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Provider communication and HPV vaccination: The impact of recommendation quality

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ABSTRACT

Background: Receiving a healthcare provider's recommendation is a strong predictor of HPV vaccination, but little is known empirically about which types of recommendation are most influential. Thus, we sought to investigate the relationship between recommendation quality and HPV vaccination among U.S. adolescents.
Methods: In 2014, we conducted a national, online survey of 1495 parents of 11–17-year-old adolescents. Parents reported whether providers endorsed HPV vaccination strongly, encouraged same-day vaccination, and discussed cancer prevention. Using an index of these quality indicators, we categorized parents as having received no, low-quality, or high-quality recommendations for HPV vaccination. Separate multivariable logistic regression models assessed associations between recommendation quality and HPV vaccine initiation (≥1 dose), follow through (3 doses, among initiators), refusal, and delay.
Results: Almost half (48%) of parents reported no provider recommendation for HPV vaccination, while 16% received low-quality recommendations and 36% received high-quality recommendations. Compared to no recommendation, high-quality recommendations were associated with over nine times the odds of HPV vaccine initiation (23% vs. 74%, OR = 9.31, 95% CI, 7.10–12.22) and over three times the odds of follow through (17% vs. 44%, OR = 3.82, 95% CI, 2.39–6.11). Low-quality recommendations were more modestly associated with initiation (OR = 4.13, 95% CI, 2.99–5.70), but not follow through. Parents who received high- versus low-quality recommendations less often reported HPV vaccine refusal or delay.
Conclusions: High-quality recommendations were strongly associated with HPV vaccination behavior, but only about one-third of parents received them. Interventions are needed to improve not only whether, but how providers recommend HPV vaccination for adolescents.

1. Introduction

Only a small minority of adolescents in the United States receives human papillomavirus (HPV) vaccine according to national guidelines. Although the Advisory Committee on Immunization Practices recommends completion of the three-dose HPV vaccine series by age 12, just 26% of females and 16% of males were up-to-date at age 13 in 2014 [1,2]. Coverage estimates for series completion in older adolescents were somewhat higher, reaching 51% for females and 23% for males by age 17, but remain far below the Healthy People 2020 goal of 80% [2,3]. These low levels of coverage represent a missed opportunity to prevent 53,000 future cervical cancer cases over the lifetimes of today's population of girls ages 12 and younger, as well as many additional cases of other cancers, precancers, and genital warts in both sexes [4].

The urgent need to improve HPV vaccination coverage has generated support for immunization quality improvement efforts across a broad array of leaders in adolescent health and cancer prevention, including the Centers for Disease Control and Prevention (CDC), the President's Cancer Panel, and the American Academy

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of Pediatrics [4–6]. A consistent theme in this work is the need to increase the frequency with which healthcare providers recommend HPV vaccine [4–6]. A provider's recommendation is so highly influential that over 70% of adolescents who receive a recommendation initiate HPV vaccination [7]. In relative terms, receiving a provider recommendation is a stronger predictor of HPV vaccination than other commonly studied factors, including race/ethnicity, insurance status, HPV-related knowledge, or perceptions of HPV vaccine effectiveness and safety [8–11]. Despite strong evidence of providers' influence, more than one-third of age-eligible girls and half of age-eligible boys do not receive recommendations for HPV vaccination [12]. Taken together, these data make increasing the frequency of provider recommendations a logical goal for HPV vaccination quality improvement efforts.

In contrast to recommendation frequency, the role that recommendation quality plays in HPV vaccination is less clear. A growing body of research suggests that, in addition to being infrequent, providers' recommendations for HPV vaccination are often weak insofar as they frame HPV vaccine as less important than other vaccines or suggest deferring HPV vaccination to a future visit [13–16]. Furthermore, parents who perceive providers' recommendations as weak may be less likely to get HPV vaccine for their children [17,18]. In response to these concerns, the CDC encourages providers to deliver "strong" recommendations for HPV vaccination. More specifically, educational materials for healthcare providers suggest strategies such as saying the vaccine is important, emphasizing cancer prevention, and encouraging same-day vaccination [19]. Although these suggestions hold intuitive appeal and were informed by formative research, little is known empirically about how to define a strong recommendation or its relative influence on HPV vaccination behavior.

