RESEARCH PAPER

Examining strategies for improving healthcare providers' communication about adolescent HPV vaccination: evaluation of secondary outcomes in a randomized controlled trial

Jenna E. Reno ^a, Jacob Thomas^a, Jennifer Pyrzanowski^a, Steven Lockhart^a, Sean T. O'Leary^a, Elizabeth J. Campagna^a, and Amanda F. Dempsey ^a

^aAdult and Child Consortium for Health Outcomes Research and Delivery Science (ACCORDS), University of Colorado Denver, Aurora, CO, USA

ABSTRACT

There is a critical need for campaigns and interventions to increase rates of human papillomavirus (HPV) vaccination among U.S. adolescents. Healthcare providers are key stakeholders in parents' HPV vaccine decision-making. The current study presents the evaluation of secondary outcomes in a multi-component communication-based intervention to improve healthcare providers' communication about HPV vaccination. Evaluation was conducted via surveys of providers participating in a 12-month randomized controlled trial. Findings suggest use of communication components (combined use of the presumptive approach [PA] with all patients, and motivational interviewing and a fact sheet with vaccine hesitant parents) contributed to providers in the intervention group reporting higher perceived levels of parental HPV vaccine acceptance than control providers, as well as increased vaccination rates in the intervention arm in the main RCT.

ARTICLE HISTORY

Received 31 August 2018
Revised 23 October 2018
Accepted 3 November 2018

KEYWORDS

HPV vaccination; patient-provider communication; communication intervention; evaluation

Introduction

While the human papillomavirus (HPV) vaccine is the best means for preventing cervical cancer (as well as other cancers including anogenital and oropharyngeal), rates of vaccination among adolescents in the US remain well below target levels of $\geq 80\%$.¹ As of 2017, only 44.3% and 53.1% of male and female adolescents, respectively, were current on their HPV vaccination series – significantly below rates of comparable adolescent vaccines such as Tdap and MenACWY.² Roughly 90% of US adolescents visit their primary care provider at least once a year – suggesting providers are missing opportunities to vaccinate for HPV.³

Previous research has demonstrated the importance of a provider recommendation to increasing HPV vaccination rates.^{4,5} However, research demonstrates that many providers fail to consistently deliver high quality, effective recommendations for the vaccine, especially for younger adolescents in the preferred target age range for vaccination (11–12 year olds),^{6,7} and to parents who appear vaccine hesitant. Thus, there is a need for strategies to help providers improve their communication about the vaccine and to effectively address parental HPV vaccine hesitancy,^{8,9} while still maintaining time efficiency during clinical visits.

One recommended communication strategy is to use a “presumptive” approach (PA) to start the vaccine conversation.^{10–12} This approach assumes parents will vaccinate their child, as opposed to giving the impression that HPV vaccination is unnecessary. Another preferred strategy is to use language that strongly conveys the importance and need for the vaccine at the time of the visit.^{9,13}

While these two strategies are likely effective for many parents, providers have few resources that are effective when these strategies fail. In response, we developed a 5-component provider communication intervention. This intervention was evaluated in a randomized controlled trial, which resulted in substantial improved HPV vaccine series initiation and completion among adolescents in the intervention arm compared to controls.¹⁴ The intervention was perceived by providers as useful for both vaccine hesitant and non-hesitant parents. This intervention included 1) communication training encouraging providers to open the HPV vaccine conversation using PA, followed by implementation of motivational interviewing (MI) techniques if vaccine hesitancy was encountered, 2) customized HPV vaccine fact sheets designed with the practices, 3) a set of disease images representing potential sequelae of HPV infection, 4) a paper decision aid for parents unsure of their vaccine decision, and 5) an educational tailored-messaging website for parents about HPV. A full description of the intervention (with examples) is available elsewhere.¹⁴

This manuscript describes the variability in providers' use of the various intervention components, and differences between control and intervention providers' HPV vaccine communication strategies, in order to understand the specific mechanisms by which the intervention impacted provider communication and subsequent vaccination rates.

