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Parent report of provider HPV vaccine communication strategies used during a randomized, controlled trial of a provider communication intervention

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ABSTRACT

Objective: To assess secondary, parent-reported outcomes from a randomized controlled trial (RCT) of a provider communication intervention aimed at improving adolescent HPV vaccination.
Methods: A paper survey was provided to a random sample of 777 parents of adolescents from 8 control and 8 intervention clinics participating in the larger trial. Chi-square or Fisher's exact tests assessed associations between study arm and providers' HPV vaccine communication strategies, parents' vaccination attitudes and parent's HPV vaccine acceptance. Exploratory analyses assessed the association between receipt of 'very strong' or presumptive HPV vaccine recommendation (regardless of study arm) and parent's perceptions about their providers' vaccine communication, and parents' attitudes and acceptance of the HPV vaccine.
Results: The response rate was 47%. There were no differences between study arms in parents' report of how their provider communicated about the HPV vaccine, parent vaccination attitudes, or uptake of the HPV vaccine. Receipt of a 'very strong' recommendation was associated with greater perceived urgency for getting vaccinated, greater trust in the information received from the provider, decreased vaccine hesitancy, and increased vaccine receipt. Receipt of a presumptive recommendation was associated with a lower likelihood of having concerns about the vaccine's safety, lower vaccine hesitancy, and an increased likelihood of vaccination. Neither recommendation strategy appeared to negatively impact parents' visit experience or trust in the information being provided. Similar results were found in subanalyses of vaccine hesitant parents.
Conclusions: Providing very strong, presumptive HPV vaccine recommendations is associated with improved parent vaccination attitudes and acceptance, and does not seem to have significant negative impacts, even among parents who are vaccine hesitant. Response bias in our sample could explain why there were no reported differences between study arms in parents' reports of how their adolescent's providers communicated about the HPV vaccine.

1. Introduction

Vaccines against human papillomavirus (HPV) have a remarkable potential to reduce HPV-associated cancers and other diseases. Yet in the US, these vaccines are largely underutilized, with only 43.4% of adolescents age 13–17 having completed the HPV vaccine series as of 2017 [1]. It is widely accepted that a major driver of whether or not an adolescent receives this vaccine is the provider's vaccine recommendation [2,3].

Studies show that the likelihood a parent will accept the vaccine for their adolescent is dependent on the specific *way* a provider communicates their vaccine recommendation. For example, using a shared decision-making style to make the recommendation (i.e. "What do you think about getting the HPV vaccine today?") is generally less successful than a more "presumptive" style (i.e. "Let's get the vaccine done today since she is due") [4,5] Additional preferred communication strategies for providers include communicating a sense of urgency to get the vaccine on the same day it is being discussed, providing the same level of detail about the HPV

Abbreviations: Tdap, tetanus – diphtheria – acellular pertussis vaccine; MCV, meningococcal vaccine; HPV, human papillomavirus; CDC, Centers for Disease Control and Prevention.

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vaccine as other vaccines recommended at the same time, and using language that conveys the recommendation is a "strong" one [6]. Unfortunately, studies show that providers frequently do not use these recommended communication strategies [7,8]. Strategies and interventions to improve how providers communicate with patients and families about HPV vaccines are needed.

As a result, we developed a provider communication intervention that consisted of 4 tangible communication tools (a website, an HPV fact sheet, a set of disease images, and a vaccination decision aid) and a 2½ hour vaccine communication training for providers [9]. This training taught providers to open the vaccine conversation using a strong, presumptive HPV vaccine recommendation that conveyed a sense of urgency and was similar in detail to recommendations for other vaccines to be given that day. Additionally, providers received training on how to use techniques from Motivational Interviewing (MI) if they subsequently encountered vaccine hesitancy. In a large randomized controlled trial that ran from August 2014 – January 2015 we found that receipt of this intervention significantly increased HPV vaccine series initiation and completion among adolescents at the participating practices [9].