To address this gap, we used data from a national survey to evaluate the quality of recommendations that parents of adolescents received for HPV vaccination on three factors: strength of endorsement, prevention message, and urgency. We assessed associations between provider recommendation quality and four HPV vaccination behaviors: initiation (≥1 dose), follow through (3 doses, among initiators), refusal, and delay. Finally, we sought to identify disparities in recommendation quality across key demographic characteristics. By providing novel data on the role of recommendation quality, our study seeks to inform the many state and national campaigns aimed at improving provider communication so as to increase HPV vaccination coverage in the U.S.

2. Methods

2.1. Participants and procedures

We conducted an online survey of parents of adolescents in November 2014 to January 2015. Respondents were members of a standing panel of U.S. adults maintained by a survey research company [20]. To construct a nationally-representative panel, the company used a probability-based sampling approach consisting of list-assisted, random-digit dialing supplemented by address-based sampling to provide coverage of households without telephones [20]. Eligible respondents were parents of an 11–17-year-old child. Parents received a computer and free internet access or points toward small cash payments as incentives for their ongoing participation in the study panel.

The survey company emailed invitations to 2845 parents selected from the panel using a probability proportional to size (PPS) weighted sampling approach. A total of 1760 parents responded by visiting the survey website, completing an eligibility screener as to whether they were the parent of an age-eligible child, and providing informed consent. Of these, 1504 parents met eligibility criteria and went on to complete the survey. Using the American Association for Public Opinion Research guidelines for Response Rate 5 [21], we calculated an overall response rate of 61%. We excluded respondents who did not provide data on key variables ($n = 9$) for a final analytic sample of 1495 parents. The University of North Carolina Institutional Review Board approved the study protocol.

2.2. Measures

Our survey assessed receipt of provider recommendation with one item: "Has a doctor or other healthcare provider ever told you [NAME] should get the HPV vaccine?" [22]. For parents who indicated yes, the survey assessed three recommendation quality indicators that we identified based on the research literature and CDC recommendations for communicating about HPV vaccine [16,19]. Based on evidence that some providers frame HPV vaccine as an optional vaccine [14,15], we assessed *strength of endorsement*, or whether the provider said HPV vaccine was "very" or "extremely" important. Because parents value the opportunity to prevent HPV-attributable cancers [19], we assessed *prevention message*, or whether the provider said HPV vaccine prevents cancer. Because some providers suggest delaying HPV vaccination to a later visit [14,15], we assessed *urgency*, or whether the provider recommended same-day vaccination. We combined these three items into an index of overall recommendation quality by awarding one point for each indicator of quality, calculating the sum, and creating two categories: low-quality recommendation (scores of 0–1) and high-quality recommendation (scores of 2–3).

Our survey assessed HPV vaccination status with one item: "How many shots of the HPV vaccine has [NAME] had?" [23]. We defined HPV vaccine initiation as responses of 1 or more shots. We defined HPV vaccine follow through as responses of 3 shots, among those children who had initiated the series. We adopted the concept of follow through from Reiter and colleagues, who note that, unlike series completion, the measure has the advantage of focusing specifically on the behavior of continuing the vaccine series once it is started [24].

Our survey assessed HPV vaccine refusal and delay with two items: "Has there ever been a time when you [refused or decided not to get/delayed or put off getting] the HPV vaccine for [NAME]?" Refusal and delay items used yes/no response options. We adapted these items from measures used on the 2010 National Immunization Survey (NIS) – Teen [25].

On demographic characteristics, our survey assessed the sex, age, and race/ethnicity of the index child. The survey company provided data on parents' sex and educational attainment. For each household, the company also provided data on annual income and location of residence in terms of U.S. state and national region.

Prior to fielding, we cognitively tested and pretested our survey to assess respondent comprehension and ensure proper functioning. The full survey instrument is available online at http://www.unc.edu/~ntbrewer/2014_pharmacy.pdf.

2.3. Statistical analysis

We used multivariable logistic regression to assess associations between HPV vaccine recommendation quality and HPV vaccination behavior. Using separate models, we first assessed associations between each recommendation quality indicator and HPV vaccine initiation; we then assessed the association between overall quality and initiation. We repeated these analyses for the outcomes of HPV vaccine follow through, refusal, and delay. Models controlled for five demographic variables that correlate with HPV vaccination behavior: child's sex, child's age, child's race/ethnicity, parent's educational attainment, and annual household income [2,8,26,27].

