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Wording Matters When Pediatricians Recommend HPV Vaccination

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Wording Matters When Pediatricians Recommend HPV Vaccination

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1 INTRODUCTION

2
3 Human papillomavirus (HPV) vaccination prevents infection from highly
4 prevalent papillomaviruses that cause genital warts and the high-risk HPV
5 types that cause an estimated 91% of cervical and anal, 75% of vaginal,
6 69% of vulvar, 63% of penile, and 70% of oropharyngeal cancers.¹
7 However, over 15 years after Food and Drug Administration approval and
8 the recommendation in 2006 by the Centers for Disease Control and
9 Prevention (CDC) Advisory Committee on Immunization Practices, HPV
10 vaccine initiation (receipt of ≥ 1 HPV vaccine dose) among 13- to 17-year-
11 olds remains suboptimal for both US females (77.1%) and males (73.1%),²
12 and completion rates remain below the Healthy People 2030 goal of 80%.³
13 While the CDC endorses a bundled approach to HPV vaccination at all 11-
14 and 12-year-old visits,⁴ a 2014 survey conducted among pediatricians and
15 family physicians found that 27% did not strongly endorse HPV vaccination
16 and 26% did not provide timely recommendations.⁵ In addition, 22.5% of
17 parents in the 2018 national NIS-Teen survey reported that they did not
18 receive a provider recommendation for HPV vaccine.⁶ A 2015 systematic
19 review of provider communication reported evidence that when physicians
20 did recommend HPV vaccination, they used a qualified recommendation for
21 HPV vaccine compared with other adolescent vaccines. Although
22 physicians delivered more consistent HPV vaccination recommendations
23 with increasing adolescent age, they missed opportunities to target 11- and
24 12-year-old patients, the recommended age to initiate the vaccine.⁷

25 Physician recommendation is a primary determinant of HPV
26 vaccination initiation, mediating parental awareness of HPV vaccination and
27 vaccination behaviors.⁸⁻¹⁰ A qualitative study assessed 43 provider-parent
28 discussions and reported that clear, presumptive physician
29 recommendations and providers' personal endorsements led to higher HPV
30 vaccine uptake among adolescents.⁹ Underscoring the importance of
31 physician recommendation regarding HPV vaccination, the CDC and the
32 American Academy of Pediatrics endorse a presumptive, bundled
33 approach, in which the provider presents HPV vaccination bundled between
34 Tdap and meningococcal at all 11- or 12-year-old visits.¹¹ The CDC
35 promotes this recommendation method, describing it in provider education
36 materials as the "Same Way, Same Day" approach.

37 This study examined the association between HPV vaccination
38 initiation, physician characteristics associated with recommendation style,
39 and how pediatricians deliver HPV vaccination recommendations to parents
40 of adolescents, particularly focused on the recommended initiation age
41 group (11-12 years). Specifically, we examined how providers describe their

HPV vaccination recommendation word choice and the effect of different pediatricians' recommendation approaches on increasing HPV vaccination initiation among patients 11-12 years old based on electronic health records (EHRs). Examining physician characteristics associated with HPV vaccination recommendation style, as well as effect of HPV vaccination recommendation framing on HPV vaccination initiation outcomes, among 11- and 12-year-olds will inform physician-targeted interventions aimed at increasing effectiveness of provider recommendations delivered to parents of younger adolescents.

METHODS

We conducted a cross-sectional, observational study of pediatricians (n=134) who provide primary care to adolescents between 11–12 years of age to examine the effect of pediatrician recommendation wording on HPV vaccination initiation. We linked patient-level data from a large pediatric system's EHRs with pediatrician-level data from a provider survey assessing correlates of HPV vaccination recommendation practices. The pediatric clinic network comprises 51 clinics in the greater Houston, Texas, area, with more than 200 board-certified pediatricians. As one of the largest networks of pediatric practices in the US in one of the most ethnically diverse cities, the pediatric network provides full-service care to a diverse population.