We tested the following research question and hypotheses: 1) Which component(s) of the intervention are reported to be most effective? (i.e., perceived to lead to

vaccine acceptance)?; 2) Providers in the intervention group would use the preferred communication strategies of making “presumptive” and “strong” recommendations more frequently than control group providers; 3) Self-efficacy for discussing the vaccine with hesitant parents would be higher among intervention than control providers; 4) Because of the tools provided, the time spent discussing the HPV vaccine with parents would be shorter among intervention providers than control; 5) Providers in the intervention group will report greater improvement in parental HPV vaccine acceptance than control providers; 6) Providers in the intervention group will report fewer instances where parents refuse, request to delay, or otherwise express concerns about HPV vaccination.

Results

Participants

Completion rates across surveys ranged from 62% to 78%. Overall, 108 providers in the intervention group and 79 in the control group completed one or more surveys. Table 1 describes the respondents' characteristics.

Use of intervention components

Of the four “tangible” (i.e., not PA or MI) toolkit items assessed among the intervention group, the fact sheet was used most often. Providers reported on average using the fact sheet during

29.3% of vaccine-eligible patient visits post-intervention versus < 6% for the decision aid, disease images, and website. Use of the fact sheet was significantly correlated with high parental acceptance of the HPV vaccine, ($r_s = 0.41$, $p < .001$). Use of the disease images and vaccine acceptance approached significance ($r_s = 0.23$, $p = .06$). Further details of toolkit item use among intervention providers have been reported elsewhere.¹⁵

Use of PA and MI

Post-intervention, the intervention group demonstrated higher use of both the PA (78.2% vs. 61.2%, $p = .04$) and MI (see Table 2) than the control group. Of the MI skills measured, use of reflections and affirmations was higher among the intervention group versus control group (see Table 2).

Changes in strongly recommending the vaccine to 11–12 year-olds

Both the intervention group and control group saw similar increases from baseline to post-intervention in the percent of providers reporting *strongly* recommending the HPV vaccine to 11–12 year-olds (Intervention – Girls: 60.8% baseline, 86.1% post; Boys: 56.8% baseline, 83.5% post; Control – Girls: 58.7% baseline, 83.7% post; Boys: 53.3% baseline, 81.6% post). There were no differences in these outcomes between intervention and control groups for adolescents of either sex ($p = .99$ and $p = .87$, respectively).

Table 1. Demographics across surveys.

	Baseline		Post-Intervention	
	Control (N = 75)	Intervention (N = 74)	Control (N = 79)	Intervention (N = 108)
Respondents	All	All	62% (49)	78% (79)
Respondents with ≥ 1 HPV vaccine eligible visit	Not assessed	Not assessed	Not assessed	84% (66)
Type of Practice				
Private	77% (58)	50% (37)	80% (63)	52% (53)
Public	23% (17)	50% (37)	20% (16)	48% (48)
Gender				
Female	77% (57)	78% (58)	76% (60)	75% (76)
Role				
MD	56% (42)	73% (54)	52% (41)	75% (76)
DO			13% (10)	10% (10)
Nurse Practitioner	20% (15)	9% (7)	27% (21)	15% (15)
Physician Assistant	24% (18)	18% (13)	9% (7)	0% (0)

Results reported as column-% (N).

Table 2. Percentage of providers who reported using motivational interviewing (MI) skills most of the time (> 75%), post-intervention.

Use of MI Techniques	Control	Intervention	p-value
Reflections (e.g. What I hear you saying is....)			
Most of the time (> 75%)	12% (6)	28% (19)	0.05
Affirmation (e.g. you're not the type of person who just rushes into a decision; That's a very good question! You are right about that. Nobody knows your child like you do.)			
Most of the time (> 75%)	10% (5)	28% (19)	0.02
Ruler (e.g. on a scale of 0–10 with 0 meaning you are not at all ready and 10 meaning you are completely ready to vaccinate, where would you say you are? Why not a lower number?)			
Most of the time (> 75%)	2% (1)	4% (3)	0.64
Metaphors or hypothetical scenarios (e.g. when you are riding a bicycle when do you put on your helmet, before you get on the bike or after you've crashed?)			
Most of the time (> 75%)	12% (6)	16% (11)	0.57
Open-ended questions (e.g. what questions, if any, do you have?; What information would be most helpful for you right now)			
Most of the time (> 75%)	61% (30)	55% (38)	0.51
Get Permission (e.g. Is it OK if I share with you why I think the vaccine is important?)			
Most of the time (> 75%)	10% (5)	20% (14)	0.14

Bolded items highlight statistically significant differences between study arms.