Table 1
Sample characteristics ($n = 1495$).

	n	(%)
Child characteristics		
Sex		
Male	761	(51)
Female	734	(49)
Age (years)		
11–12	421	(28)
13–15	626	(42)
16–17	448	(30)
Race/ethnicity		
Non-Hispanic white	979	(65)
Non-Hispanic black	145	(10)
Hispanic	260	(17)
Other	111	(7)
HPV vaccination status		
0 doses	806	(54)
≥1 dose	689	(46)
Parent characteristics		
Sex		
Male	664	(44)
Female	831	(56)
Educational attainment		
High school degree or less	575	(38)
Some college, no degree	388	(26)
College degree or more	532	(36)
Household characteristics		
Annual income		
<$35,000	328	(22)
$35,000–$74,999	468	(31)
≥$75,000	699	(47)
Region		
Northeast	260	(17)
Midwest	391	(26)
South	494	(33)
West	350	(23)

We used Pearson's chi-squared tests to assess potential disparities in HPV vaccine recommendation quality across each of these five demographic variables.

To assess the robustness of our findings, we repeated analyses after re-categorizing "high-quality" recommendations to be those with a score of 3 on the recommendation quality index (versus a score of 2 or higher as described earlier). Because these analyses yielded a similar pattern of findings, we do not report on them further. We conducted analyses using Stata Version 12.0 (College Station, TX). Statistical tests were two-tailed with a critical alpha of 0.05.

3. Results

3.1. Sample characteristics

The sample was balanced with regard to the sex of index children, with 51% of parents reporting on a son and 49% reporting on a daughter (Table 1). The mean age for children was 14 years, and most were non-Hispanic white (65%), Hispanic (17%), or non-Hispanic black (10%). Overall, almost half (46%) had initiated HPV vaccination, with sex-specific coverage being 52% for girls and 40% for boys. Among the 689 adolescents who had initiated HPV vaccination, 234 (or 34%) had followed through to complete the 3-dose series. About one-fifth of parents (22%) reported having a household income of less than $35,000 per year.

3.2. HPV vaccine recommendation quality

About half of parents (781/1495 or 52%) in our sample reported receiving a provider recommendation for HPV vaccination. Among these 781 respondents, HPV vaccine recommendation quality was most often lacking on urgency, with only 317 parents (41%) reporting that their child's provider recommended same-day vaccination (Table 2). On strength of endorsement, 495 parents, or 63% of those who received a recommendation, indicated that the provider said HPV vaccine was highly important for their child. On prevention message, 673 parents, or 86% of those who received a recommendation, reported that the provider said HPV vaccine prevents cancer. Using composite recommendation quality scores, we categorized parents in our sample as having received no provider recommendation for HPV vaccine (48%), a low-quality recommendation (16%), or a high-quality recommendation (36%).

Table 2
Quality of HPV vaccine recommendations received by parents of adolescents.

	n	(%)
Strength of endorsement		
Provider said HPV vaccine was...		
Not/slightly/moderately important	286	(37)
Very/extremely important	495	(63)
Prevention message		
Provider said HPV vaccine prevents cancer		
No	108	(14)
Yes	673	(86)
Urgency		
Provider recommended getting HPV vaccine...		
At later visit/gave a choice/other	464	(59)
At current visit	317	(41)
Overall quality		
No recommendation	714	(48)
Low-quality	237	(16)
High-quality	544	(36)

Note: Individual quality indicators were assessed for parents who received a provider recommendation ($n = 781$). For each indicator, the lower quality response is listed first. Overall quality was assessed for all parents ($n = 1495$). HPV: human papillomavirus.

3.3. Associations between recommendation quality and HPV vaccination behavior

3.3.1. Initiation

Higher recommendation quality correlated with HPV vaccine initiation (Table 3). In terms of overall quality, receiving a high-quality recommendation versus no recommendation was associated with over nine times the odds of having received at least one dose of HPV vaccine (23% versus 74%, odds ratio [OR] = 9.31, 95% confidence interval [CI], 7.10–12.22). Receiving a low-quality recommendation versus no recommendation was associated with over four times the odds of initiation (23% versus 53%, OR = 4.13, 95% CI, 2.99–5.70). In indicator-specific models, strength of endorsement was associated with initiation, while the association between urgency and initiation approached, but did not achieve, statistical significance.

