HPV Vaccine Delivery Practices by Primary Care Physicians

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abstract

BACKGROUND AND OBJECTIVES: To examine, among pediatricians and family physicians (FPs) (1) human papillomavirus (HPV) vaccine delivery practices, (2) delivery experiences, and (3) attitudes regarding new 2-dose HPV vaccination schedules.

METHODS: We surveyed nationally representative networks of pediatricians and FPs by Internet or mail from July 2018 to September 2018. Multivariable regression was used to assess factors associated with refusal or deferral rates of ≥50% among 11- to 12-year-old patients.

RESULTS: The response rate was 65% (302 pediatricians and 228 FPs included). Pediatricians who strongly recommended the HPV vaccine ranged from 99% for patients ≥15 years old (female) to 83% for those 11 to 12 years old (male); FPs ranged from 90% for patients ≥15 years old (female) to 66% for those 11 to 12 years old (male) (P < .0001 between specialties). Sixty-five percent of pediatricians and 42% of FPs always or almost always used presumptive style when discussing the HPV vaccine (P < .0001). Overall, 40% used standing orders and 42% had electronic alerts. Among pediatricians, the proportion reporting a refusal or deferral rate ≥50% was 19% for female patients and 23% for male patients 11 to 12 years old; FPs reported 27% and 36%, respectively. In the multivariable regression (both sexes), refusal or deferral was associated with physicians not strongly recommending the HPV vaccine to 11- to 12-year-old patients, not using a presumptive style, perceiving less resistance when introducing the HPV vaccine to a 13-year-old patient versus an 11- or 12-year-old patient, and anticipating an uncomfortable conversation when recommending the HPV vaccine to an 11- or 12-year-old patient. Eighty-nine percent of pediatricians and 79% of FPs reported that more adolescents <15 years old are completing the HPV series now that only 2 doses are recommended.

CONCLUSIONS: Although most physicians strongly recommend the HPV vaccine to 11- to 12-year-old patients, our data reveal areas for improvement in recommendation and delivery methods. Most physicians perceive that the 2-dose schedule is resulting in higher HPV completion rates.

WHAT’S KNOWN ON THIS SUBJECT: Although diseases caused by human papillomavirus (HPV) are responsible for major morbidity and mortality in the United States, HPV vaccination rates remain low. Primary care physicians’ current HPV vaccine delivery practices and their experiences with HPV vaccine delivery are not well described.

WHAT THIS STUDY ADDS: Although most physicians recommend the HPV vaccine for patients 11 to 12 years old, many are not using a presumptive style when introducing the HPV vaccine, standing orders, or electronic alerts for HPV delivery. Most perceive that the 2-dose schedule is resulting in higher HPV completion rates.


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Dr Kempe conceptualized and designed the study, contributed to the data collection instrument design, and drafted the initial and final manuscripts; Drs O’Leary, Hurley, Markowitz, and Meites and Ms Lindley and Ms Stokley assisted in study design and creation of the data collection instrument and reviewed and revised the manuscript; Dr Crane conceptualized and designed the study, designed the data collection instrument, and reviewed and revised the manuscript; Ms Beaty contributed to the study design, conducted the initial and additional analyses, (Continued)
Disease caused by human papillomavirus (HPV) remains a major public health problem globally.\textsuperscript{1–5} Nearly all cervical and anal cancers; 63\% to 75\% of vulvar, vaginal, and penile cancers; and \(\sim70\%\) of oropharyngeal cancers are attributable to HPV.\textsuperscript{5–7,10} Annually in the United States, 33,700 new cancers are related to HPV, and 4,175 women die of cervical cancer.\textsuperscript{11}

Effective HPV vaccines have been routinely recommended at ages 11 to 12 years by the Advisory Committee on Immunization Practices (ACIP) since 2006 for girls and since 2011 for boys.\textsuperscript{12,13} The recommendations targeting those 11 to 12 years old were based in part on facilitating implementation because other vaccines are recommended at this age. In addition, HPV vaccines are most effective when given before any HPV exposure, and vaccination at this age reaches most persons before initiation of sexual activity.