Based on extensive qualitative and quantitative analysis among providers, the communication training appeared to be one of the most used and useful components of the intervention [10]. We hypothesized that because of this, parents at intervention practices would experience providers' HPV vaccine recommendations significantly differently than parents from control practices, and that these differences would result in differences in parents' HPV vaccination perceptions, vaccine hesitancy, and vaccine utilization between control and intervention clinics. In addition, we also wanted to assess whether our intervention may have had potential negative impacts on parents' visit experience with regard to how long they spent discussing the vaccine, and among vaccine hesitant parents, whether the communication provided was perceived as adequate to address their concerns. Finally, in exploratory analyses we sought to determine the relationship between preferred HPV vaccine communication practices, and parents' visit experiences, HPV vaccination attitudes, and HPV vaccine acceptance. Analyses of parent survey results that tested these hypotheses are the focus of this manuscript.

2. Materials and methods

2.1. Study overview and population

At the end of the 12-month intervention period (January 2015 – February 2016), we conducted a cross sectional survey of parents of young adolescents seen at the 16 primary care practices (control and intervention combined) in the Denver metro area who had participated in our randomized, controlled trial [9] (ClinicalTrials.gov NCT02456077). From each practice, fifty parents of young adolescents (25 male, 25 female) who had a well-child exam in which they were eligible to initiate the HPV vaccine series during the study period were randomly selected from the pool of patients (ranging from ~100 to ~500 at most sites) at the practice meeting this criteria. The sample was comprised of 11–14 year-olds seen from August 2015 through January 2016 for pediatric practices. Due to low numbers of adolescent patients, the sampling frame for family medicine practices (n = 4) was expanded to include 11–17 year-olds seen from February 2015 through January 2016, with the most recently seen patients prioritized for the sample. However, even with this, two family practices fell short of the desired of sample size of 50 (n = 31 and 46). Data from clinic medical records and from the state immunization registry were used to evaluate HPV vaccine eligibility.

2.2. Data collection

The paper-based survey (available upon request from the authors) was provided to parents via postal mail with up to 4 mailed and 1 phone reminder provided to non-respondents over a period of 16 weeks. An incentive of $5 was provided in the initial mailing, with an additional $5 sent to parents if they completed the survey after the 3rd mailing. All study activities were approved by Colorado's Multiple Institutional Review Board.

2.3. Outcome measures

Three sets of outcome measures were assessed in this study. The two primary outcomes were parents' report of the providers' verbal HPV vaccine communication style and parents' HPV vaccine perceptions (including safety, efficacy, urgency, hesitancy, and trust in information being provided). Because vaccination has been assessed in the main trial as the primary outcome, adolescent HPV vaccine receipt or parental intention for adolescent HPV vaccination were considered secondary outcomes for this analysis and were therefore self-reported.

There were eight outcome measures related to providers' verbal HPV vaccine communication style. Four of these were assessed among all parents. The first was the perceived strength of the HPV vaccine recommendation. This was assessed using the statement *"Tell us how strongly your adolescent's medical provider has recommended the following vaccines for your adolescent"*, and a 5-category response scale of "*very strongly*", "*somewhat strongly*," *"not very strongly,"* *"recommended against the vaccine,"* or *"not applicable/not discussed*." Those with the latter two responses were removed from subsequent analyses and the *'very strongly'* response was compared against the remaining two responses. The second was the use of a presumptive style of conversation. This was assessed with the question *"When your adolescent's medical provider first brought up the topic of adolescent vaccines, [the] provider FIRST talked to me about vaccines as if my child…"* and response choices of "*would get all the vaccines due for,*" *"might not get one or more of the vaccines due for,"* *"would not get one of more of the vaccines due for,"* or *"other*" with a write in response available. The third was whether any vaccines were "singled out" from the others. This was assessed using the statement "*When your adolescent's medical provider first brought up vaccines for your adolescent, did he/she single out any of the vaccines?*" (examples of this were provided), and a 3-item set of responses "*no, was not singled out,*" *"yes, was singled out,"* *and "not applicable, not discussed.*" The fourth was the reported time spent discussing the vaccine. This was assessed using the question "*when first discussing the HPV vaccine with you and your adolescent, how long did your adolescent's medical provider spend on the topic?*" with response choices of "0 min, have not discussed the HPV vaccine," "4 min or less" and several higher minute categories that were later collapsed into "5 + minutes" due to the distribution of responses.