3.3.2. Follow through

Among children who had initiated HPV vaccination, receiving a high-quality recommendation versus no recommendation was associated with following through to complete the three-dose series (OR = 3.82, 95% CI, 2.39–6.11) (Table 3). Receiving a low-quality recommendation approached, but did not achieve, a statistically significant association with follow-through. In indicator-specific models, both strength of endorsement and prevention message were associated with follow through, while the association between urgency and follow through approached statistical significance.

3.3.3. Refusal and delay

Among parents who had received a recommendation for HPV vaccine, higher recommendation quality was associated with less

Table 3
Associations between HPV vaccine recommendation quality and HPV vaccine initiation and follow through.

	Parents reporting HPV vaccine initiation for child/Total parents in category (%)		Multivariable		Parents reporting HPV vaccine follow through for child/Total parents in category (%)		Multivariable	
			OR	(95% CI)[a]			OR	(95% CI)[b]
Strong endorsement								
No	154/286	(54)	1		46/154	(30)	1	
Yes	372/495	(75)	2.58	(1.86–3.56)**	161/372	(43)	1.81	(1.20–2.74)**
Prevention message								
No	74/108	(69)	1		18/74	(24)	1	
Yes	452/673	(67)	0.86	(0.53–1.39)	189/452	(42)	1.98	(1.09–3.59)*
Urgency								
No	295/464	(64)	1		105/295	(36)	1	
Yes	231/317	(73)	1.35	(0.97–1.86)	102/231	(44)	1.41	(0.97–2.03)
Overall quality								
No recommendation	163/714	(23)	1		27/163	(17)	1	
Low-quality	126/237	(53)	4.13	(2.99–5.70)**	33/126	(26)	1.78	(0.99–3.20)
High-quality	400/544	(74)	9.31	(7.10–12.22)**	174/400	(44)	3.82	(2.39–6.11)**

Note: Models control for child's sex, child's age, child's race/ethnicity, parent's educational attainment, and annual household income. HPV: human papillomavirus. OR: odds ratio. CI: confidence interval.

* $p < 0.05$.

** $p < 0.01$.

[a] Odds of receiving at least one dose of HPV vaccine. Analyses of individual quality indicators restricted to parents who received a provider recommendation ($n = 781$). Overall quality assessed for all parents ($n = 1495$).

[b] Odds of receiving three doses of HPV vaccine, among those who started the series. Analyses of individual quality indicators restricted to parents who received a provider recommendation ($n = 526$). Overall quality assessed for all parents who started the series ($n = 689$).

HPV vaccine refusal and delay (Table 4). Parents who received a high- versus low-quality recommendation had about half the odds of reporting HPV vaccine refusal (OR = 0.52, 95% CI, 0.38–0.72) or delay (OR = 0.59, 95% CI, 0.43–0.82). In indicator-specific models, only strength of endorsement was associated with refusal and delay.

3.4. Disparities in recommendation quality

Disparities were present in HPV vaccine recommendation quality by child's sex and age (both $p < 0.001$). Parents less often reported receiving high-quality recommendations for male versus female children (29% and 45%, respectively) and for younger children, ages 11–12, versus older children, ages 13–15 or 16–17 (28%, 40%, and 39%, respectively) (Fig. 1). Conversely, receiving no recommendation was more common for male versus female children (56% and 39%), and for ages 11–12 versus ages 13–15 or 16–17 (57%, 44%, and 45%). The proportion of low-quality recommendations was the same for male and female children (16% and 16%) and for ages 11–12, 13–15, and 16–17 (16%, 16%, and 16%). We did not find evidence of disparities in recommendation quality by child's race/ethnicity, parent's educational attainment, or annual household income (all $p > 0.05$).

4. Discussion

In a national survey of parents of adolescents, we found that provider recommendation quality was consistently associated with HPV vaccination behavior. In keeping with prior research [12,28], almost half of the parents in our sample had not received an HPV vaccine recommendation for their age-eligible child, and less than one-quarter of the children in this group had initiated HPV vaccination. By contrast, over half of parents who received low-quality recommendations had initiated HPV vaccination, and about one-quarter of initiators followed through with series completion. Even more dramatically, almost three-quarters of parents who

Table 4
Associations between HPV vaccine recommendation quality and HPV vaccine refusal and delay.