HPV vaccines have demonstrated high efficacy in preventing cervical precancers, other genital cancers, oropharyngeal cancers, and genital warts.\textsuperscript{14} Healthy People 2020 goals include coverage of 80\% for all vaccines routinely recommended for US adolescents.\textsuperscript{15} Although these goals have been met for other adolescent vaccines, in the 2017 National Immunization Survey-Teen, HPV initiation among adolescents 13 to 17 years old was 69\% for girls and 63\% for boys, and series completion was only 53\% for girls and 44\% for boys.\textsuperscript{16} Low HPV vaccination is related to a variety of barriers originating from health care providers and patients.\textsuperscript{17–26} Because of the crucial role of provider recommendation in parental decisions to vaccinate,\textsuperscript{27–29} a great deal of research\textsuperscript{30–36} and intervention efforts\textsuperscript{37–40} have been focused on improving provider communication regarding HPV vaccination. Until 2016, completion of the HPV series was defined as 3 doses over 6 months. In late 2016, the ACIP recommended a 2-dose schedule for adolescents who initiate the HPV vaccination series at ages 9 through 14 years.\textsuperscript{23} In the 2-dose schedule, the first and second doses of the HPV vaccine should be administered at least 6 to 12 months apart.\textsuperscript{23} Three doses remain recommended for persons who initiate the series at ages 15 through 26 years and for persons who are immunocompromised. In the context of continued suboptimal vaccination rates and recent changes to recommendations, our objectives were to examine the following among nationally representative panels of pediatricians and family physicians (FPs): (1) current delivery and communication practices regarding the HPV vaccine; (2) attitudes toward and experiences with HPV vaccine delivery; (3) rates of refusal or deferral of the HPV vaccine; (4) perceived barriers to delivery of the HPV vaccine; and (5) knowledge, practices, and attitudes regarding the 2-dose HPV vaccination schedule.

**METHODS**

From July 2018 to September 2018, we administered surveys to national networks of physicians who had agreed to participate in surveys about vaccine policy issues. The Colorado Multi-institutional Review Board approved this study as exempt research.

**Study Setting and Population**

As part of the Vaccine Policy Collaborative Initiative, a rapid survey mechanism used to assess physician attitudes about vaccine issues, we surveyed members of networks of pediatricians and FPs recruited from the memberships of the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP). Physicians were eligible if they spent \(\geq50\%\) of their time providing primary care. We performed quota sampling\textsuperscript{24} to ensure networks were similar to the AAP and AAFP memberships with respect to region, urban versus rural location, and practice setting. In previous work, we demonstrated that survey responses from network physicians were similar to those of physicians randomly sampled from American Medical Association physician databases with respect to reported demographic characteristics, practice attributes, and attitudes about vaccination issues.\textsuperscript{24}

**Survey Design**

We used 4-point Likert scales to assess physicians’ strength of recommendation of the HPV vaccine for patients in different age groups, physicians’ frequency of using different vaccine discussion styles, physicians’ perceived barriers to vaccination and extent of agreement with statements about the change from a 3-dose to a 2-dose schedule in younger teenagers, and physicians’ experiences with HPV vaccine delivery. Physicians were classified as using a “presumptive”\textsuperscript{41} (or “announcement”)\textsuperscript{30} style if they reported almost always or always introducing the HPV vaccine by saying, “We’ve got 3 vaccines today: Tdap, HPV and meningococcal vaccines.” Physicians were classified as using a “conversational”\textsuperscript{30,41} (or “participatory”)\textsuperscript{41} style if they reported almost always or always saying, “Are you interested in getting HPV vaccine for your child today?” National advisory panels of 6 AAP members and 6 AAFP members representing different states pretested the survey, and it was then pilot tested among 13 pediatricians and 10 FPs.

**Survey Administration**

The survey was administered July 2018 to September 2018, through the Internet or US mail, depending on physician preference. We sent the Internet group an initial e-mail with...
RESULTS

The overall response rate was 65% (588 of 908); 70% (317 of 456) among pediatricians and 60% (271 of 452) among FPs. Of respondents, 280 (48%) responded via the Internet. Fifteen pediatricians and 43 FPs did not administer the HPV vaccine and were excluded. Reasons for not administering the HPV vaccine were not explored in this survey. In Table 1, we compare respondents and nonrespondents and show additional characteristics available only for respondents. Among FPs, respondents were significantly younger than nonrespondents and had more providers in their practices.

