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Associations between parents' satisfaction with provider communication and HPV vaccination behaviors

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Abstract

Background—Despite increasing awareness of the importance of a provider recommendation for HPV vaccine, the U.S. has yet to achieve the Healthy people 2020 goal of 80% series completion among adolescents. This failure indicates a need for further examination of the modifiable influences on parents' decision-making. Healthcare providers can influence parents' HPV vaccination decision-making, but little is known about parents' perspectives on the counseling they receive. We sought to assess U.S. parents' satisfaction with provider communication about HPV vaccine and associations with vaccination behaviors.

Methods—Parents of 11-to-17-year-old adolescents who discussed HPV vaccination with a healthcare provider at least once ($n=795$) completed our online survey in Fall 2016. We assessed their satisfaction with the discussion using the HPV Vaccine Communication Satisfaction Scale ($\alpha=0.94$). We examined associations between satisfaction (categorized as low, moderate, or high), and three vaccination behaviors: refusal/delay, series initiation (1 dose), and continuation (2 doses among initiators) using multivariable logistic regression.

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Results—Most parents reported high (36%) or moderate (38%) satisfaction with provider communication about HPV vaccination; fewer reported low (26%) satisfaction. Moderately satisfied parents (vs. low) had lower odds of refusal/delay (aOR=0.59, 95% CI:0.38–0.89), and higher odds of initiation (aOR=1.71, 95% CI:1.15–2.55) and continuation (aOR=2.05, 95% CI: 1.24–3.40). The associations were stronger for highly satisfied parents (refusal/delay aOR=0.45, 95% CI:0.29–0.70, initiation aOR=3.59, 95% CI:2.23–5.78, and continuation aOR=4.08, 95% CI: 2.38–7.01).

Conclusions—Our study suggests that parent satisfaction with provider communication may play an important role in HPV vaccination decision-making. Yet, communication satisfaction has been largely unexamined in the HPV-vaccine literature to date. We introduce a brief, 7-item HPV Vaccine Communication Scale that can be used to assess parents' level of satisfaction with their provider's communication specific to HPV vaccine. We identify communication areas for providers to prioritize when discussing HPV vaccine with parents.

Keywords

Adolescent health; HPV vaccination; cancer prevention; parents; patient education and counseling

1. Introduction

Although widespread use of HPV vaccine would prevent the majority of HPV-associated cancers in the United States (U.S.), coverage is lower than for other adolescent vaccines [1–3]. Parent behavior contributes to the suboptimal uptake: 36% of parents report declining HPV vaccination for their children [4], and healthcare providers regularly encounter hesitant parents in their clinical practices [5]. A high-quality provider recommendation that includes a strong endorsement for same-day vaccination and an emphasis on cancer prevention is associated with decreased parental refusal and increased series initiation and receipt of subsequent doses [6]. While healthcare professionals' increased awareness and emphasis on the importance of a provider recommendation for HPV vaccine is encouraging, the U.S. has yet to achieve the Healthy people 2020 goal of 80% coverage for series completion [1], indicating the need for further examination of the modifiable provider influences on parents' decision-making.

In contrast to the compelling literature on the influence of provider recommendations, there is little available evidence regarding the role that parents' satisfaction with provider counseling plays in their decision-making about HPV vaccination [7]. Interest in assessing parents' satisfaction with providers' communication has been spurred by recent research on directive or “presumptive” approaches to recommending vaccines; although presumptive recommendations are consistently associated with vaccine acceptance, early research with parents of young children suggested that the approach might negatively impact patient experience [8]. A comprehensive measure of parents' satisfaction could facilitate research and intervention development aimed at reducing hesitancy and increasing uptake. To address this need, we used data from a national sample of parents of adolescents to develop the HPV Vaccine Communication Satisfaction Scale. We then sought to estimate associations between parents' communication satisfaction and three HPV vaccination behaviors: refusal/

delay during the initial discussion, series initiation (1 dose), and continuation (2 doses among initiators).

2. Methods

2.1. Participants and Procedures

In September 2016, we conducted an online, cross-sectional survey of parents of adolescents. Respondents were members of KnowledgePanel, a nationally representative panel of U.S. adults maintained by the survey research company GfK [9]. GfK constructs the panel using an address-based sampling (ABS) frame supplemented with follow-up phone calls to nonresponsive households; this probability-based sampling methodology is designed to more effectively recruit difficult-to-reach individuals, such as young adults and those in low-response areas, as compared to random digit dialing alone [10]. GfK provides internet service and a web-enabled device to households that lack these resources to ensure that participation is accessible to lower-income adults. Panelists with established internet access instead receive points toward small cash payments. These incentives are provided for ongoing participation in the panel across multiple surveys.