Time spent and self-efficacy

There were no significant differences between intervention and control groups in changes in the time spent discussing HPV vaccines with hesitant parents or non-hesitant parents (see Table 3). Although results also did not reach statistical significance for differences between study arms in the self-efficacy measures (see Table 4), there was a notably larger change among intervention than control providers in the proportion disagreeing with the statement “When parents wish to delay or refuse... there is not much I can say to change their minds” ($\Delta + 14$ percentage points intervention, $\Delta -2$ percentage points control).

Provider reported acceptance of HPV vaccine

Post-intervention, more providers in the intervention group reported high parental HPV vaccine acceptance (accepted the

HPV vaccine without question most of the time [$> 75\%$]) compared to control (46% vs 29%, respectively); however, the change in parental vaccine acceptance over time was not statistically significant between groups (+15 percentage points for intervention, +9 percentage points for control; $p = .22$). In the intervention group alone, providers’ reported use of PA was significantly associated with greater instances of reported high parental HPV vaccine acceptance at post-intervention ($p = .003$). Among those in the intervention group who used PA, 50.8% of providers reported parents accepted the vaccine “most of the time”, versus only 29.4% of providers in the intervention group who did not use PA.

Parent reactions to HPV vaccine communication

There was a significant association between study arm and the proportion of reported “parents express[ing] concerns about HPV vaccination” post-intervention (see Table 5) – wherein

Table 3. Time spent discussing HPV vaccination with hesitant parents.

Rate of time spent discussing with children with mental problems							
	Control			Intervention			p*
	% (n)			% (n)			
	Baseline	Post	Δ	Baseline	Post	Δ	
Substantial concerns							0.77
≤4 minutes	36% (27)	39% (19)	+ 3%	34% (25)	37% (29)	+ 3%	
5–9 minutes	55% (41)	53% (26)	–2%	59% (43)	51% (40)	–8%	
>9 minutes	9% (7)	8% (4)	–1%	7% (5)	12% (9)	5%	
Typical							0.18
≤4 minutes	88% (66)	90% (44)	+ 2%	86% (63)	96% (75)	+ 10%	
>4 minutes	12% (9)	10% (5)	–2%	14% (10)	4% (3)	–10%	

*p-value indicates comparisons of changes over time (Δ) between control and intervention.

Table 4. Providers’ self-efficacy for communicating about the HPV vaccine.

	Control			Intervention			p*
	% (n)			% (n)			
	Baseline	Post	Δ	Baseline	Post	Δ	
I am usually able to convince hesitant parents to accept HPV vaccination for their child.							
Strongly agree/Somewhat agree	93% (54)	90% (44)	−3%	82.5% (66)	88% (69)	+ 5.5%	0.28
Strongly disagree/Somewhat disagree	7% (4)	10% (5)	+ 3%	17.5% (14)	12% (9)	−5.5%	
When parents wish to delay or refuse HPV vaccination for their child there is not much I can say to change their minds.							
Strongly agree/Somewhat agree	43% (25)	45% (22)	+ 2%	47% (38)	33% (26)	−14%	0.21
Strongly disagree/Somewhat disagree	57% (33)	55% (27)	−2%	53% (43)	67% (52)	+ 14%	

*p-value indicates comparisons of changes over time (Δ) between control and intervention.

Table 5. Parent reactions to providers’ HPV vaccine recommendation, post-intervention.