	Parents reporting HPV vaccine refusal for child/Total parents in category (%)		Multivariable		Parents reporting HPV vaccine delay for child/Total parents in category (%)		Multivariable	
			OR	(95% CI)[a]			OR	(95% CI)[b]
Strong endorsement								
No	147/285	(52)	1		138/284	(49)	1	
Yes	138/494	(28)	0.37	(0.27–0.50)**	140/494	(28)	0.42	(0.31–0.57)**
Prevention message								
No	39/108	(36)	1		34/108	(31)	1	
Yes	246/671	(37)	1.06	(0.68–1.66)	244/670	(36)	1.25	(0.79–1.98)
Urgency								
No	169/463	(37)	1		175/463	(38)	1	
Yes	116/316	(37)	1.07	(0.79–1.45)	103/315	(33)	0.80	(0.59–1.09)
Overall quality								
Low-quality	113/237	(48)	1		104/236	(44)	1	
High-quality	172/542	(32)	0.52	(0.38–0.72)**	174/542	(32)	0.59	(0.43–0.82)**

Note: Models control for child's sex, child's age, child's race/ethnicity, parent's educational attainment, and annual household income. HPV: human papillomavirus. OR: odds ratio. CI: confidence interval.

** $p < 0.01$.

[a] Odds of refusing HPV vaccine, among those who received a provider recommendation ($n = 779$). Analyses exclude respondents ($n = 2$) who did not provide data on HPV vaccine refusal.

[b] Odds of delaying HPV vaccine, among those who received a provider recommendation ($n = 778$). Analyses exclude respondents ($n = 3$) who did not provide data on HPV vaccine delay.

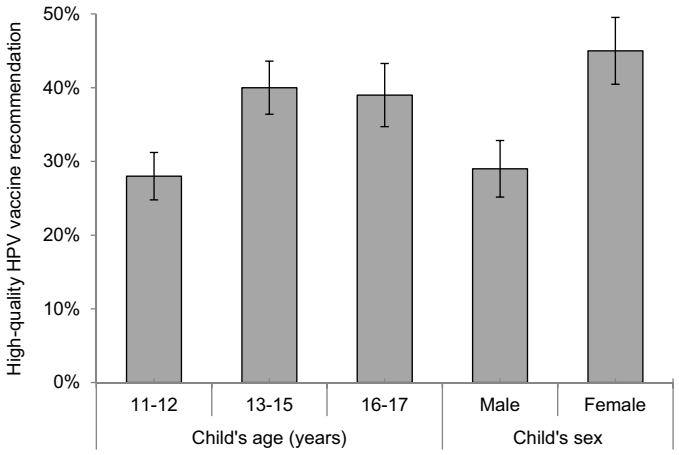

Fig. 1. Disparities in receipt of a high-quality recommendation for HPV vaccination ($n = 1495$). Error bars show 95% confidence intervals.

received high-quality recommendations had initiated HPV vaccination, and well over one-third of initiators completed the series. This pattern of findings suggests that high-quality recommendations may be more effective than low-quality recommendations for promoting HPV vaccine initiation and completion.

Our findings also raise the possibility that high-quality recommendations encourage vaccination among vaccine hesitant parents. Parents who received high- versus low-quality recommendations less often reported HPV vaccine refusal or delay. While we interpret our results with care to acknowledge this study's cross-sectional design, high-quality recommendations may reassure parents and decrease their decisional burden by more clearly communicating the recommended course of action [13]. These findings offer early evidence to assuage the concern held by some providers that strong recommendations will elicit resistance from parents and are therefore best avoided [13,14].

In terms of implications for improving provider communication, our findings offer support for the practices of endorsing HPV vaccine highly, emphasizing cancer prevention, and recommending same-day vaccination. Of our three quality indicators, strength of endorsement was most consistently associated with HPV vaccination behavior, suggesting that this communication practice is especially important. Unfortunately, over one-third of parents in our sample reported that their providers did not say HPV vaccination was very important for their children, a finding which corresponds to our prior research with healthcare providers. For example, in a survey of primary care physicians, we found that about one-quarter did not recommend HPV vaccine as being very important for their 11–12-year-old patients [16].