We invited panel members who were parents of an 11- to 17-year-old child living primarily in their households to participate in the survey. Of the 2580 invited parents, 1253 confirmed having an age-eligible child, gave informed consent, and completed the survey. The American Association for Public Opinion Research (AAPOR) formula 4 response rate was 59% [11]. We asked parents with more than one age-eligible child to complete the survey for the child with the most recent birthday. For the present study, we focus on the subset of 795 parents who reported having discussed HPV vaccination with their child's healthcare provider at least once. Harvard Pilgrim Health Care Institute's Institutional Review Board approved the study protocol.

2.2. Measures

2.2.1. Initial refusal/delay—We assessed parents' self-reported refusal/delay of HPV vaccination for their child during their initial conversation with their child's healthcare provider with one item: "What did you decide to do about getting the HPV vaccine for [child's name]?" We dichotomized responses to reflect initial refusal/delay ("To get it at a later visit," "Not to ever get it," or "To make a decision later") vs. initial acceptance ("To get it at that visit").

2.2.2. HPV vaccination status—We assessed HPV vaccination status with the following item: "How many shots of the HPV vaccine has [child's name] had [12]?" We categorized the responses, defining HPV vaccine series initiation as 1 dose and series continuation as 2 doses among those who initiated. Parents who initially refused/delayed were included in these measures as they may have gone on to get HPV vaccine for their adolescent at a subsequent visit.

2.2.3. Communication satisfaction—We assessed parents' satisfaction with the provider's counseling during the initial conversation through 7 statements. Parents reported

their agreement on a scale of 1 (strongly disagree) to 5 (strongly agree) that the provider: (a) gave a clear message about getting HPV vaccine, (b) spent the right amount of time discussing HPV vaccine, (c) used easy to understand language, (d) addressed concerns, (e) gave the chance to ask questions, (f) discussed scheduling all shots, and their (g) overall satisfaction with the communication. We adapted the items from existing measures of general patient satisfaction with provider communication [13–16], as well as qualitative studies of parent preferences for provider communication specific to HPV vaccination [17–18]. We created the HPV Vaccine Communication Satisfaction Scale by averaging the responses and categorizing the composite scores into low (mean score of 1–3.9), moderate (4–4.9), and high (5) satisfaction based on similar cut-points for general patient satisfaction scales [13–16].

2.2.4. Provider recommendation quality—We asked whether the provider recommended HPV vaccination during the first discussion (yes/no). For parents who reported receiving a recommendation, we used a validated index to assess if the provider included up to 3 quality indicators in the recommendation: (a) said HPV vaccination was important, (b) said the vaccine prevents cancer, and (c) recommended same-day vaccination [7,19]. We summed the number of indicators that were included in the recommendation to create a three-level measure of recommendation quality: no recommendation, low-quality recommendation (0–1 indicators), or high-quality recommendation (2–3 indicators).

2.2.5. Vaccination confidence—We assessed parents' confidence in adolescent vaccination in general (not specific to HPV vaccination) with four items adapted from the Vaccination Confidence Scale, a validated measure of parents' vaccination beliefs ($\alpha=0.87$) [20, 21]. Parents reported their agreement on a scale of 1 (strongly disagree) to 5 (strongly agree) with statements about vaccination (a) effectiveness, (b) safety, (c) importance, and (d) the likelihood of their child getting a vaccine-preventable disease if unvaccinated. We averaged responses to the four items and categorized vaccination confidence scores below the median as low (1–4.4), and at or above the median as high (4.5–5).

2.2.6. Parent-provider relationship quality—Our survey assessed parents' perceptions of the quality of their relationship with their child's healthcare provider using a validated index of four items ($\alpha=0.78$) adapted from Saha et al [22]. Parents reported their agreement on a scale of 1 (strongly disagree) to 5 (strongly agree) with statements about (a) their overall satisfaction with the quality of their child's health care, (b) the extent to which the provider gives them the information they need, (c) the extent to which the provider spends adequate time with them, and (d) their overall trust in the provider. We averaged the responses to the four items and categorized relationship quality scores below the median as low (1–4.2) and at or above the median as high (4.3–5).