	Control	Intervention	p-value
Parents expressed concerns about HPV vaccination			
Most of the time ($>75\%$)	–	–	< 0.01
Often (51–75%)	29% (14)	14% (11)	
Sometimes (26–50%)	53% (26)	42% (33)	
Rarely/Never (0–25%)	18% (9)	44% (34)	
Parents appeared offended or angry that you brought up the topic			
Most of the time ($>75\%$)	–	–	0.21
Often (51–75%)	–	1% (1)	
Sometimes (26–50%)	6% (3)	1% (1)	
Rarely/Never (0–25%)	94% (45)	98% (76)	
Requested to delay the HPV vaccination until a future visit			
Most of the time ($>75\%$)	6% (3)	4% (3)	0.44
Often (51–75%)	16% (8)	14% (11)	
Sometimes (26–50%)	57% (28)	49% (38)	
Rarely/Never (0–25%)	20% (10)	33% (26)	
Refused HPV vaccination for their child			
Most of the time ($>75\%$)	–	1% (1)	0.96
Often (51–75%)	2% (1)	3% (2)	
Sometimes (26–50%)	35% (17)	36% (28)	
Rarely/Never (0–25%)	63% (31)	60% (47)	

the control group reported higher instances of parental expressing concern about the vaccine. There were no statistically significant differences found between study groups in providers reporting that parents: 1) appeared offended or angry regarding the vaccine recommendation, 2) requested to delay the vaccine, or 3) refused the vaccine (see Table 5).

Discussion

In the larger trial, upon which this study was a part, there were significantly higher HPV vaccination rates among intervention clinics¹⁴ than control. This corresponds to the results from the current analysis showing that providers in the intervention group reported higher perceived levels of parental HPV vaccine acceptance than control providers. While both the control and intervention cohorts reported similar increases over time in strongly recommending the vaccine to 11–12 year olds, it appears that among the intervention cohort the combined use of the PA with all patients, and MI and the fact sheet with vaccine hesitant parents is the main mechanism by which the intervention improved HPV vaccination rates. These results are echoed by a survey conducted with parents who attended the intervention clinics during the study who indicated that PA along with a strong recommendation for the HPV vaccine increased their willingness to accept the vaccine (A. F. Dempsey, et al. unpublished data, 2018).

Unsurprisingly, use of some of the MI techniques assessed (e.g., reflections and affirmations) was higher among intervention providers than control providers. This is to be expected since intervention providers were taught these techniques specifically. In contrast, there were no statistically significant differences found between intervention and control groups' use of other MI techniques such as open-ended questions and asking permission. This may be due to the fact that these skills are widely taught and promoted by medical schools and other health professional training programs as fundamental communication strategies.^{16,17} It is possible that the MI training in future iterations of the intervention could be made shorter by highlighting only those skills that differed between control and intervention groups. Future research is needed to assess if an MI training with only selected techniques is similarly effective.

Previous research has suggested that providers inconsistently use a PA to communicate HPV vaccine recommendations because they may anticipate hesitancy or pushback from parents.¹⁸ Such disinclination is not surprising given medical training and practice often emphasize “shared decision-making,”¹⁹ which may be perceived as counter to the PA style. An important finding of our study, therefore, is that providers in the intervention group did not have significantly more reported instances of parents appearing “offended or angry” when HPV vaccines were brought up in this manner. This suggests that for many parents, providers' concerns about using the PA may be unfounded.

The intervention group also reported significantly fewer instances of parents “express[ing] concerns about HPV vaccination.” We hypothesize that this result may also be attributed to use of the PA, which is meant to promote vaccine acceptance as the norm, and could therefore increase parents' perceived confidence in the providers' HPV vaccine recommendation.

This hypothesis is supported by previous research that suggests the healthcare providers' recommendations are a key influencer in vaccine acceptance.^{4,8,10,12} Yet, despite reports of more parents accepting the HPV vaccine and fewer parents expressing concerns, providers in the intervention group did not demonstrate statistically significant increases in their self-efficacy related to recommending the HPV vaccine. This may be due to the number of parents who still reportedly refuse the vaccine. Alternatively, our sample size may be too small to detect statistically significant changes between groups as there was a notable difference in both the magnitude and direction of change in one of the self-efficacy measures among the intervention providers compared to control.