The remaining four measures were assessed specifically among parents reporting that they had raised concerns or questions about the HPV vaccine at their visit. The first was a proxy measure for use of MI during the visit which was assessed with a single statement that reflected a key MI skill (asking for permission) that had been taught during the communication training, [11] *"The provider asked if it was okay to share what he/she knew about the vaccine before giving me information.*" Responses were a 4-point Likert scale from "*strongly agree*" to "*strongly disagree*". The next three measures assessed parent experience and whether the communication was adequate to address their concerns. This included whether the provider "*listened carefully to me,*" "*spent enough time on the topic,*" and

"explained things in a way that was easy to understand," which was assessed with the same Likert scale.

Parents' vaccine perceptions were assessed with 6 items. The first three - safety, efficacy and trust in information - were assessed using 3 statements adapted from prior research, [12–14] and 4-point Likert scale of responses from "strongly agree" to "strongly disagree". Vaccination urgency was assessed using the same 4-point agreement scale and two statements - *"I do not think my adolescent needs the HPV vaccine now,"* and "*I do not think my adolescent needs the HPV vaccine ever*". Parents' post-visit vaccine hesitancy was assessed with the question, *"Overall, how hesitant about the HPV vaccine would you say you were after your adolescent's most recent well-child visit?"* and a 5-item response choice of "not at all hesitant," "not too hesitant," "somewhat hesitant," "very hesitant," or "not sure."

HPV vaccine receipt was self-reported. For parents who indicated their adolescent had not received any doses of the HPV vaccine, or they were unsure, a follow up question on vaccine intention was asked – "*If your adolescent's medical provider recommended the HPV vaccine at his/her next check-up, how likely would you be to allow him/her to get the vaccine?*" with response categories of "very likely," "somewhat likely," "somewhat unlikely" or "very unlikely".

2.4. Analysis

Descriptive statistics were generated for all survey questions. In many cases, Likert scales were collapsed into fewer categories due to the distribution of responses. The main analysis was a series of univariate comparisons between the two study arms for the various outcomes described, unadjusted for any other variables due to the randomized controlled trial design. Because there were few differences between arms, additional exploratory analyses of two commonly suggested vaccine recommendation strategies were performed [4,15]. We examined univariate relationships between receipt of a "very strong" or "presumptive" HPV vaccine recommendations and the remaining outcomes of interest. A p-value of ≤ 0.05. Associations were assessed using Chi-square or Fisher's exact tests as appropriate. All analyses were performed in SAS 9.4 (SAS Institute, Cary, NC).

3. Results

3.1. Sample

Of the 777 parents contacted 723 had valid addresses and 342 returned the survey for an adjusted response rate of 47%. Among the 16 practices used for recruitment, response rates varied from 18% to 69%. There was no difference in response rates between participants recruited from family medicine versus pediatrics practices, but response rates were significantly higher among those recruited from private practices compared with public practices (55% vs. 34%, $p < 0.01$). Data on non-respondents was not available. Table 1 demonstrates the respondents' characteristics.

3.2. Intervention vs. control comparison

There were generally no differences between study arms with regard to any of the outcomes assessed (Table 2). The exception was asking permission to share vaccine information, a specific MI technique taught to intervention practices, which was reported more commonly among parents attending *control* practices than intervention (74% vs 53%, $p = 0.03$).

Table 1
Participant characteristics.

