 10.9)	.84	−0.8 (−10.9, 9.3)	.87
Post Module 2	5.0 (−0.8, 10.7)	.09	−2.0 (−10.1, 6.2)	.64	−3.0 (−10.1, 4.1)	.41
Post Module 3	**8.1 (2.4, 13.8)**	**<.01**	1.8 (−6.2, 9.7)	.43	**−9.9 (−16.1, −3.6)**	**<.01**
Child Age						
6–12 Months	Referent		Referent		Referent	
13–23 Months	−8.2 (−20.9, 4.4)	.20	5.9 (−5.2, 16.9)	.30	2.4 (−8.4, 13.1)	.67
2–5 Years	**−11.4 (−21.8, −8.9)**	**.03**	4.7 (−5.9, 15.3)	.38	6.7 (−2.0, 15.3)	.13
6–10 Years	**−10.7 (−21.1, −0.3)**	**.04**	−0.8 (−14.8, 13.3)	.92	11.5 (−1.4, 24.4)	.08
Child Sex						
Female	Referent		Referent		Referent	
Male	−1.9 (−5.5, 1.7)	.30	**5.6 (0.3, 10.9)**	**.04**	−3.7 (−8.9, 1.5)	.16
Parent Age						
<25 Years	Referent		Referent		Referent	
25–34 Years	6.9 (−4.9, 18.7)	.25	−0.8 (−11.9, 10.4)	.89	−6.2 (−24.2, 11.8)	.50
35–44 Years	10.8 (−1.6, 23.1)	.08	−3.0 (−13.9, 7.9)	.59	−7.7 (−23.4, 7.9)	.33
45+ Years	10.0 (−3.3, 23.3)	.14	−4.7 (−16.9, 7.6)	.45	−5.31 (−25.3, 14.7)	.60
Parent Education						
<=High School	Referent		Referent		Referent	
<=Bachelor's degree	−4.3 (−8.9, 0.3)	.06	1.5 (−6.0, 9.0)	.70	2.9 (−4.8, 10.5)	.47
>Bachelor's degree	**−6.6 (−11.5, −1.7)**	**<.01**	**−7.1 (−13.2, −1.0)**	**.02**	**13.7 (7.3, 20.1)**	**<.01**
Parent Race						
White	Referent		Referent		Referent	
Black	−7.8 (−17.4, 1.8)	.11	**20.1 (11.5, 28.6)**	**<.01**	**−12.3 (−23.2, −1.4)**	**.03**
Asian	−2.9 (−17.2, 11.4)	.69	**18.7 (6.1, 31.3)**	**<.01**	**−15.8 (−26.7, −4.9)**	**<.01**
Mixed/Other	**−7.3 (−10.5, −4.0)**	**<.01**	**12.4 (3.3, 21.4)**	**<.01**	−5.1 (−15.2, 5.0)	.32
Parent Ethnicity						
Non-Hispanic	Referent		Referent		Referent	
Hispanic	4.3 (−6.8, 15.5)	.44	2.4 (−5.5, 10.3)	.54	−6.8 (−14.8, 1.3)	.10

[a]Outcome Category A = Clinician *used both* a negative-positive combined treatment recommendation *and* a contingency plan

Outcome Category B = Clinician *used either* a negative-positive combined treatment recommendation *or* a contingency plan, but not both

Outcome Category C = Clinician *used neither* preferred communication behavior

[b]Adjusted difference is the absolute change in the percent of visits where parents reported the specified communication behaviors were used by clinicians comparing each predictor to its respective referent; 95% CI = 95%

Confidence Interval

[c]Module 1 content: Two 25-minute online tutorials about best practices for both clinician communication practices and antibiotic prescribing; live or recorded 40-minute webinars on those same topics; individualized feedback report presenting antibiotic prescribing rates during ARTI visits in the baseline control period.

Module 2 content: Two 5-minute online booster video vignettes recapping communication best practices followed by knowledge questions; a second antibiotic prescribing feedback report, presenting prescribing rates during module 1.

Module 3 content: One 5-minute communication booster video vignette followed by knowledge questions; a third and a fourth antibiotic prescribing feedback report, presenting prescribing rates during modules 2 and 3, respectively.