2.2.7. Demographics—Parents reported their child's sex and age (years). In addition, they reported their child's age at the initial conversation about HPV vaccine. We subtracted the child's age at the first conversation from the child's age at the time of the survey to determine the time in years since the first conversation. The survey company provided

information on parents' sex, race/ethnicity, marital status, and educational attainment, as well as annual household income and geographic region [9, 23].

2.3. Statistical Analysis

To assess internal consistency of the standardized 7 items in the HPV Vaccine Communication Satisfaction Scale, we estimated Cronbach's alpha and the inter-item correlation. We conducted a principal factor analysis with oblique rotation to allow for correlation between factors to determine scale dimensionality. We fit and examined factor loadings for one-, two-, and three-factor models. To select the number of factors to retain, we assessed for factors with eigenvalues > 1 , and changes in the curve of the scree plot. We also examined each item individually to determine if it loaded meaningfully on at least one factor, and discarded items with loadings of < 0.30 on all factors [24]. We compared squared means (transformed to improve normality) of communication satisfaction scores across demographic subgroups using *t*-tests (untransformed means reported in text). To determine if parents' communication satisfaction differed by time since the initial conversation, we compared scores between parents who discussed HPV vaccine with their doctor 0–1 years prior versus 2 or more years.

We built separate multivariable logistic regression models to assess the associations between parents' level of satisfaction with provider communication and each of the three HPV vaccination behaviors: initial refusal/delay, series initiation, and series continuation (among initiators only). Based on their bivariate associations with the outcomes ($p < 0.10$), we adjusted all three models for provider recommendation quality, parents' vaccination confidence, parent-provider relationship quality, child age, time (years) from the first conversation, parent race/ethnicity, and parent educational attainment. Finally, in exploratory analyses to determine the relative contributions of different aspects of provider communication on vaccination behavior, we used Pearson chi-square analyses to identify associations between individual items in the HPV Vaccine Communication Satisfaction Scale with each of the three HPV vaccination behaviors. We conducted all analyses using Stata 14.2 (College Station, TX). Statistical tests were two-tailed with a critical alpha of 0.05 unless otherwise noted.

3. Results

3.1. Sample Characteristics and Vaccination Behavior

About one-fifth of the 795 parents in our sample were Hispanic (19%; Table 1) and one-tenth were non-Hispanic black (9%). Over one-third (39%) had a high school degree or less education. Respondents reported from all regions of the U.S. The average age of the child was 14.2 years, and the initial discussion about HPV vaccine had occurred on average 2.1 years prior to the survey.

During their initial discussions with their child's provider, over half (62%) of parents indicated they had initially refused/delayed HPV vaccination. However, at the time of the survey, over two-thirds (69%, $n=550$) reported having initiated the HPV vaccine series for their children (including 50% ($n=249$) of the 494 parents who initially refused/delayed).

Among these initiators, 61% ($n=334$) reported their child had received two or more doses of HPV vaccine (series continuation).

3.2. HPV Vaccine Communication Satisfaction Scale

3.2.1. Scale development—The HPV Vaccine Communication Satisfaction Scale demonstrated high internal consistency with Cronbach's $\alpha=0.94$ and average inter-item correlation of 0.71. Visual examination of the scree plot and assessment of the eigenvalues in the exploratory factor analysis solution indicated a one-dimension scale accounting for 99% of the total variance. Each item had a factor loading on the one-factor solution of 0.80 (Table 2).

Similar proportions of parents had moderate (38%) and high (36%) satisfaction with the provider's communication about HPV vaccine. The overall mean score on the scale was high (4.3, SD 0.8). Mean scores were slightly lower among Hispanic parents compared to non-Hispanic whites (4.2 (SD 0.9) vs. 4.3 (SD 0.8), $p=0.03$). Mean scores did not differ significantly across other demographic subgroups or by the amount of time since the first discussion (all $p>0.05$). Mean scores were also not significantly different between the 41% of parents who had the initial conversation with their provider about HPV vaccine within the last 0–1 years and the 59% of parents who had the conversation 2 or more years prior (4.4 (SD 0.8) vs 4.3 (SD 0.8)).

