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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

42 HPV vaccination recommendation word choice and the effect of different
43 pediatricians' recommendation approaches on increasing HPV vaccination
44 initiation among patients 11-12 years old based on electronic health records
45 (EHRs). Examining physician characteristics associated with HPV
46 vaccination recommendation style, as well as effect of HPV vaccination
47 recommendation framing on HPV vaccination initiation outcomes, among
48 11- and 12-year-olds will inform physician-targeted interventions aimed at
49 increasing effectiveness of provider recommendations delivered to parents
50 of younger adolescents.

51

52 **METHODS**

53

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

65 We examined medical record of patients meeting the following
66 eligibility criteria: patients had not initiated HPV vaccination as of October
67 1, 2014, patients had attended a pediatrician visit between October 1, 2014,
68 and September 30, 2015, and their pediatrician completed an HPV
69 vaccination survey. This study was conducted as part of a larger, multilevel
70 program targeting clinic systems, pediatricians, and patients to improve
71 HPV vaccination rates. This collaborative effort included the clinic network
72 leadership, The University of Texas School of Public Health, and Baylor
73 College of Medicine. The study was approved by the Institutional Review
74 Board at The University of Texas Health Sciences Center at Houston and
75 the Institutional Review Board at Baylor College of Medicine.

76

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

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

98
99 **COVARIATES.** The survey included questions on age, sex, race/ethnicity,
100 years since completion of residency training, patient volume (number of
101 patients seen in a typical day), and number of years working at the clinic.
102 We used EHRs to identify patient characteristics, which included age, sex,
103 parent-reported race/ethnicity, and type of health insurance (public or
104 private/commercial).

105
106 **OUTCOME VARIABLE.** We used EHRs to obtain adolescent vaccination
107 outcomes, including HPV, Tdap, and meningococcal vaccination. The main
108 study outcome measure, HPV vaccination initiation, was a binary variable
109 (yes/no) indicating whether each patient received the first dose of the HPV
110 vaccine anytime within the 12-month study period.

111
112 **ANALYSIS.** Pediatrician characteristics are presented by comparing
113 physicians whose patients' HPV vaccine initiation rates fell above or below
114 the median percentage of eligible patients who initiated vaccination during
115 the study period (<25% versus ≥25%). Patient characteristics are presented
116 by HPV vaccine initiation status. Unadjusted, multilevel, generalized linear
117 models were conducted with a logit link function with binomial distribution
118 and randomly varying intercepts using patient-level HPV vaccination
119 initiation clustered by treating physician to calculate the association
120 between each patient- and physician-level characteristic and physician
121 recommendation strategy with the odds of vaccination initiation. Next, we
122 used a multivariable model that controlled for the physician and patient

123 characteristics associated with HPV vaccine initiation in univariable
 124 analyses. Multilevel models allowed for variation between patients across
 125 all groups and within each physician cluster. To characterize physician-level
 126 effects, a latent random variable was used to calculate the physician-
 127 specific probabilities of patient vaccination initiation. A significance level of
 128 $\alpha=0.05$ was selected. All analyses were conducted using SAS 9.4 software
 129 (Cary, NC).

130

131 RESULTS

132

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

134

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

	Total physician population	Physicians with <25% of patients initiating HPV vaccine	Physicians with \geq 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)

137

138

139 Among those, the majority were female, under the age of 50, and non-
 140 Hispanic white. Most respondents saw fewer than 30 patients per day, and
 141 half had worked in their respective clinic for less than 10 years and practiced
 142 for more than 10 years since residency. Among the patients 11-12 years of
 143 age during the study period (n=18,117), an average of 24.8% of patients
 144 initiated the HPV vaccination series (Table 2). Pediatrician characteristics
 145 associated with increased odds of vaccination initiation included physicians'
 146 younger age, being female, and seeing less than 30 patients per day.
 147 Physicians with less than 25% of their patients initiating HPV vaccination
 148 were mostly over the age of 60, non-Hispanic white, and female. Compared
 149 with physicians under 40 years of age, the odds of adolescents' initiation
 150 were significantly lower among physicians between the ages of 50 and 59
 151 (OR: 0.68, 95% CI: 0.49-0.93) and those 60 and older (OR: 0.59, 95% CI:
 152 0.41-0.86). No other physician characteristics included in the multivariable
 153 model were statistically associated with HPV vaccination initiation.

154

155

156 Table 2. Patient Demographic Characteristics and HPV Vaccination Initiation
 157 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)	

158

*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

174 is due for two vaccines, Tdap and meningococcal. There is also the HPV
 175 vaccine, which is optional" (25.0%), and 3) "Your child is due for three
 176 vaccines, including the HPV vaccine" (40.0%). However, among
 177 pediatricians with less than 25% of their patients initiating the vaccine, the
 178 more common recommendation approaches included: 1) "Your child is due
 179 for two vaccines, Tdap and meningococcal. There is also the HPV vaccine,
 180 which is optional" (75.0%), 2) "Your child is due for three vaccines, including
 181 the HPV vaccine" (60.0%), and 3) "Your child is due for three vaccines:
 182 Tdap, HPV, and meningococcal vaccine" (30.4%). Multivariable analysis
 183 also indicated a significantly greater likelihood of vaccine initiation among
 184 providers using the presumptive, bundled recommendation approach: "Your
 185 child is due for three vaccines: Tdap, HPV, and meningococcal vaccine"
 186 (OR: 1.99, 95% CI: 1.52-2.60) (Table 4). On the other hand, the
 187 presumptive, nonbundled recommendation approach was not significantly
 188 associated with a greater likelihood of vaccine initiation in univariable or
 189 multivariable analyses. Of note, there was an inverse association between
 190 the participatory approach "Your child is due for the Tdap and
 191 meningococcal vaccine; and we can discuss the HPV vaccine if you would
 192 like" and the odds of initiating the vaccine in univariable analysis (OR = 0.33,
 193 95% CI= 0.14-0.76).