No significant differences were found between groups pertaining to reports of the number of parents who requested to delay the vaccine or refused the vaccine. While those in the intervention group demonstrated higher self-report of patient acceptance of the vaccine, they did not report significantly lower numbers of patient refusal or wish to delay. Thus, although the intervention seems to be efficacious for addressing parent HPV vaccine hesitancies, it may not address HPV vaccine refusal. However, the small sample size of providers in the study limited our statistical power to detect differences in this outcome, so results should be interpreted with caution. Additionally, future research is needed to identify communication strategies effective for effectively mitigating concerns among parents who refuse the vaccine.

Finally, while providers may have concerns about the amount of time needed to have MI types of discussions with HPV vaccine hesitant parents, we found no significant differences between the control and intervention groups regarding provider-reported time spent discussing the vaccine with hesitant patients. Thus, even though providers in the intervention group reported greater use of MI than control providers, they did not report corresponding increases in time spent having conversations about the HPV vaccine with parents who expressed substantial concerns. This finding is important for underscoring the feasibility of implementing our intervention in other settings.

Limitations

A major limitation of this study is the relatively small sample size. Although, we surveyed the majority (> 90%) of the providers working in participating clinics, the overall number of participants in each group was low. This means that differences in outcomes were limited in their power to detect significance – potentially leading to false negatives (i.e., type II errors). Further, it is unknown the extent to which differences in practice setting and provider type between control and intervention groups may have impacted results.

In addition, outcomes are based on provider self-report and may be associated with reporting bias – especially, in regard to survey items that are difficult to quantify and that we were unable to otherwise confirm for accuracy (e.g., time spent with patients, frequency of parent responses, etc.). However, our results correlate well with the results from the main randomized controlled trial¹⁴ as well as qualitative interviews²⁰ and quantitative surveys of parents and providers (A. F. Dempsey, et al., unpublished data, 2018).

Conclusion

Overall, findings of the current study suggest that interventions aimed at improving providers' communication skills can increase not only perceived rates of HPV vaccine acceptance but also, as demonstrated by our larger randomized trial, actual vaccination rates. Specifically, in this instance it appears that use of PA with all parents, along with use of the fact sheet and MI techniques with HPV vaccine-hesitant parents may have the greatest impact on improving HPV vaccine acceptance. Thus, future research should examine the effectiveness of a streamlined version of our intervention, focusing on communication skills training and fact sheets to determine if effectiveness is similar to the 5-component toolkit tested here. Communication-based interventions have the potential to provide a critical solution to low use of HPV vaccination among adolescents.

Methods and materials

Toolkit components

As described above, the intervention toolkit consisted of five components. These have been described in detail previously.^{14,15,21} The control arm received surveys (described below) and otherwise conducted usual care during the intervention time period.

Participants

Participants included 187 providers from 16 practices (8 intervention, 8 control) recruited for the original trial¹⁴ from a central Colorado practice-based research network (Colorado Children's Outcomes Network). Practice eligibility criteria for the trial included having: 1) ≥ 400 active adolescent patients, 2) baseline HPV vaccination rates $\leq 80\%$, and 3) HPV vaccines available at the clinic. Control and intervention providers received both a baseline (August – December 2014) and post-intervention (January 2016) survey via email or in person to assess the outcomes of interest, which were self-reported. Providers in the intervention arm received four additional serial surveys over a 12-month period to assess intervention use over time (data not included in this manuscript). Baseline and post-intervention surveys were obtained from different but overlapping sets of providers (i.e., many but not all providers who were invited to complete surveys completed both surveys). All research activities were approved by the University of Colorado Institutional Review Board.

Outcome measures

Use of individual intervention components

Use of four of the five intervention components was assessed among intervention providers only (exception was PA/MI, described below). Providers were asked to report their estimated total number of HPV vaccine-eligible visits for the past month and to also estimate the total number of those eligible visits wherein they used each toolkit item.