Characteristic	% (n) N = 342
Parent	
Age	
<40	27% (91)
40–49	52% (174)
50+	21% (69)
Sex	
Male	9% (30)
Female	91% (306)
Race	
White	77% (251)
Black	4% (13)
Other	15% (48)
Asian	5% (16)
Hispanic	27% (89)
Education	
< High school	9% (30)
HS graduate	13% (43)
Some college	14% (47)
College grad/advanced degree	64% (2 1 7)
Income	
<50 k	27% (92)
50 k-99,999 k	19% (66)
100 k +	42% (1 4 3)
Don't Know/No answer	12% (41)
Adolescent	
Age	
<13 years	59% (2 0 2)
13 + years	41% (1 4 0)
Sex	
Male	50% (1 7 2)
Female	50% (1 7 0)
Insurance	
Public	31% (1 0 3)
Private	68% (2 2 9)
Other	1% (5)
Time since last well child check up	
Within the last year	95% (3 1 8)
Longer/Never/Not Sure	5% (17)

Percentages are out of non-missing values; n's may not total 342.

3.3. Associations with receipt of a "very strong" HPV vaccine recommendation

Table 3 demonstrates results from exploratory analyses of the relationship between parent report of receiving a "very strong" HPV vaccine recommendation from the provider (regardless of study arm) and the other study outcomes. Parents perceiving the provider's recommendation was "very strong" more frequently reported the use of a presumptive style for the recommendation and spending 5 min or longer discussing the vaccine than parents who did not receive a very strong recommendation. Receiving a very strong recommendation was also associated with greater perceived urgency for getting vaccinated, greater trust in the information received from the provider, decreased vaccine hesitancy, and increased vaccine receipt. There were no differences between parents who did or did not receive a very strong recommendation with regard to concerns about vaccine safety or efficacy, reporting that the provider explained things in a way that was easy to understand, or that the provider spent enough time on the topic. Among the subset of parents reporting that they were initially "very hesitant" or "somewhat hesitant" about the HPV vaccine (n = 159), those that received a very strong provider recommendation were significantly more likely to have had their adolescent vaccinated,

Table 2
Parents report of providers verbal HPV vaccine communication, parents' vaccine beliefs, and vaccine uptake/intention, intervention vs. control, (column % (n)).

	Overall N = 342	Intervention N = 180	Control N = 162	p-value
Parents' Report of Providers HPV Vaccine Verbal Communication				
Gave a "very strong" HPV vaccine recommendation	53% (167)	53% (88)	53% (79)	0.99
First brought up vaccines as if my child would get all the vaccines they were due for (presumptive)	81% (259)	80% (136)	83% (123)	0.56
Asked if OK to share what they knew about the vaccines (MI technique)**	**64% (66)**	**53% (26)**	**74% (40)**	**0.03**
Singled out HPV from other recommended vaccines	56% (164)	54% (83)	58% (81)	0.45
Listened carefully**	91% (96)	91% (47)	91% (49)	>0.999
Spent enough time on the topic**	86% (90)	87% (45)	85% (45)	0.81
Explained things about HPV vaccine in a way that was easy to understand**	87% (91)	85% (44)	89% (47)	0.54
Spent 4 min or less talking about HPV vaccination	62% (177)	61% (94)	62% (83)	0.87
Parentś Vaccine Perceptions				
I have concerns about HPV vaccine safety (% agree/strongly agree)	52% (168)	51% (85)	54% (83)	0.55
I do not think the HPV vaccine works very well (% agree/strongly agree)	17% (52)	18% (27)	17% (25)	0.91
I don't trust the HPV vaccine information provided by my child's medical office (% agree/strongly agree)	17% (52)	17% (28)	16% (24)	0.86
I do not think adolescent needs HPV vaccine now (% agree/strongly agree)	46% (147)	44% (74)	47% (73)	0.65
I do not think adolescent needs HPV vaccine ever (% agree/strongly agree)	20% (64)	18% (30)	22% (34)	0.37
Not at all hesitant about HPV vaccine after adolescent's most recent well child visit	38% (125)	38% (66)	38% (59)	0.94
Vaccination Uptake/Intention				
Parent reports adolescent got HPV vaccine	51% (171)	55% (96)	47% (75)	0.18
Very or Somewhat Likely to get their adolescent vaccinated at the next check-up*	60% (85)	63% (41)	58% (44)	0.53