3.2.2. Associations with vaccination behaviors—In multivariable analyses, parents with moderate (vs. low) communication satisfaction had lower odds of initial refusal/delay (aOR=0.59, 95% CI 0.38–0.89; Table 3), and higher odds of series initiation (aOR=1.71, 95% CI 1.15–2.55) and continuation among initiators (aOR=2.05, 95% CI 1.24–3.40). Parents who had high (vs. low) communication satisfaction also had lower odds of initial refusal/delay (aOR=0.45, 95% CI 0.29–0.70), and higher odds of series initiation (aOR=3.59, 95% CI 2.23–5.78) and continuation among initiators (aOR=4.08, 95% CI 2.38–7.01).

3.3. Individual Scale Items

Among the individual scale items, over half of parents strongly agreed that their provider used language that was easy to understand (67%; Table 4), gave them the opportunity to ask questions (65%), and told them about scheduling all three shots (58%). Relatively fewer parents strongly agreed that their provider gave a clear message about whether it was a good idea to get HPV vaccine (50%), did a good job of addressing their concerns (49%), or spent the right amount of time for the discussion (47%).

In exploratory analyses, strongly agreeing (vs. disagreeing or neither agreeing/disagreeing) with individual scale items was associated with a lower prevalence of initial refusal/delay and a higher prevalence series initiation and continuation (Table 3). For example, there was a lower prevalence of initial refusal/delay among parents who strongly agreed that the provider addressed their concerns (vs. disagreed/neither; 55% vs. 73%, $p<.001$). Series initiation and continuation were both higher among those who strongly agreed that the

provider addressed their concerns (initiation: 80% vs. 57%, $p < .001$; continuation among initiators: 68% vs. 45%, $p < .001$).

4. Discussion and Conclusion

4.1. Discussion

Findings from this national sample of parents suggest that their satisfaction with healthcare providers' communication about HPV vaccine may influence their vaccination behavior. While prior research has not shown an association between parents' satisfaction with overall provider communication and HPV vaccination behavior [16], our study is the first to examine parents' satisfaction across multiple items specific to communication about HPV vaccination. The 7-item HPV Vaccine Communication Satisfaction Scale can be used in future research to assess parents' level of satisfaction with provider counseling about HPV vaccine. The unidimensional scale demonstrated high internal consistency and did not vary meaningfully across demographic subgroups, indicating that it can be used in diverse populations. Parents who reported high (vs. low) satisfaction had approximately half the odds of initial refusal/delay of HPV vaccination for their children, three times higher odds of series initiation, and four times higher odds of series continuation among initiators. Our findings contribute to the literature on provider HPV vaccine recommendations by suggesting parents' satisfaction with provider communication may play an additional role in their decision to vaccinate.

In addition to the overall scale, we observed associations between each of the individual scale items and parents' vaccination behaviors. Increasing levels of agreement with items such as clarity of message, addressing concerns, and discussing scheduling of future shots, were each associated with decreasing prevalence of initial refusal/delay, and increasing prevalence of series initiation and continuation. Our findings support and expand upon results from previous studies regarding certain aspects of parents' satisfaction with provider communication. For example, parents who accepted (vs. did not accept) HPV vaccination for their adolescent daughters in the 2010 NIS-Teen were more likely to report that their provider spent enough time discussing HPV vaccine with them [25]. Furthermore, the qualitative literature suggests that parents have decreased satisfaction with their provider's communication when they are given limited opportunities to ask questions or do not receive a clear recommendation, and that these factors may present as barriers to HPV vaccination acceptance [26–28]. Our study supports these previous findings, while adding further evidence of the impact of multiple aspects of parents' satisfaction with their provider's communication about HPV vaccine on vaccination behavior.

4.2. Practice Implications

The HPV Vaccine Communication Satisfaction Scale highlights actionable areas for improving conversations with parents. For example, given that the majority of respondents in our survey stated they received a provider recommendation for HPV vaccine, our finding that only half felt the provider was clear about whether getting HPV vaccine was a good idea for their child suggests that some providers may be giving ambiguous recommendations. This finding is consistent with previous research, in which parents report receiving an

equivocal provider recommendation for HPV vaccination, and many pediatric and family care providers report that they do not strongly recommend HPV vaccine [18, 26, 28, 29]. The need for provider training in giving an unambiguous recommendation and allowing adequate time for questions may be areas for quality improvement for clinics seeking to increase their HPV vaccination coverage.