Use of PA and MI

Use of the PA of vaccine recommendation and MI were measured in a different way than the other toolkit items and were assessed in both study arms, recognizing that some providers in the control group may have spontaneously adopted one or both of these verbal communication techniques. PA was measured with one item querying, "When bringing up the HPV vaccine for the first time with parents of 11–12 year-old patients, please select the approach that best describes your current practice." Responses included the following: 1) I first ask parents a question, such as: "Are you interested in getting the HPV vaccine for your child today?" (PARTICIPATORY APPROACH); 2) I first tell parents what to expect, such as: "we've got three vaccines today: Tdap, HPV, and Meningococcal vaccine." (PRESUMPTIVE APPROACH); 3) I use both approaches equally (PRESUMPTIVE and PARTICIPATORY); 4) I don't generally bring up the vaccine because we have a standing order for these vaccines. So, the only parents I discuss the vaccines with are ones I already know have questions; and 5) I don't generally bring up the vaccine at 11–12 year-old visits because most parents don't accept it anyway. For the purposes of this analysis, only people who chose the second option were categorized as consistently using PA. All other answers were categorized as not consistently using PA. MI was assessed by having providers respond to a series of questions that asked how often they used MI-specific techniques, including: open-ended questions, reflections, affirmations, ruler-method, metaphors or hypothetical scenarios, and getting permission. For each item responses included "Most of the time ($> 75\%$)," "Often (51–75%)," "Sometimes (26–50%)," and "Rarely/Never (0–25%)." MI and PA use was assessed specifically in the post-intervention survey.

Strong HPV vaccine recommendations for 11–12 year-olds

Providers in both intervention and control groups reported at baseline and post-intervention their standard routine for recommending the HPV vaccine for 11–12 year-olds, separately for girls and boys. Providers were prompted "Please tell us what your current practice is with respect to recommending the HPV vaccine for each of the groups listed." Response items included: 1) "Strongly recommend the vaccine", 2) "Recommend the vaccine, but not strongly", 3) "Make no recommendation," and 4) "Recommend against the vaccine".²²

Self-efficacy

Providers' self-efficacy for influencing parents' decisions to vaccinate was measured at baseline and post-intervention in both the intervention and control groups using 3 items: "I am usually able to convince hesitant parents to vaccinate their child;" "When parents wish to delay or refuse HPV vaccination for their child there is not much I can say to change their minds;" and "I am influential in parents' decision about whether or not to get the HPV vaccine for their child." Responses consisted of a 4-point Likert scale ranging from "Strongly Agree – Strongly Disagree."

Time with patients

Providers in both intervention and control groups were asked at baseline and post-intervention to report how much time they spent discussing the HPV vaccine with "typical" parents

and “parents with substantial concerns” (hesitant parents), and also, time spent discussing the Tdap vaccine (as a comparator vaccination discussion that is not typically problematic). Responses included “No time or someone else discusses”, “≤4 minutes”, “5–9 minutes”, “10–14 minutes”, “15–19 minutes”, and “≥20 minutes”.

Provider reported acceptance of HPV vaccine

Providers in both the intervention and control groups were asked at baseline and post intervention to report how often parents accepted their recommendation of the HPV vaccine using the item: “Please think about times during the last year that you have recommended HPV vaccine to parents of girls and boys 11–12 years old. How often did parents react in the following ways? – Accepted the recommendation for HPV vaccination without question.” Responses included “Most of the time (> 75%),” “Often (51–75%),” “Sometimes (26–50%),” and “Rarely/Never (0–25%).”

Parent reactions to HPV vaccine communication

In addition to measuring HPV vaccine acceptance without question, providers in both the intervention and control groups were asked in the post-intervention survey to report on other responses to an HPV vaccine recommendation. The following prompt was used: “Please think about times during the last year that you have recommended HPV vaccine to parents of girls and boys 11–12 years old. How often did parents react in the following ways?”. Measured reactions included: 1) “Requested to delay the HPV vaccination until a future visit”, 2) “Refused HPV vaccination for their child”, 3) “Expressed concerns about HPV vaccination”, and 4) “Appeared offended or angry that you brought up the topic”. Responses included “Most of the time (> 75%),” “Often (51–75%),” “Sometimes (26–50%),” and “Rarely/Never (0–25%).”