We examined medical record of patients meeting the following eligibility criteria: patients had not initiated HPV vaccination as of October 1, 2014, patients had attended a pediatrician visit between October 1, 2014, and September 30, 2015, and their pediatrician completed an HPV vaccination survey. This study was conducted as part of a larger, multilevel program targeting clinic systems, pediatricians, and patients to improve HPV vaccination rates. This collaborative effort included the clinic network leadership, The University of Texas School of Public Health, and Baylor College of Medicine. The study was approved by the Institutional Review Board at The University of Texas Health Sciences Center at Houston and the Institutional Review Board at Baylor College of Medicine.

PEDIATRICIAN SURVEY. The research team conducted a survey of all pediatricians practicing in the pediatric network. Pediatricians received an email link to an online survey between August and September 2015. The survey required fewer than 30 minutes to complete, and pediatricians received a \$50 electronic gift card upon completion.

The survey assessed pediatricians' vaccination practices, and experiences and perceptions of organizational and patient barriers when recommending HPV, Tdap, and meningococcal vaccinations for adolescents. Pediatricians were asked to respond to the question, "Choose the statement that is closest to how you typically introduce adolescent vaccinations during a pediatric patient visit" with the following response options: 1) "Your child is due for three vaccines, including the HPV vaccine"; 2) "Your child is due for two vaccines, Tdap and meningococcal. There is also the HPV vaccine, which is optional"; 3) "Your child is due for three vaccines: Tdap, HPV, and meningococcal vaccine"; 4) "Your child is due for Tdap and meningococcal vaccine, and we can discuss the HPV vaccine if you like"; and 5) "Other (specific)." The third choice, bundling HPV vaccination between the other adolescent recommended vaccines, exemplifies the CDC's guidelines for how pediatricians may deliver a brief, unqualified, strong HPV vaccine recommendation to parents of adolescents.¹¹

COVARIATES. The survey included questions on age, sex, race/ethnicity, years since completion of residency training, patient volume (number of patients seen in a typical day), and number of years working at the clinic. We used EHRs to identify patient characteristics, which included age, sex, parent-reported race/ethnicity, and type of health insurance (public or private/commercial).

OUTCOME VARIABLE. We used EHRs to obtain adolescent vaccination outcomes, including HPV, Tdap, and meningococcal vaccination. The main study outcome measure, HPV vaccination initiation, was a binary variable (yes/no) indicating whether each patient received the first dose of the HPV vaccine anytime within the 12-month study period.

ANALYSIS. Pediatrician characteristics are presented by comparing physicians whose patients' HPV vaccine initiation rates fell above or below the median percentage of eligible patients who initiated vaccination during the study period (<25% versus ≥25%). Patient characteristics are presented by HPV vaccine initiation status. Unadjusted, multilevel, generalized linear models were conducted with a logit link function with binomial distribution and randomly varying intercepts using patient-level HPV vaccination initiation clustered by treating physician to calculate the association between each patient- and physician-level characteristic and physician recommendation strategy with the odds of vaccination initiation. Next, we used a multivariable model that controlled for the physician and patient

characteristics associated with HPV vaccine initiation in univariable analyses. Multilevel models allowed for variation between patients across all groups and within each physician cluster. To characterize physician-level effects, a latent random variable was used to calculate the physician-specific probabilities of patient vaccination initiation. A significance level of $\alpha=0.05$ was selected. All analyses were conducted using SAS 9.4 software (Cary, NC).

RESULTS

A total of 134 pediatricians (59.8%) completed the survey (Table 1).