Delivery and Communication Practices for the HPV Vaccine

Within each specialty, a larger percentage of physicians made a strong recommendation for HPV vaccination for older adolescents compared with adolescents 11 to 12 years old (Fig 1). For each age group, a larger percentage of pediatricians than FPs made a strong recommendation. Sixty-five percent of pediatricians and 42% of FPs reported almost always or always using a presumptive style, whereas 16% of pediatricians and 24% of FPs almost always or always used a conversational style of introduction. Overall, 40% of physicians used standing orders for HPV vaccination, 66% had a computer-based system that could report adolescents who needed an HPV vaccine, and 42% had an electronic alert in the medical record if a patient needed an HPV vaccine (no significant differences by specialty).

Perceived Barriers to HPV Vaccine Delivery

Perceived barriers to HPV vaccination that ≥20% of physicians in either specialty reported as major were the following: misinformation parents receive from the Internet or social media, parental concerns about the safety of the HPV vaccine, parents not
thinking the HPV vaccine was necessary for their daughters or sons, and opposition to vaccination for moral or religious reasons (Fig 4).

Knowledge, Practices, and Attitudes Regarding 2-Dose Schedules

Physicians, especially FPs, frequently were incorrect or reported not knowing about the number of doses recommended in different scenarios or whether additional vaccination with 9 valent HPV should be offered to adolescents who were fully immunized previously with 2 valent HPV or 4 valent HPV (Fig 5).

Regarding dosing intervals, among pediatricians, 74% reported routinely recommending the second HPV dose 6 months after the first, and 25% reported routinely recommending it at 12 months; among FPs, corresponding percentages were 88% at 6 months and 12% at a 12 months ($P < .0001$).

The vast majority of physicians strongly or somewhat agreed that the 2-dose schedule is as efficacious as a 3-dose schedule for adolescents, 15 years and that the new schedule facilitated completion and initiation of the series among adolescents in this age group, with pediatricians being more likely to strongly agree with all of these statements than FPs (Fig 6). However, more than half of FPs and close to one-third of pediatricians strongly or somewhat agreed that having different recommendations for adolescents $\leq 15$ years old and younger adolescents created confusion among patients and parents or practice staff.

DISCUSSION

Despite the existence of highly effective and safe HPV vaccines, national vaccination coverage remains suboptimal. This is the first national survey of physician attitudes regarding the new ACIP recommendations for a 2-dose schedule in younger adolescents, and it offers a glimpse into physician