194
 195
 196
 197

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

198 *The multivariable analysis controls for patient variables (age, race/ethnicity, public
199 insurance) and physician variables (sex, age, and daily patient volume).
200 NI = not included in multivariable model.
201

202 **DISCUSSION**

203
204 We examined pediatrician and patient characteristics associated with HPV
205 vaccination and the effect of pediatrician vaccination recommendation style
206 on patient HPV vaccine uptake among 134 providers and 18,117
207 adolescent patients in one of the largest pediatric networks in the US. HPV
208 vaccination among younger adolescents, before 13 years of age, is
209 recommended due to the stronger immune response,¹² to ensure that
210 adolescents are immunized against HPV before preventive adolescent
211 visits become less frequent as they age,¹³ and to reduce the need for 3
212 doses, as required for those initiating the vaccine at age 15 and older.
213 Despite these benefits, in 2020 only 58.6% of US adolescents were up-to-
214 date on their HPV vaccines at age 13.¹⁴ Moreover, the National
215 Immunization Survey–Teen, 2020 data indicate that HPV initiation rates in
216 the US among 13-year-old adolescents were significantly lower (69.4%)
217 compared with 2 other recommended adolescent vaccines, Tdap (88.9%)
218 and meningococcal (87.5%).¹⁴

219 Despite endorsement by a number of professional organizations for
220 pediatricians to deliver strong HPV vaccine recommendations at the 11- or
221 12-year-old well visit,¹⁵ providers have been slow to deliver consistent and
222 strong (presumptive) HPV vaccination recommendations.^{10,16,17} In a
223 national survey, nearly half of providers reported delaying HPV vaccination
224 at 11- and 12-year-old visits, rather than recommending vaccination at the
225 visit using the “same-day” approach.⁵ Previous research indicates that
226 providers’ weak HPV vaccination recommendation approaches, including
227 qualifying the recommendation (e.g., HPV vaccination is optional or not
228 required for school)^{7,9} or delaying strong recommendations for older
229 adolescents,^{7,18} translates to low HPV vaccination rates at the 11- to 12-
230 year-old adolescent visit compared with other vaccines.

231 Provider HPV vaccination recommendation approaches at 11- and
232 12-year-old visits may reflect providers’ perception of parental barriers.^{19,20}
233 In a 2014 systematic review, major barriers to HPV vaccine included
234 providers’ perception of parental financial barriers, attitudes, and
235 concerns.²¹ In addition, physician preference to defer the vaccine was
236 related to providers’ perception that parents exhibited low acceptance of the
237 vaccine.^{5,22,23} More recent provider surveys indicated that provider
238 recommendation behaviors also depended on providers’ comfort level

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

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

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

280 patients received vaccinations either immediately after receiving a provider
281 recommendation or at a later visit during the same year. A small proportion
282 of vaccinations occurred outside the clinic system and were later entered
283 into the EHR. In these cases, the vaccination provider was registered as a
284 “non-TCP provider”; thus, those cases were not included in our analysis.
285 While we report an inverse association between HPV vaccination outcome
286 and the participatory approach (“Your child is due for the Tdap and
287 meningococcal vaccine, and we can discuss the HPV vaccine if you would
288 like”) only 4 physicians reported using this approach, so this finding must
289 be interpreted with caution. Recall bias and/or social desirability bias may
290 have influenced provider responses, inflating the proportions of providers
291 reporting they used the “bundled approach.” Approximately 40% of
292 physicians did not respond to the survey. While this is consistent with other
293 web-based pediatrician surveys,^{28,29} there is potential for selection bias.
294 Another potential limitation is that the study was limited to one
295 urban/suburban pediatric clinic network. Nonetheless, the network
296 comprises 51 clinic sites based in the most racially/ethnically diverse
297 metropolitan region in the US,³⁰ lending support to the generalizability of
298 these results to other pediatric patient populations.
299

300 **CONCLUSION**

301
302 This research used EHR-based HPV vaccination outcome data to
303 demonstrate that a presumptive, bundled recommendation approach
304 increases the odds of HPV vaccination initiation among a diverse group of
305 providers, diverse patients, and across 51 different clinical settings.
306 Notably, this recommendation approach is brief and may take less time.
307 Findings may also inform targeting of provider HPV vaccination
308 communication trainings. Overall, this work indicates that future vaccination
309 intervention studies are needed to improve provider delivery of presumptive
310 HPV vaccination recommendations to increase uptake among adolescents.

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