4.3. Study Strengths and Limitations

Our study's strengths include a large, national sample of parents of adolescents who discussed HPV vaccination with their child's healthcare provider. The survey panel from which our sample was drawn is similar in demographic composition to the U.S. population. A limitation is the cross-sectional study design, which limits our ability to infer directionality or length of time between communication and vaccination behaviors. It is possible that parents who vaccinated (vs. did not) differentially remember their satisfaction with the provider's communication about HPV vaccine. This differential recall may result in under- or over-estimation of the effect estimates. A second potential limitation is our study's reliance on parental report of vaccination behavior. Parental report has been observed to be comparable to provider report for HPV vaccination status in prior studies, although it may be less accurate for series completion, as well as for male guardians and those with public insurance [30, 31].

Finally, the impact of the provider's recommendation style on parent satisfaction with communication is an area for future research. Both observational and intervention studies have found increased vaccination uptake among parents whose providers used a bundled, "announcement" style approach to recommend HPV vaccination, as compared to a conversational or participatory approach [8, 29, 32]. However, there is conflicting evidence regarding parents' satisfaction with their visit experience when they receive announcement (vs. participatory) style recommendations for vaccines [8, 33]. A previous qualitative study of HPV vaccine hesitant parents found that while most reported receiving a strong provider recommendation, those who went on to vaccinate (vs. those who did not) were more likely to report having a conversation in which the provider gave reassuring and convincing information in response to their concerns [34]. A recent intervention study demonstrated improved HPV vaccination delivery among the clinicians who received presumptive/announcement recommendation in combination with motivational interviewing training and customized HPV fact sheets [35]. We speculate that a combination of an announcement-style recommendation, with training in recommendation quality and aspects of provider communication associated with higher parental satisfaction, may reduce hesitancy and maximize HPV vaccine series initiation and follow through. Further research on parents' satisfaction with a recommendation style and the influence of that satisfaction on HPV vaccination behaviors is needed.

4.4. Conclusions

While a healthcare provider recommendation is instrumental in motivating acceptance of HPV vaccination, findings from our national survey of parents of adolescents suggest that their satisfaction with provider counseling also plays an important role in their decision-making. The 7-item HPV Vaccine Communication Satisfaction Scale can be used in future

studies seeking to assess parent perceptions of provider counseling. The items in the scale point to areas providers can focus on to improve their communication and potentially increase HPV vaccine series initiation and continuation.