We found evidence of disparities in who receives high-quality provider recommendations, such that parents of younger adolescents and male adolescents less often reported getting them. With regard to age, these findings are consistent with prior studies in which healthcare providers have expressed a preference for recommending HPV vaccination for older adolescents rather than the 11–12-year-old age group specified by national guidelines [13–16]. With regard to sex, the lack of high-quality recommendations for boys likely reflects the history of practice guidelines, which initially recommended routine administration of HPV vaccine for girls only [1]. Interventions to improve provider communication about HPV vaccination should seek to address disparities in recommendation quality by emphasizing the benefits of guideline-consistent delivery of HPV vaccine. For male patients, these benefits include the prevention of genital warts and HPV-attributable cancers, including anal and oropharyngeal cancers, which are increasingly common [1]. For younger patients, benefits include the opportunity to vaccinate before exposure and to achieve stronger immune response, which may increase vaccine effectiveness [1,29].

In terms of opportunities for future study, researchers should seek to expand our understanding of what constitutes "strong" communication about HPV vaccination. We developed our framework of recommendation quality based on national practice guidelines and CDC educational materials [1,5], but other communication practices may be relevant as well. For example, in our physician survey, we also explored recommendation "consistency" (i.e., using routine- versus risk-based approaches to recommending HPV vaccine) and "timeliness" (i.e., recommending HPV vaccine at ages 11 and 12 versus older) [16]. Investigating subgroup differences is another promising avenue for future research, given that the relationship between recommendation quality and HPV vaccination behavior may differ according to factors such as adolescents' sex. Finally, additional research is needed to understand how providers tailor their communication practices according to their perceptions of parents' communication needs. By identifying how and for whom provider communication is most influential, future research can offer providers specific guidance about how to improve their HPV vaccine recommendations.

Strengths of this study include the use of cognitively tested survey items, a good response rate, and a large, national sample of respondents. Correspondence between our findings and those of other, nationally-representative surveys provides support for the validity of our sample. For example, our estimates of the proportions of 13–17-year-old adolescents who received provider recommendations for HPV vaccination were similar to those reported by the 2013 NIS-Teen for girls (65% vs. 64%) and boys (46% vs. 42%) [12].

The primary limitation of this study is its cross-sectional design, which prevents us from assessing the directionality of the relationship between recommendation quality and HPV vaccination behavior. Although our findings are consistent with the hypothesis that recommendation quality encourages vaccination, it may also be that parents who vaccinate their children are more likely to remember and report higher quality recommendation practices. The self-reported nature of our measures is also a limitation, particularly given that what constitutes a provider recommendation is not always straightforward. For example, parents receiving "presumptive" recommendations, which do not actively engage parents in decision making, may not have recognize them as such, leading to misclassification [30]. Although parental recall of HPV vaccination is fairly accurate [31], some parents may have also misreported their children's vaccination status. Finally, because our sample included 11–12-year-olds in the target age range for routine HPV vaccination, some parents may not have had an opportunity to discuss HPV vaccination with their children's healthcare providers at the time of the survey. Future research can overcome these limitations by employing experimental designs that manipulate provider communication and assess subsequent vaccination behavior using medical records.

5. Conclusion

The possibility of improving HPV vaccine delivery and, in turn, preventing HPV-attributable cancers simply by changing what healthcare providers say has been a cause for considerable optimism in recent years, motivating large-scale immunization quality improvement efforts. A strong body of evidence speaks to the importance of increasing the frequency of provider recommendations for HPV vaccination. The findings of our study provide empirical support for the hypothesis that recommendation quality may also influence HPV vaccination behavior. By endorsing

HPV vaccine highly, recommending same-day vaccination, and emphasizing cancer prevention, providers may be able to promote HPV vaccine initiation and completion while discouraging vaccine refusal and delay. Future research should seek to build on the present study by identifying other discrete communication practices that support HPV vaccination and by prospectively assessing their relative influence. By expanding our conceptualization of "provider recommendation" from a dichotomous, yes-or-no variable to a more complex concept encompassing multiple communication practices, we can arrive at a more nuanced understanding of how to communicate effectively about HPV vaccination and other healthcare services that are of vital importance to the goals of cancer prevention and control.

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