Data analysis

Frequency distributions were used to summarize survey questions. Chi-square tests, Fisher’s exact test, and t-tests were used for comparisons when appropriate. Spearman correlations were used to test the association between Likert-style questions that were kept on a continuous scale. Logistic regression analyses were used to compare the change from baseline to post-intervention between control and intervention (i.e. difference in differences analysis), including analyses of the variables for: 1) Strong HPV Vaccine Recommendations for 11–12 year-olds; 2) Self-efficacy; 3) Time with Patients; and 4) Provider Reported Acceptance of HPV Vaccine. All reported p-values are from two-sides hypothesis tests; statistical significance was defined at $\alpha = 0.05$. All analyses used SAS software, Version 9.4 (SAS Institute Inc, Cary, NC, USA).

Disclosure of potential conflicts of interest

Amanda Dempsey serves as a consultant on advisory boards for Merck & Co., and Pfizer Inc. She does not receive research support from either of these companies nor did they play any role in this research. All other authors have no conflicts of interest to declare.

Funding

The funding source for this study was the Centers for Disease Control and Prevention (5U01IP000801), who provided input into the main study (randomized controlled trial) design and data interpretation. The funding source had no direct involvement in this manuscript.

ORCID

Jenna E. Reno <http://orcid.org/0000-0003-3343-8108>

Amanda F. Dempsey <http://orcid.org/0000-0001-7085-6259>

References

1. US Department of Health and Human Services. Healthy People 2020. Washington (DC): Office of Disease Prevention and Health Promotion; 2010. <https://www.healthypeople.gov>.
2. Walker TY, Elam-Evans LD, Yankey D, Markowitz LE, Williams CL, Mbaeyi SA, Fredua B, Stokley S. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years — United States, 2017. *MMWR Morb Mortal Wkly Rep*. 2018;67:909–917. doi:10.15585/mmwr.mm6733a1.
3. National Center for Health Statistics. Ambulatory care use and physician office visits. Centers for Disease Control and Prevention; 2018. <https://www.cdc.gov/nchs/fastats/physician-visits.htm>.
4. Dorell C, Yankey D, Kennedy A, Stokley S. 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. doi:10.1177/0009922812468208.
5. Kester LM, Zimet GD, Fortenberry JD, Kahn JA, Shew ML. A national study of HPV vaccination of adolescent girls: rates, predictors, and reasons for non-vaccination. *Matern Child Health J*. 2013;17(5):879–885. doi:10.1007/s10995-012-1066-z.
6. Bratic JS, Seyferth ER, Bocchini JA. Update on barriers to human papillomavirus vaccination and effective strategies to promote vaccine acceptance. *Curr Opin Pediatr*. 2016;28(3):407–412. doi:10.1097/MOP.0000000000000353.
7. Vadaparampil ST, Malo TL, Sutton SK, Ali KN, Kahn JA, Casler A, Salmon D, Walkosz B, Roetzheim RG, Zimet GD, et al. Missing the target for routine human papillomavirus vaccination: consistent and strong physician recommendations are lacking for 11–12 year old males. *Cancer Epidemiol Prev Biomark*. 2016;25(10):1435–1446. doi:10.1158/1055-9965.EPI-15-1294.
8. Zimet GD. Health care professionals and adolescent vaccination. A call for intervention research. *Hum Vaccines Immunother*. 2014;10(9):2629–2630. doi:10.4161/hv.28525.
9. Dempsey AF, Pyrzanowski J, Lockhart S, Campagna E, Barnard J, O’Leary ST. Parents’ perceptions of provider communication regarding adolescent vaccines. *Hum Vaccines Immunother*. 2016;12(6):1469–1475. doi:10.1080/21645515.2016.1147636.
10. Brewer NT, Hall ME, Malo TL, Gilkey MB, Quinn B, Lathren C. Announcements versus conversations to improve HPV vaccination coverage: A randomized trial. *Pediatrics*. 2017;139(1):e20161764. doi:10.1542/peds.2016-1764.
11. Leask J, Kinnersley P. Physician communication with vaccine-hesitant parents: The start, not the end, of the story. *Pediatrics*. 2015;136(1):180–182. doi:10.1542/peds.2015-1382.
12. Opel DJ, Heritage J, Taylor JA, Mangione-Smith R, Salas HS, Devere V, Zhou C, Robinson JD. The architecture of provider-parent vaccine discussions at health supervision visits. *Pediatrics*. 2013;132(6):1037–1046. doi:10.1542/peds.2013-2037.
13. Gilkey MB, Calo WA, Moss JL, Shah PD, Marciniak MW, Brewer NT. Provider communication and HPV vaccination: The impact of recommendation quality. *Vaccine*. 2016;34(9):1187–1192. doi:10.1016/j.vaccine.2016.01.023.
14. Dempsey AF, Pyrzanowski J, Lockhart S, Barnard J, Campagna EJ, Garrett K, Fisher A, Dickinson LM, O’Leary ST. Effect of a health care professional communication training intervention on adolescent human papillomavirus vaccination: A cluster randomized