Percentages are out of non-missing values; n's may not total 342. P-value is from Pearson's χ^2 test of association or Fisher's exact test.
Bolded values are statistically significant, $p < 0.05$.
* Among 141 parents who indicated their adolescent had not yet been vaccinated.
** Assessed only among parents (n = 106) indicating they had questions or concerns about the HPV vaccine they brought up at their adolescent's most recent well child encounter.

or to be "very likely" to receive it in the near future, than parents who had not received a very strong recommendation (68% vs. 36%, $p < 0.001$). This was also true when the analysis was limited to only "very hesitant" parents (n = 67, data not shown).

3.4. Association with receipt of a presumptive HPV vaccine recommendation

Parents whose provider used a presumptive style for the recommendation were more likely to perceive their provider's vaccine recommendation as "very strong," less likely to have concerns about the vaccine's safety, have lower vaccine hesitancy, and more likely to have their child vaccinated (Table 4) than parents whose provider did not use a presumptive recommendation style. There were no differences between parents who did or did not receive a presumptive recommendation in perceiving whether the provider explained the topic in a way that was easy to understand or spent enough time on it, urgency for vaccination, perceptions about vaccine efficacy, or whether the information provided was trustworthy. Among the subset of parents reporting that they were initially "very hesitant" or "somewhat hesitant" about the HPV vaccine, those that received a presumptive recommendation were significantly more likely to have had their adolescent vaccinated or be "very likely" to receive it in the near future than parents who had not received a presumptive recommendation (55% vs. 31%, $p = 0.02$). This association was no longer significant when the analysis was limited to "very hesitant" parents ($p = 0.15$).

4. Discussion

In our randomized, controlled trial of a 5-component provider communication intervention the communication training seemed to be a key aspect used by intervention providers [10,16]. Yet, results from this analysis did not show significant differences between parents from control and intervention practices in their perceptions of how their provider communicated their HPV vaccine recommendations. Parents from both groups reported a similar likelihood of receiving a very strong recommendation delivered in a presumptive style, and reported similar vaccination attitudes, acceptance and uptake after their visit.

These results contrast those from the randomized controlled trial that showed a 9.5 absolute percentage point increase in HPV vaccine series initiation, and a 4.5 percentage point increase in HPV vaccine series completion among adolescents in intervention practices compared with control [16]. We hypothesize that two reasons likely underlie this discrepancy. First, several of the communication techniques we sought to assess (e.g. presumptive recommendation, use of MI) do not have validated measures. Given that these communication techniques are somewhat nuanced and may therefore be difficult to adequately explain in survey format, it is possible that our assessment measures did not adequately capture the actual communication techniques used by providers in the practices. This could have led to inaccurate assessments of these activities that could have varied by arm since only the intervention arm was primed (i.e. received prior information and training) about the specific vaccine communication techniques that were assessed. Secondly, with a response rate of 47%, there is the possibility of bias in the sample. Parents with more positive (or more negative) attitudes about the vaccine or the provider could have been more likely to respond to the survey. That fact that vaccine uptake was assessed by parent report rather than record review could have also contributed to this discrepancy. It is notable that simultaneously collected data from a corresponding survey of study *providers did* show significant increases in the likelihood of using a presumptive communication style and MI techniques among intervention practices compared with controls (manuscript under review). However, it is interesting to consider that this lack of parent-reported difference could actually be real, and that other mechanisms besides provider communication underlies the success of the "provider communication intervention" we tested. It will be important to replicate the intervention in other studies to understand this more definitively.