Table 1. Characteristics of Physicians (n=134), by the Percent of Patients Who Initiated HPV Vaccination

	Total physician population	Physicians with <25% of patients initiating HPV vaccine	Physicians with ≥25% of patients initiating HPV vaccine
	n (column %)	n (row %)	n (row %)
Total physician cohort	134 (100.0)	67 (50.0)	67 (50.0)
Physician demographics			
Age			
< 40	49 (36.6)	20 (40.8)	29 (59.2)
40-49	40 (29.9)	18 (45.0)	22 (55.0)
50-59	23 (17.2)	14 (60.9)	9 (39.1)
>60	22 (16.4)	15 (68.2)	7 (31.8)
Race/ethnicity			
Non-Hispanic White	67 (50.0)	35 (52.2)	32 (47.8)
Black	12 (9.0)	4 (33.3)	8 (66.7)
Hispanic	13 (9.7)	6 (46.2)	7 (53.9)
Other	23 (17.2)	11 (47.8)	12 (52.2)
Missing	19 (14.2)	11 (57.9)	8 (42.1)
Daily patient volume			
Less than 30	81 (60.5)	36 (44.4)	45 (55.6)
30 or more	46 (34.3)	27 (58.7)	19 (41.3)
Missing	7 (5.2)	4 (57.1)	3 (42.9)
Sex			
Female	94 (70.1)	44 (46.8)	50 (53.2)
Male	40 (29.9)	23 (57.5)	17 (42.5)
Time since residency (y)			
<5	15 (11.2)	7 (46.7)	8 (53.3)
5-9	30 (22.4)	10 (33.3)	20 (66.7)
10-14	31 (23.1)	14 (45.2)	17 (54.8)
>15	58 (43.3)	36 (62.1)	22 (37.9)
Work time at clinic (y)			
< 5	39 (29.1)	16 (41.0)	23 (59.0)

5-9	28 (20.9)	11 (39.3)	17 (60.7)
10-15	19 (14.2)	13 (68.4)	6 (31.6)
>15	41 (30.6)	23 (56.1)	18 (43.9)
Missing	7 (5.2)	4 (57.1)	3 (42.9)

Among those, the majority were female, under the age of 50, and non-Hispanic white. Most respondents saw fewer than 30 patients per day, and half had worked in their respective clinic for less than 10 years and practiced for more than 10 years since residency. Among the patients 11-12 years of age during the study period (n=18,117), an average of 24.8% of patients initiated the HPV vaccination series (Table 2). Pediatrician characteristics associated with increased odds of vaccination initiation included physicians' younger age, being female, and seeing less than 30 patients per day. Physicians with less than 25% of their patients initiating HPV vaccination were mostly over the age of 60, non-Hispanic white, and female. Compared with physicians under 40 years of age, the odds of adolescents' initiation were significantly lower among physicians between the ages of 50 and 59 (OR: 0.68, 95% CI: 0.49-0.93) and those 60 and older (OR: 0.59, 95% CI: 0.41-0.86). No other physician characteristics included in the multivariable model were statistically associated with HPV vaccination initiation.

Table 2. Patient Demographic Characteristics and HPV Vaccination Initiation
October 1, 2014–September 30, 2015 (n=18,117)

	Total patient population n (%)	Initiated vaccination* n (%)	Did not initiate vaccination n (%)	chi2 p-value
Total 11-12 year-olds	18,117 (100%)	4262 (23.5%)	13,855 (76.5%)	
Sex				0.039
Female	8791 (48.5)	2127 (24.2)	6664 (75.8)	
Male	9326 (51.5)	2135 (22.9)	7191 (77.1)	
Race/Ethnicity				<0.000
Non-Hispanic White	8193 (45.2)	1453 (17.7)	6740 (82.3)	
Black	2264 (12.5)	684 (30.2)	1580 (69.8)	
Hispanic	4457 (24.6)	1450 (32.5)	3007 (67.5)	
Other	3203 (17.7)	675 (21.1)	2528 (78.9)	
Insurance type				<0.000
Public	4279 (23.6)	1641 (38.4)	2638 (61.6)	
Private	13,838 (76.4)	2621 (18.9)	11,217 (81.1)	

*Patients who received the first HPV vaccine dose.

159 Table 3. Physician Self-reported HPV Vaccination Recommendation Style, by 2 HPV
 160 Vaccination Initiation Outcome Groups.