- clinical trial. *JAMA Pediatr.* 2018;172(5):e180016. doi:[10.1001/jamapediatrics.2018.0016](https://doi.org/10.1001/jamapediatrics.2018.0016).
15. Reno JE, O'Leary S, Garrett K, Pyrzanowski J, Lockhart S, Campagna E, Barnard J, Dempsey AF. Improving provider communication about HPV vaccines for vaccine-hesitant parents through the use of motivational interviewing. *J Health Commun.* 2018;23(4):313–320. doi:[10.1080/10810730.2018.1442530](https://doi.org/10.1080/10810730.2018.1442530).
 16. Cegala DJ, Lenzmeier Broz S. Physician communication skills training: A review of theoretical backgrounds, objectives and skills. *Med Educ.* 2002;36(11):1004–1016. doi:[10.1046/j.1365-2923.2002.01331.x](https://doi.org/10.1046/j.1365-2923.2002.01331.x).
 17. Ha JF, Longnecker N. Doctor-patient communication: A review. *Ochsner J.* 2010;10(1):38–43. doi:[10.1043/toj-09-0040.1](https://doi.org/10.1043/toj-09-0040.1).
 18. Sturm L, Donahue K, Kasting M, Kulkarni A, Brewer NT, Zimet GD. Pediatrician-parent conversations about human papillomavirus vaccination: An analysis of audio recordings. *J Adolesc Health.* 2017;61(2):246–251. doi:[10.1016/j.jadohealth.2017.02.006](https://doi.org/10.1016/j.jadohealth.2017.02.006).
 19. Levine DM, Landon BE, Linder JA. Trends in patient-perceived shared decision making among adults in the United States, 2002–2014. *Ann Fam Med.* 2017;15(6):552–556. doi:[10.1370/afm.2132](https://doi.org/10.1370/afm.2132).
 20. Lockhart S, Dempsey AF, Pyrzanowski J, O'Leary ST, Barnard JG. 2018. Provider and parent perspectives on enhanced communication tools for human papillomavirus vaccine-hesitant parents. *Acad Pediatr.* 18:776–782.
 21. Reno JE, O'Leary ST, Pyrzanowski J, Lockhart S, Thomas J, Dempsey AF. Evaluation of the implementation of a multi-component intervention to improve healthcare provider communication about HPV vaccination. *Acad Pediatr.* 2018;18:882–888. pii: S1876-2859(18)30525-4. doi:[10.1016/j.acap.2018.08.004](https://doi.org/10.1016/j.acap.2018.08.004).
 22. Daley MF, Crane LA, Markowitz LE, Black SR, Beaty BL, Barrow J, Babbel C, Gottlieb SL, Liddon N, Stokley S, et al. Human papillomavirus vaccination practices: Survey of US physicians 18 months after licensure. *Pediatrics.* 2010;126(3):425–433. doi:[10.1542/peds.2009-3500](https://doi.org/10.1542/peds.2009-3500).