### TABLE 1 Respondent and Nonrespondent Characteristics by Physician Specialty

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pediatricians</th>
<th>FPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents (n = 317)</td>
<td>Nonrespondents (n = 139)</td>
<td>Respondents (n = 271)</td>
</tr>
<tr>
<td>Mean (SD)/median age, y</td>
<td>52 (10)/52</td>
<td>51 (11)/50</td>
</tr>
<tr>
<td>Mean (SD)/median No. providers</td>
<td>10 (16)/6</td>
<td>16 (53)/8</td>
</tr>
<tr>
<td>Male sex, %</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>Region, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>Northeast</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>South</td>
<td>35</td>
<td>44</td>
</tr>
<tr>
<td>West</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Location of practice, %</td>
<td></td>
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</tr>
<tr>
<td>Rural</td>
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<td>Urban (not inner city)</td>
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<td>53</td>
<td>56</td>
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<td>Setting, %</td>
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<tr>
<td>Private practice</td>
<td>80</td>
<td>78</td>
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<td>University, hospital, public, or other</td>
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<td>17</td>
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<td>HMO</td>
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<td>4</td>
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<tr>
<td>Decision-making</td>
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<tr>
<td>Independent</td>
<td>72</td>
<td>65</td>
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<tr>
<td>Larger system level</td>
<td>28</td>
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<tr>
<td>Proportion of adolescents 11–18 y old in practice, %</td>
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</tr>
<tr>
<td>0%–9%</td>
<td>2</td>
<td>N/A</td>
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<tr>
<td>10%–19%</td>
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<tr>
<td>20%–29%</td>
<td>41</td>
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<tr>
<td>≥30%</td>
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<tr>
<td>Proportion of Hispanic patients in practice, %</td>
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<tr>
<td>0%–9%</td>
<td>40</td>
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<tr>
<td>10%–24%</td>
<td>35</td>
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<tr>
<td>25%–49%</td>
<td>15</td>
<td>N/A</td>
</tr>
<tr>
<td>≥50%</td>
<td>11</td>
<td>N/A</td>
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<tr>
<td>Proportion of African American patients in practice, %</td>
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<td>44</td>
<td>N/A</td>
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<tr>
<td>10%–24%</td>
<td>33</td>
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<tr>
<td>25%–49%</td>
<td>18</td>
<td>N/A</td>
</tr>
<tr>
<td>≥50%</td>
<td>5</td>
<td>N/A</td>
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<tr>
<td>Proportion of patients with private insurance in practice, %</td>
<td></td>
<td></td>
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<tr>
<td>0%–24%</td>
<td>24</td>
<td>N/A</td>
</tr>
<tr>
<td>25%–49%</td>
<td>22</td>
<td>N/A</td>
</tr>
<tr>
<td>50%–74%</td>
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<tr>
<td>75%–100%</td>
<td>25</td>
<td>N/A</td>
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<tr>
<td>Proportion of patients with Medicaid or CHIP in practice, %</td>
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<td></td>
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<tr>
<td>0%–9%</td>
<td>24</td>
<td>N/A</td>
</tr>
<tr>
<td>10%–24%</td>
<td>22</td>
<td>N/A</td>
</tr>
<tr>
<td>25%–49%</td>
<td>28</td>
<td>N/A</td>
</tr>
<tr>
<td>≥50%</td>
<td>25</td>
<td>N/A</td>
</tr>
</tbody>
</table>

CHIP, Children’s Health Insurance Program; HMO, health maintenance organization; N/A, not applicable.

* $P < .05$ for $t$ test for difference within specialty for respondents versus nonrespondents.

** $P < .05$ for Wilcoxon rank test for difference within specialty for respondents versus nonrespondents.
practices with respect to current HPV vaccine recommendations and delivery practices. Our data reveal that a high proportion of physicians are recommending the HPV vaccine, although more are recommending it for older adolescents than for those 11 to 12 years old. A lower proportion of FPs compared with pediatricians strongly recommend the HPV vaccine to patients of all ages evaluated. Slightly more than half of pediatricians and less than half of FPs reported using a presumptive recommendation style, and less than half of those in both specialties used standing orders or electronic alerts in HPV vaccine delivery. Physicians reported high rates of refusal, especially by 11- to 12-year-old patients, who are the target population for vaccination according to national guidelines. Physicians were more likely to report high refusal rates by 11- to 12-year-old patients if physicians did not use a presumptive style, if physicians did not strongly recommend vaccination to young adolescents, or if physicians anticipated less resistance to vaccination from patients older than 11 or 12 years. Although physicians demonstrated some knowledge gaps about the 2-dose recommendations, the majority believed that the revised schedule was facilitating both initiation and completion of the HPV vaccine series among adolescents <15 years of age.

A physician recommendation has been shown to be 1 of the most important factors in parental vaccine acceptance,\textsuperscript{27–29} and the lack of a strong recommendation has been identified as an important barrier to HPV vaccination.\textsuperscript{22,45–48} Our data reveal substantial increases in the strength of recommendation when compared with a survey conducted ∼5 years ago by using similar methodology.\textsuperscript{49} Percentages of pediatricians strongly recommending the HPV vaccine have increased from 60% in the 2013 survey to 85% in the 2018 survey for 11- to 12-year-old girls and from 52% to 83% for 11- to 12-year-old boys. Smaller increases have occurred among FPs during the same period (from 59% to 72% for 11- to 12-year-old girls and from 41% to 66% for 11- to 12-year-old boys), although the disparity in strength of recommendations between specialties persists.\textsuperscript{49} Although the overall percentage of physicians who strongly recommended the HPV vaccine for patients age 11 to 12 years was high in the current study, it was 13 to 15 absolute percentage points lower than that for patients age 13 to 14 years old in both specialties.