Despite there being no differences between study arms in essentially any of our outcome measures, our study does provide further evidence on the importance and utility of using a presumptive recommendation style and "strong" language to communicate

Table 3
Parents receipt of a "very strong" HPV vaccine communication and reported provider verbal communication, parent vaccine beliefs, and vaccine uptake/intention, (column % (n)).

	Very strong recommendation (N = 167)	Other strength recommendations (N = 146)	p-value
Parents' Report of Providers' HPV Vaccine Verbal Communication			
First brought up vaccines as if my child would get all the vaccines they were due for (presumptive)	**87% (142)**	**76% (82)**	**0.02**
Singled out HPV from other recommended vaccines	57% (89)	59% (65)	0.74
Listened carefully**	89% (41)	96% (46)	0.26
Spent enough time on the topic**	89% (41)	87% (41)	0.78
Explained things about HPV vaccine in a way that was easy to understand**	89% (41)	91% (43)	0.74
Spent 4 min or less talking about HPV vaccination	**50% (77)**	**75% (81)**	**<0.001**
Parents Vaccine Perceptions			
I have concerns about HPV vaccine safety (% agree/strongly agree)	46% (74)	55% (60)	0.16
I do not think the HPV vaccine works very well (% agree/strongly agree)	12% (19)	16% (16)	0.36
I don't trust the HPV vaccine information provided by my child's medical office (% agree/strongly agree)	12% (19)	21% (22)	0.07
I do not think adolescent needs HPV vaccine now (% agree/strongly agree)	**34% (54)**	**56% (62)**	**<0.001**
I do not think adolescent needs HPV vaccine ever (% agree/strongly agree)	16% (25)	21% (23)	0.24
Not at all hesitant about HPV vaccine adolescents now	**55% (88)**	**28% (31)**	**<0.001**
Vaccination Uptake/Intention			
Parent reported adolescent got HPV vaccine	**63% (104)**	**45% (51)**	**0.003**
Parent reported they are Very or Somewhat likely to get their adolescent vaccinated at the next check-up*	68% (36)	56% (30)	0.19

Percentages are out of non-missing values; n's may not total 342. P-value is from Pearson's χ^2 test of association or Fisher's exact test.
Bolded equals significant (Pp $\leq$ 0.05) results.
* Among 125 parents who indicated their adolescent had not yet been vaccinated.
** Assessed only among parents (n = 102) indicating they had questions or concerns about the HPV vaccine they brought up at their adolescent's most recent well child encounter.

Table 4
Receipt of a presumptive style HPV vaccine recommendation and reported provider verbal communication, parent vaccine beliefs, and vaccine uptake/intention, (column % (n)).

	Presumptive recommendation (N = 259)	Not presumptive recommendation (N = 60)	p-value
Parents' Report of Providers' HPV Vaccine Verbal Communication			
Recommendation perceived as "Very Strong"	**58% (142)**	**39% (21)**	**0.01**
Singled out HPV from other recommended vaccines	56% (129)	61% (31)	0.52
Listened carefully**	88% (69)	96% (23)	0.45
Spent enough time on the topic**	83% (65)	92% (22)	0.51
Explained things about HPV vaccine in a way that was easy to understand**	88% (68)	87% (20)	0.99
Spent 4 min or less talking about HPV vaccination	60% (136)	70% (35)	0.18
Parents Vaccine Perceptions			
I have concerns about HPV vaccine safety (% agree/strongly agree)	**49% (119)**	**67% (37)**	**0.01**
I do not think the HPV vaccine works very well (% agree/strongly agree)	16% (38)	21% (10)	0.42
I don't trust the HPV vaccine information provided by my child's medical office (% agree/strongly agree)	15% (35)	20% (11)	0.31
I do not think adolescent needs HPV vaccine now (% agree/strongly agree)	43% (104)	52% (29)	0.21
I do not think adolescent needs HPV vaccine ever (% agree/strongly agree)	19% (47)	22% (12)	0.69
Not at all hesitant about HPV vaccine now	**44% (110)**	**27% (15)**	**0.05**
Vaccination Uptake/Intention			
Parent reported adolescent got HPV vaccine	**56% (141)**	**38% (21)**	**0.01**
Parent reported they are Very or Somewhat likely to get their adolescent vaccinated at the next check-up*	63% (59)	50% (17)	0.17