	Total physician population n (%)	Physicians with <25% of patients initiating HPV vaccine n (%)	Physicians with ≥25% of patients initiating HPV vaccine n (%)
Wording of physician recommendation*			
1. "Your child is due for three vaccines, including the HPV vaccine." (<i>Nonbundled approach</i>)	20 (14.9)	12 (60.0)	8 (40.0)
2. "Your child is due for two vaccines, Tdap and meningococcal. There is also the HPV vaccine, which is optional." (<i>Presumptive, nonbundled approach</i>)	32 (23.9)	24 (75.0)	8 (25.0)
3. "Your child is due for three vaccines: Tdap, HPV, and meningococcal vaccine." (<i>Presumptive, bundled approach</i>)	69 (51.5)	21 (30.4)	48 (69.6)
4. "Your child is due for the Tdap and meningococcal vaccine, and we can discuss the HPV vaccine if you would like." (<i>Nonbundled, participatory approach</i>)	4 (3.0)	4 (100)	0 (0.0)
5. Other	9 (6.7)	6 (66.7)	3 (33.3)

161 * Survey question for HPV recommendation outcomes: How do you typically
 162 introduce adolescent vaccinations during a pediatric patient visit?
 163
 164

165 Table 3 presents physicians' reported responses to the question
 166 regarding how they presented their HPV vaccination recommendation,
 167 comparing responses by two groups: the high vaccinators (greater than 25%
 168 of patients initiating) and the low vaccinators (less than 25% of patients
 169 initiating). Overall, 48.5% of physicians reported using a nonbundled
 170 approach to recommending HPV vaccination. Among physicians with 25%
 171 or more of their patients initiating the HPV vaccine, the top three
 172 recommendation styles reported were: 1) "Your child is due for three
 173 vaccines: Tdap, HPV, and meningococcal vaccine" (69.6%), 2) "Your child

is due for two vaccines, Tdap and meningococcal. There is also the HPV vaccine, which is optional" (25.0%), and 3) "Your child is due for three vaccines, including the HPV vaccine" (40.0%). However, among pediatricians with less than 25% of their patients initiating the vaccine, the more common recommendation approaches included: 1) "Your child is due for two vaccines, Tdap and meningococcal. There is also the HPV vaccine, which is optional" (75.0%), 2) "Your child is due for three vaccines, including the HPV vaccine" (60.0%), and 3) "Your child is due for three vaccines: Tdap, HPV, and meningococcal vaccine" (30.4%). Multivariable analysis also indicated a significantly greater likelihood of vaccine initiation among providers using the presumptive, bundled recommendation approach: "Your child is due for three vaccines: Tdap, HPV, and meningococcal vaccine" (OR: 1.99, 95% CI: 1.52-2.60) (Table 4). On the other hand, the presumptive, nonbundled recommendation approach was not significantly associated with a greater likelihood of vaccine initiation in univariable or multivariable analyses. Of note, there was an inverse association between the participatory approach "Your child is due for the Tdap and meningococcal vaccine; and we can discuss the HPV vaccine if you would like" and the odds of initiating the vaccine in univariable analysis (OR = 0.33, 95% CI= 0.14-0.76).

Table 4. Univariable and Multivariable Analysis for the Odds of Patient Initiation of HPV Vaccination (n=18,117)

	Univariate		Multivariable*	
	OR	95% CI	OR	95% CI
Level 1: Patient characteristics				
Sex				
Female	1		NI	
Male				
Race/ethnicity				
Non-Hispanic White	1		1	
Black	1.25	1.11-1.42	1.15	1.02-1.31
Hispanic	1.52	1.38-1.68	1.40	1.26-1.55
Other	1.13	1.01-1.26	1.12	1.00-1.25
Insurance type				
Private	1		1	
Public	1.76	1.59-1.94	1.64	1.48-1.81
Level 2: Physician characteristics				
Physician age				
< 40	1		1	
40-49	0.77	0.54-1.09	0.89	0.68-1.18
50-59	0.58	0.39-0.87	0.68	0.49-0.93
>60	0.44	0.29-0.67	0.59	0.41-0.86