Lower rates of strong recommendations for HPV vaccination among FPs have important implications given their prominent role in adolescent health care delivery. A recent national analysis revealed that the proportion of adolescents seen by FPs increases from 25% among 11-year-old male patients to 57% among 18-year-old male patients and from 31% among 11-year-old female patients to 41% among 18-year-old female patients.\textsuperscript{50} The differences we observed by specialty are reflective of previous literature regarding childhood\textsuperscript{51–56} and adolescent\textsuperscript{49,57–62} vaccines and highlight the fact that FPs need to remain a major focus of vaccine

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**FIGURE 1**
Strength of physician recommendation for HPV vaccine by patient age and sex (pediatricians, \(n = 302\); FPs, \(n = 228\)). All comparisons between male and female patients within each age group within specialty differ significantly at \(P < .05\) (Fisher’s exact test). * \(P < .05\) for comparison between FPs and pediatricians (Fisher’s exact test).
It is important that adolescents be vaccinated before they engage in early physical intimacy, including kissing.

I encounter more resistance to the HPV vaccine compared with other adolescent vaccines because it is not required for schools in my state.*

I encounter less resistance from parents and patients to beginning the HPV series at age 13 years versus at age 11 years.

I recommend the HPV vaccine more often for adolescents at higher risk for getting HPV.*

When I think about recommending the HPV vaccine for 11- to 12-year-old patients, I anticipate having an uncomfortable conversation.

I do not push hard for adolescents to be vaccinated with the HPV vaccine if they are not engaging in risky sexual behaviors.*

**FIGURE 2**
Physician experiences with HPV vaccine discussions (pediatricians: n = 502; FPs: n = 228). * P < .05 for comparison between FPs and pediatricians (χ² test). Some percentage do not add up to 100% because of rounding.

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education and practice improvement strategies to improve HPV vaccine delivery.

Reported rates of deferrals or refusals were high among our respondents, especially for patients ages 11 to 12 years and among FPs and appear relatively stable from 5 years ago.*49 Physicians, especially FPs, reported higher rates of deferral or refusal for their male patients compared with female patients in every age group. This may be related to the longer duration of recommendations for female patients or to a higher perceived benefit of the HPV vaccine for female patients. Physicians who perceive higher refusal or deferral rates among 11- to 12-year-old patients more frequently were those who (1) did not strongly recommend vaccination in this age group, (2) anticipated uncomfortable discussions with parents of 11- to 12-year-old patients, and (3) expected to encounter more resistance from parents of 11- to 12-year-old patients versus older adolescents. This finding is consistent with those of previous studies demonstrating that physicians are less likely to discuss the HPV vaccine with patients aged 11 to 12 years if they believe parents are likely to defer.*49,63,64 However, other literature has revealed that
physicians may considerably overestimate the amount of resistance to vaccination that they are likely to encounter. Our data also reveal that physicians who report high levels of refusal or deferral are also less likely to use a presumptive recommendation style. To our knowledge, this has not previously been reported. The circular nature of provider anticipation of refusal or deferral potentially leading to a weaker recommendation style and less persistence in responding to parental hesitancy could be creating a self-perpetuating cycle within a subgroup of physicians.

Our data suggest that improvements are needed in how the HPV vaccine is being recommended. A presumptive41 style of initiating HPV vaccine discussions uses words that convey an assumption of vaccination and does not discuss the HPV vaccine in a different manner than other adolescent vaccines, whereas, a conversational30 style engages parents in an open-ended discussion about the HPV vaccine without linguistic presupposition of vaccination. A presumptive approach has been shown to be associated with higher HPV acceptance compared with a conversational approach in multiple studies.30–33 Updated implementation guidance from the AAP includes the use of a strong pediatrician recommendation with wording consistent with a presumptive style, and the AAFP Web site refers FPs to Centers for Disease Control and Prevention talking points that included recommendations for “same way” as for other adolescent vaccines and “same day” recommendations. Our data indicate that large percentages of physicians, including a majority of pediatricians, have adopted the presumptive communication style in initiating HPV vaccine discussion, but there are still substantial proportions who have not. In addition to improving physician communication styles, HPV vaccine delivery could also be optimized by increased use of evidence-based methods, including standing orders and alert systems in the medical record to remind providers of the need for vaccination at the point of care, both of which are recommended by the Community Preventive Services Task Force.