Percentages are out of non-missing values; n's may not total 342. P-value is from Pearson's χ^2 test of association or Fisher's exact test.
Bolded equals significant (P < 0.05) results.
* Among 129 parents who indicated their adolescent had not yet been vaccinated.
** Assessed only among parents (n = 103) indicating they had questions or concerns about the HPV vaccine they brought up at their adolescent's most recent well child encounter.

about vaccines. Parents who reported receiving a presumptive or a strong HPV vaccine recommendation had more positive vaccination attitudes, lower vaccine hesitancy, and a higher likelihood of having their adolescent vaccinated. This study therefore adds to the growing body of evidence that for many parents, using a strong, presumptive recommendation style is an effective HPV vaccine communication strategy [4,17,18]. Qualitative data from our study [3] indicates that these communication strategies are easily incorporated into existing clinic workflows, and can often increase the efficiency of clinic visits. Thus, it may be important in the future to incorporate this skill into residency training programs and continuing medical education efforts related to improving vaccination in the primary care setting.

One consideration to recommending widespread use of a presumptive recommendation style is that such an approach could be perceived by some parents as overly paternalistic and thus

undermine the parent/provider relationship. This notion is supported by a study of parents of younger children showing that receipt of a presumptive vaccine recommendation from the provider was associated with *lower* overall visit satisfaction than when a "participatory" vaccine recommendation was provided [19]. Our results do not support this as a major concern for HPV vaccination. In our study parents reporting a presumptive HPV vaccine recommendation had similar perceptions about whether their child's provider spent enough time on the topic, and whether the information was trustworthy. Similar conclusions were also drawn from qualitative assessments of parents in our study, many of whom were vaccine hesitant [10]. However, to address this concern adequately, further research is needed to assess whether there are particular subsets of parents (e.g. highly vaccine hesitant) for whom receiving a presumptive recommendation would negatively impact their relationship with their child's provider.

In addition to the limitations described above, our results should be considered in light of other factors that could have influenced our conclusions. First, outcomes (including vaccination) were self-reported and therefore may not accurately reflect what the parent experienced. Parents were asked about these outcomes sometimes several months after their visit had occurred, which could result in recall bias, or parents attitudes could have changed in the intervening time period. Moreover, we were not able to link individual provider communication techniques used with individual patient visits – it is likely that providers varied from visit to visit in the types of HPV vaccine communication techniques used. In addition, our study was done in a single geographic area and therefore may not represent the broader primary care context. Some outcomes measures (i.e. vaccine hesitancy) were assessed with only one or a few items. However, as we describe above, many of our study findings are consistent with others' research.

5. Conclusions

In this study we found essentially no differences between control and intervention clinics in parents' reported experiences receiving HPV vaccine recommendations from their adolescent's provider, or in their vaccination perceptions or receipt. However, we did find associations between receiving a "very strong" HPV vaccine recommendation that was delivered using a presumptive style with more positive vaccination attitudes and increased vaccine utilization and intention. These results add to the growing body of research suggesting that strong language and a presumptive style are preferred communication strategies for primary care providers when making HPV vaccine recommendations.

All authors attest they meet the ICMJE criteria for authorship.

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Declaration of interest statement

We wish to acknowledge that none of the data in this manuscript has been published elsewhere, nor has it been submitted for consideration for publication to another journal simultaneously with this submission.

Role of the funding agency

This work was funded by the Centers for Disease Control and Prevention. This agency did not have any role in the study design, implementation, analysis or decision to submit for publication.

Conflicts of interest

Amanda Dempsey serves on Advisory boards for Merck and Pfizer. These companies played no role in this research study. Dr. Dempsey does not receive research support from either company. All other authors have no conflicts of interest to declare.

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