Race/Ethnicity				
Non-Hispanic White	1		NI	
Black	1.48	0.87-2.52		
Hispanic	1.48	0.89-2.46		
Other	1.16	0.76-1.75		
Missing	0.91	0.59-1.42		
Daily patient volume				
Less than 30	1		1	
30 or more	0.69	0.50-0.93	0.83	0.65-1.06
Missing	0.48	0.25-0.92	0.61	0.36-1.04
Sex				
Male	1		1	
Female	1.48	1.08-2.03	1.11	0.85-1.45
Time since residency (y)				
<5	1		NI	
5-9	1.35	0.81-2.25		
10-14	1.00	0.61-1.66		
>15	0.61	0.39-0.98		
Work time at clinic (y)				
< 5	1		NI	
5-10	1.00	0.67-1.51		
10-15	0.52	0.33-0.82		
>15	0.61	0.43-0.88		
Missing	0.42	0.22-0.83		

Physician communication

How do you typically introduce adolescent vaccinations during a pediatric patient visit?

"Your child is due for two vaccines, Tdap and meningococcal. There is also the HPV vaccine, which is optional." (<i>Nonbundled approach</i>)	1		1	
"Your child is due for three vaccines, including the HPV vaccine." (<i>Presumptive, nonbundled approach</i>)	1.33	0.85-2.07	1.20	0.83-1.75
"Your child is due for three vaccines: Tdap, HPV, and meningococcal vaccine." (<i>Presumptive, bundled approach</i>)	2.05	1.47-2.84	1.99	1.52-2.60
"Your child is due for the Tdap and meningococcal vaccine, and we can discuss the HPV vaccine if you would like." (<i>Nonbundled, participatory approach</i>)	0.33	0.14-0.76	0.57	0.27-1.19
Other/missing	1.09	0.69-2.18	1.13	0.69-1.83

*The multivariable analysis controls for patient variables (age, race/ethnicity, public insurance) and physician variables (sex, age, and daily patient volume).
 NI = not included in multivariable model.

DISCUSSION

We examined pediatrician and patient characteristics associated with HPV vaccination and the effect of pediatrician vaccination recommendation style on patient HPV vaccine uptake among 134 providers and 18,117 adolescent patients in one of the largest pediatric networks in the US. HPV vaccination among younger adolescents, before 13 years of age, is recommended due to the stronger immune response,¹² to ensure that adolescents are immunized against HPV before preventive adolescent visits become less frequent as they age,¹³ and to reduce the need for 3 doses, as required for those initiating the vaccine at age 15 and older. Despite these benefits, in 2020 only 58.6% of US adolescents were up-to-date on their HPV vaccines at age 13.¹⁴ Moreover, the National Immunization Survey–Teen, 2020 data indicate that HPV initiation rates in the US among 13-year-old adolescents were significantly lower (69.4%) compared with 2 other recommended adolescent vaccines, Tdap (88.9%) and meningococcal (87.5%).¹⁴

Despite endorsement by a number of professional organizations for pediatricians to deliver strong HPV vaccine recommendations at the 11- or 12-year-old well visit,¹⁵ providers have been slow to deliver consistent and strong (presumptive) HPV vaccination recommendations.^{10,16,17} In a national survey, nearly half of providers reported delaying HPV vaccination at 11- and 12-year-old visits, rather than recommending vaccination at the visit using the “same-day” approach.⁵ Previous research indicates that providers’ weak HPV vaccination recommendation approaches, including qualifying the recommendation (e.g., HPV vaccination is optional or not required for school)^{7,9} or delaying strong recommendations for older adolescents,^{7,18} translates to low HPV vaccination rates at the 11- to 12-year-old adolescent visit compared with other vaccines.