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References

1. Reagan-Steiner S, Yankey D, Jeyarajah J, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years - United States, 2015. *MMWR Morb Mortal Wkly Rep*. 2016; 65(33):850–858. [PubMed: 27561081]
2. Saraiya M, Unger ER, Thompson TD, et al. US Assessment of HPV Types in Cancers: Implications for Current and 9-Valent HPV Vaccines. *J Natl Cancer Inst*. 2015; 107(6):12.
3. Van Damme P, Olsson SE, Block S, et al. Immunogenicity and Safety of a 9-Valent HPV Vaccine. *Pediatrics*. 2015; 136(1):e28–e39. [PubMed: 26101366]
4. Gilkey MB, Calo WA, Marciniak MW, et al. Parents who refuse or delay HPV vaccine: Differences in vaccination behavior, beliefs, and clinical communication preferences. *Hum Vaccin Immunother*. 2017; 13(3):680–686. [PubMed: 27763818]
5. McRee AL, Gilkey MB, Dempsey AF. HPV vaccine hesitancy: findings from a statewide survey of health care providers. *J Pediatr Health Care*. 2014; 28(6):541–549. [PubMed: 25017939]
6. Gilkey MB, Calo WA, Moss JL, et al. Provider communication and HPV vaccination: The impact of recommendation quality. *Vaccine*. 2016; 34(9):1187–1192. [PubMed: 26812078]
7. Gilkey MB, McRee AL. Provider communication about HPV vaccination: A systematic review. *Hum Vaccin Immunother*. 2016; 12(6):1454–1468. [PubMed: 26838681]
8. Opel DJ, Mangione-Smith R, Robinson JD, et al. The influence of provider communication behaviors on parental vaccine acceptance and visit experience. *Am J Public Health*. 2015; 105(10):1998–2004. [PubMed: 25790386]
9. GfK. [Accessed November 14, 2017] Knowledgepanel Design Summary. 2013. Available at: [www.knowledgenetworks.com/knpanel/docs/knowledgepanel\(R\)-design-summary-description.pdf](http://www.knowledgenetworks.com/knpanel/docs/knowledgepanel(R)-design-summary-description.pdf)
10. Link MW, Battaglia MP, Frankel MR, et al. A comparison of address-based sampling (ABS) versus random-digit dialing (RDD) for general population surveys. *Public Opin Q*. 2008; 72(1):6–27.
11. American Association for Public Opinion Research. [Accessed November 14, 2017] Standard definitions. 2016. Available at: www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf
12. Reiter PL, Brewer NT, Gottlieb SL, et al. Parents' health beliefs and HPV vaccination of their adolescent daughters. *Soc Sci Med*. 2009; 69(3):475–480. [PubMed: 19540642]
13. Hays RD, Shaul JA, Williams VSL, et al. Psychometric properties of the CAHPS (TM) 1.0 survey measures. *Consumer Assessment of Health Plans Study*. *Med Care*. 1999; 37(3 Suppl):MS22–MS31. [PubMed: 10098556]
14. Dyer N, Sorra JS, Smith SA, et al. Psychometric properties of the Consumer Assessment of Healthcare Providers and Systems (CAHPS (R)) Clinician and Group Adult Visit Survey. *Med Care*. 2012; 50(Suppl):S28–S34. [PubMed: 23064274]
15. Mosen DM, Carlson MJ, Morales LS, et al. Satisfaction with provider communication among Spanish-speaking Medicaid enrollees. *Ambul Pediatr*. 2004; 4(6):500–504. [PubMed: 15548101]
16. Rand CM, Schaffer SJ, Humiston SG, et al. Patient-Provider communication and human papillomavirus vaccine acceptance. *Clin Pediatr (Phila)*. 2011; 50(2):106–113. [PubMed: 20837607]
17. Alexander AB, Stupiansky NW, Ott MA, et al. What parents and their adolescent sons suggest for male HPV vaccine messaging. *Health Psychol*. 2014; 33(5):448–456.

18. Perkins RB, Chigurupati NL, Apte G, et al. Why don't adolescents finish the HPV vaccine series? A qualitative study of parents and providers. *Hum Vaccin Immunother.* 2016; 12(6):1528–1535. [PubMed: 26810765]
19. Gilkey MB, Malo TL, Shah PD, et al. Quality of Physician Communication about Human Papillomavirus Vaccine: Findings from a National Survey. *Cancer Epidemiol Biomarkers Prev.* 2015; 24(11):1673–1679. [PubMed: 26494764]
20. Gilkey MB, Magnus BE, Reiter PL, et al. The Vaccination Confidence Scale: A brief measure of parents' vaccination beliefs. *Vaccine.* 2014; 32(47):6259–6265. [PubMed: 25258098]
21. Gilkey MB, Reiter PL, Magnus BE, et al. Validation of the Vaccination Confidence Scale: A brief measure to identify parents at risk for refusing adolescent vaccines. *Acad Pediatr.* 2016; 16(1):42–49. [PubMed: 26300368]
22. Saha S, Arbelaez JJ, Cooper LA. Patient-physician relationships and racial disparities in the quality of health care. *Am J Public Health.* 2003; 93(10):1713–1719. [PubMed: 14534227]
23. United States Census Bureau. [Accessed November 14, 2017] Census regions and divisions of the United States. 2016. Available at: www.census.gov
24. Schmitt TA. Current methodological considerations in exploratory and confirmatory factor analysis. *J Psychoeduc Assess.* 2011; 29(4):304–321.
25. Dorell C, Yankey D, Kennedy A, et al. Factors that influence parental vaccination decisions for adolescents, 13 to 17 years old: National Immunization Survey-Teen, 2010. *Clin Pediatr (Phila).* 2013; 52(2):162–170. [PubMed: 23221308]
26. Wilson R, Brown DR, Boothe MAS, et al. Knowledge and acceptability of the HPV vaccine among ethnically diverse black women. *J Immigr Minor Health.* 15(4):747–757.
27. Hamlisch T, Clarke L, Alexander KA. Barriers to HPV immunization for African American adolescent females. *Vaccine.* 2012; 30(45):6472–6476. [PubMed: 22910288]
28. Warner EL, Lai D, Carbajal-Salisbury S, et al. Latino parents' perceptions of the HPV vaccine for sons and daughters. *J Community Health.* 2015; 40(3):387–394. [PubMed: 25269400]
29. Perkins RB, Clark JA, Apte G, et al. Missed opportunities for HPV vaccination in adolescent girls: A qualitative study. *Pediatrics.* 2014; 134(3):e666–e674. [PubMed: 25136036]
30. Boakye EA, Tobo BB, Osazuwa-Peters N, et al. Comparison of parent-and provider-reported human papillomavirus vaccination of adolescents. *Am J Prev Med.* 2017; 52(6):742–752. [PubMed: 27890518]
31. Apte G, Pierre-Joseph N, Vercruyse JL, et al. Could poor parental recall of HPV vaccination contribute to low vaccination rates? *Clin Pediatr (Phila).* 2015; 54(10):987–991. [PubMed: 26045587]
32. Brewer NT, Hall ME, Malo TL, et al. Announcements versus conversations to improve HPV vaccination coverage: A randomized trial. *Pediatrics.* 2017; 139(1) pii:e20161764.
33. Hofstetter AM, Robinson JD, Lepere K, et al. Clinician-parent discussions about influenza vaccination of children and their association with vaccine acceptance. *Vaccine.* 2017; 35(20): 2709–2715. [PubMed: 28392141]
34. Meers JM, Short MB, Rosenthal SL, et al. Provider-parent communication about HPV vaccination among a sample of vaccine hesitant parents. *J Adolesc Health.* 2016; 58(2):S116–S116.
35. Dempsey AF, Pyrznowski J, Lockhart S, et al. Effect of a health care professional communication training intervention on adolescent human papillomavirus vaccination: A cluster randomized clinical trial. *JAMA Pediatr.* 2018:e180016. (Epub March 05). [PubMed: 29507952]