Provider HPV vaccination recommendation approaches at 11- and 12-year-old visits may reflect providers’ perception of parental barriers.^{19,20} In a 2014 systematic review, major barriers to HPV vaccine included providers’ perception of parental financial barriers, attitudes, and concerns.²¹ In addition, physician preference to defer the vaccine was related to providers’ perception that parents exhibited low acceptance of the vaccine.^{5,22,23} More recent provider surveys indicated that provider recommendation behaviors also depended on providers’ comfort level

regarding talking about HPV vaccination.⁵ Time constraints were another potential factor influencing provider recommendations, with providers reporting more time needed to discuss HPV vaccination.²⁴ Our own work indicated that adolescents had significantly lower HPV vaccination initiation among providers who self-reported concerns about safety, efficacy, and financial burden of HPV vaccination.²⁵ In addition, we found increased odds of vaccination initiation among patients whose pediatrician saw less than 30 patients per day, possibly suggesting that providers who spent more time with patients in general may be addressing parent vaccination hesitancy rather than deferring the decision to future office visits. Future research is needed to examine this finding.

Findings from this study link EHR-based HPV vaccination initiation outcomes to the presumptive, bundled recommendation approach. The association between recommendation style and HPV vaccination initiation provides empirical evidence that pediatricians' wording matters when recommending HPV vaccination initiation to parents of younger adolescents. A strength of this work is the diversity among pediatricians, patients, and clinic settings, as well as use of EHRs to document initiation outcomes among 11- and 12-year-olds, specifically. Importantly, univariable results also demonstrated an inverse association between recommending the HPV vaccine in a participatory conversational approach ("Your child is due for the Tdap and meningococcal vaccine, and we can discuss the HPV vaccine if you would like") and the separated-out approach (Your child is due for three vaccines, including the HPV vaccine) and HPV vaccine rates. Our findings are supported by intervention studies that reported higher clinic vaccination rates among intervention clinics that received provider training to use presumptive wording compared with clinics that received provider training to engage in participatory conversations with parents.^{26,27} Our study adds to this body of research by showing that a presumptive approach alone may not be enough. We found that a presumptive, bundled approach, recommending the HPV vaccine the same way as other adolescent vaccines, was associated with a greater likelihood of HPV vaccination, while a presumptive approach that singles out the HPV vaccine ("Your child is due for three vaccines, including the HPV vaccine") is not effective. These findings support the view that presumptive, bundled vaccination recommendations, with no qualifiers, thus presenting HPV vaccine in the same way as other recommended vaccines, will increase HPV vaccination rates among 11-12 year old adolescents.

There were some limitations of the study. First, this was a cross-sectional study, limiting conclusions regarding causality. Also, vaccinations could have occurred at any time in the 12-month period; however, most

patients received vaccinations either immediately after receiving a provider recommendation or at a later visit during the same year. A small proportion of vaccinations occurred outside the clinic system and were later entered into the EHR. In these cases, the vaccination provider was registered as a “non-TCP provider”; thus, those cases were not included in our analysis. While we report an inverse association between HPV vaccination outcome and the participatory approach (“Your child is due for the Tdap and meningococcal vaccine, and we can discuss the HPV vaccine if you would like”) only 4 physicians reported using this approach, so this finding must be interpreted with caution. Recall bias and/or social desirability bias may have influenced provider responses, inflating the proportions of providers reporting they used the “bundled approach.” Approximately 40% of physicians did not respond to the survey. While this is consistent with other web-based pediatrician surveys,^{28,29} there is potential for selection bias. Another potential limitation is that the study was limited to one urban/suburban pediatric clinic network. Nonetheless, the network comprises 51 clinic sites based in the most racially/ethnically diverse metropolitan region in the US,³⁰ lending support to the generalizability of these results to other pediatric patient populations.

CONCLUSION

This research used EHR-based HPV vaccination outcome data to demonstrate that a presumptive, bundled recommendation approach increases the odds of HPV vaccination initiation among a diverse group of providers, diverse patients, and across 51 different clinical settings. Notably, this recommendation approach is brief and may take less time. Findings may also inform targeting of provider HPV vaccination communication trainings. Overall, this work indicates that future vaccination intervention studies are needed to improve provider delivery of presumptive HPV vaccination recommendations to increase uptake among adolescents.

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