Highlights

- Little is known about parents' perspectives on provider discussions about HPV vaccine.
- How providers present HPV vaccination affects parent satisfaction with communication.
- Parents' communication satisfaction was associated with HPV vaccination uptake.
- Allowing for questions and addressing concerns may reduce vaccination refusal or delay.

Table 1Sample characteristics ($n=795$).

	<i>n</i>	(%)
Child characteristics		
Sex		
Male	407	(51)
Female	388	(49)
Age in years (mean, (SD))	14.2	(1.9)
Parent characteristics		
Educational Attainment		
High school degree or less	311	(39)
Some college, no degree	192	(24)
College degree or more	292	(37)
Race/ethnicity		
Non-Hispanic white	538	(68)
Non-Hispanic black	70	(9)
Hispanic	150	(19)
Other	37	(5)
Household characteristics		
Annual income		
<\$35,000	156	(20)
\$35,000-\$74,999	217	(27)
\$75,000	422	(53)
Region of United States		
Northeast	152	(19)
Midwest	196	(25)
South	262	(33)
West	185	(23)

Note. Data from 2016 national survey of parents of adolescents ages 11–17 years. SD -standard deviation.

Table 2Means and factor loadings for items in the HPV Vaccine Communication Satisfaction Scale ($n=795$).

	Mean	(SD)	Factor loading
The doctor gave a clear message about whether getting HPV vaccine was a good idea.	4.2	(0.9)	0.81
The doctor spent the right amount of time talking about HPV vaccine.	4.1	(1.0)	0.87
The doctor did a good job of addressing my concerns.	4.2	(1.0)	0.86
The doctor gave me a chance to ask questions.	4.5	(0.8)	0.84
The doctor used language that was easy to understand.	4.5	(0.8)	0.85
The doctor told me what I needed to know about scheduling all three shots.	4.3	(1.0)	0.80
Overall, I was satisfied with how the doctor talked about HPV vaccine.	4.3	(1.0)	0.90

Note. HPV-human papillomavirus; SD-standard deviation.

Responses to each item were on a scale of 1 (strongly disagree) to 5 (strongly agree).

Associations between parent satisfaction with provider communication about HPV vaccine and vaccination behavior.

Table 3

		Initial refusal/delay (<i>n</i> =795)		Initiation (1 dose) (<i>n</i> =795)		Series continuation (2 doses) (<i>n</i> =550)			
		Multivariable		Multivariable		Multivariable			
	n/N (%)	OR	(95% CI)	n/N (%)	OR	(95% CI)	n/N (%)	OR	(95% CI)
Communication Satisfaction									
Low	156/205 (76)	1		110/205 (54)	1		44/110 (40)	1	
Moderate	190/305 (62)	0.59	(0.38-0.89)	204/305 (67)	1.71	(1.15-2.55)	119/204 (58)	2.05	(1.24-3.40)
High	148/285 (52)	0.45	(0.29-0.70)	236/285 (83)	3.59	(2.23-5.78)	171/236 (72)	4.08	(2.38-7.01)

Note: HPV Vaccine Communication Satisfaction Scale responses were categorized as low (1.0-3.9), moderate (4-4.9), and high (5). Separate logistic regression models assessed associations for initial refusal/delay (*n*=795), initiation (*n*=795), and receipt of 2 doses among initiators (*n*=550).

All models adjusted for provider recommendation quality, parent's vaccination confidence, parent-provider relationship quality, child's age, time (years) from first conversation, parent's educational attainment, parent's race/ethnicity, HPV: human papillomavirus. OR: odds ratio. CI: confidence interval.

Table 4
Vaccination behaviors by individual HPV Vaccine Communication Satisfaction Scale items.

	N (%)	Initial refusal/delay			Series initiation (1 dose)			Series continuation (2 doses)		
		n/N	(%)	P	n/N	(%)	P	n/N	(%)	P
Gave clear message										
Disagree/Neither	151 (19)	116/151	(77)	<.001	86/151	(57)	<.001	33/86	(38)	<.001
Somewhat agree	247 (31)	161/247	(65)		156/247	(63)		88/156	(56)	
Strongly agree	397 (50)	217/397	(55)		308/397	(78)		213/308	(69)	
Spent right amount of time										
Disagree/Neither	173 (22)	125/173	(72)	<.001	106/173	(61)	<.001	46/106	(43)	.001
Somewhat agree	246 (31)	158/246	(64)		150/246	(61)		90/150	(60)	
Strongly agree	376 (47)	211/376	(56)		294/376	(78)		198/294	(67)	
Addressed concerns										
Disagree/Neither	194 (24)	141/194	(73)	<.001	110/194	(57)	<.001	49/110	(45)	<.001
Somewhat agree	211 (27)	138/211	(65)		129/211	(61)		73/129	(57)	
Strongly agree	215 (49)	215/390	(55)		311/390	(80)		212/311	(68)	
Gave chance to ask questions										
Disagree/Neither	81 (10)	57/81	(70)	.005	49/81	(60)	<.001	20/49	(41)	<.001
Somewhat agree	200 (25)	139/200	(70)		118/200	(59)		60/118	(51)	
Strongly agree	514 (65)	298/514	(58)		383/514	(75)		254/383	(66)	
Used easy to understand language										
Disagree/Neither	80 (10)	56/80	(70)	.02	53/80	(66)	.001	19/53	(36)	<.001
Somewhat agree	184 (23)	126/184	(68)		108/184	(59)		60/108	(56)	
Strongly agree	531 (67)	312/531	(59)		389/531	(73)		255/389	(66)	
Discussed scheduling all shots										
Disagree/Neither	163 (21)	125/163	(77)	<.001	83/163	(51)	<.001	29/83	(35)	<.001
Somewhat agree	170 (21)	110/170	(65)		108/170	(64)		48/108	(44)	
Strongly agree	462 (58)	259/462	(56)		359/462	(78)		257/359	(72)	
Parent overall satisfied										
Disagree/Neither	145 (18)	110/145	(76)	<.001	77/145	(53)	<.001	29/77	(38)	<.001
Somewhat agree	192 (24)	130/192	(68)		115/192	(60)		60/115	(52)	

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	Initial refusal/delay		Series initiation (1 dose)		Series continuation (2 doses)	
	N (%)	n/N (%)	P (%)	n/N (%)	n/N (%)	P (%)
Strongly agree	458 (58)	254/458 (55)	358/458 (78)	245/358 (68)		

Note: Table shows Pearson chi-square associations with HPV vaccination behaviors: initial refusal/delay ($n=795$), initiation ($n=795$), and receipt of 2 doses ($n=550$ initiators). For each item in the HPV Vaccine Communication Satisfaction Scale, responses were categorized as disagree/neither (1.0–3.9), somewhat agree (4–4.9), and strongly agree (5).