Factors reported by physicians as important barriers to HPV vaccination (including perceived parental concerns about safety or effects of vaccination on sexual behavior and parents thinking that the HPV vaccine is not necessary or that there are too many vaccines at 1 visit) are consistent with previously identified barriers.22 However, the barrier most frequently reported by physicians in both specialties (the effect of misinformation parents...
Parents perceived barriers to HPV vaccination (pediatricians: n = 302; FPs: n = 228). Some bars do not add up to 100% because of rounding. Barriers reported as major by <12% by both specialties include the following: parent concerns that vaccination may encourage their sons to have earlier sexual behavior, that vaccination may encourage their sons to have riskier sexual behavior, that the vaccine could cause infertility in their daughters and/or sons, or that their child will suffer immediate short-term effects from the HPV vaccine; parent concerns about the efficacy of the HPV vaccine and about waning immunity if the HPV vaccine is given too early; physician concern about giving too many vaccines in 1 visit (it will result in an uncomfortable conversation with the parent), about the safety of the HPV vaccine for female patients, and about the efficacy of the HPV vaccine for male and female patients; physician belief that HPV infection is not common enough in male and female patients to justify a vaccination, that Papanicolaou tests are an adequate way to prevent cervical cancer, and that HPV-associated diseases are not severe enough in male and female patients to justify a vaccination; parents wanting to wait to begin the HPV series until after menarche for girls; failure of some insurance companies to cover HPV vaccination; the up-front costs for a practice to purchase the vaccine; lack of adequate reimbursement for vaccination; and the time it will take a physician to discuss HPV vaccination with his or her patients and their parents. * P < .05 for comparison between FPs and pediatricians (χ² test).

However, the contribution to low HPV vaccination acceptance has not been well studied. A recent survey of 1263 parents of US adolescents revealed that stories of HPV vaccine harms were more commonly found in social media than in traditional media or conversations and were associated with lack of initiation, delay, or refusal of HPV vaccination. Along
with these data, our findings highlight the importance of developing effective public health communication strategies to counter misinformation and highlight benefits of HPV vaccination via social media.

Given the relative recency of recommendations for the 2-dose schedule for adolescents initiating HPV vaccination before age 15 years, it is not surprising that there were knowledge gaps for proportions of physicians about when a third dose is recommended, the acceptability of using different HPV vaccines to complete the series, and the need for an additional 9 valent HPV vaccination in those already fully vaccinated with either 2 valent HPV or 4 valent HPV. Physician knowledge should increase over time, as will, presumably, the ability of the electronic medical record or immunization registry–based systems to forecast the need for HPV vaccination. Interestingly, the majority of physicians in both specialties reported recommending the second dose of the 2-dose schedule at a 6-month interval rather than 12 months later at the next annual well-child visit.

### TABLE 2 Characteristics of Physicians Reporting a 50% or Higher Refusal or Deferral Rate for HPV Vaccination Among Their 11- to 12-Year-Old Patients by Sex

<table>
<thead>
<tr>
<th>Physiology and practice characteristics</th>
<th>Female Patients (n = 482)</th>
<th>Male Patients (n = 497)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;50% Refusal or Deferral Rate (n = 378, 78%)</td>
<td>50% Refusal or Deferral Rate (n = 106, 22%)</td>
</tr>
<tr>
<td>Practice specialty</td>
<td>FP 39% 50% 1.11 (0.81–1.52)</td>
<td>38% 54% 1.30 (0.99–1.69)</td>
</tr>
<tr>
<td></td>
<td>Pediatrician 61% 50%</td>
<td>62% 46%</td>
</tr>
<tr>
<td>No. providers in practice, median (IQR)</td>
<td>6 (4–11)</td>
<td>5 (3–9)</td>
</tr>
<tr>
<td>Proportion of adolescents 11–18 y old in practice, %</td>
<td>0%–9% 20 31</td>
<td>21 29</td>
</tr>
<tr>
<td></td>
<td>≥10% 80 69</td>
<td>79 71</td>
</tr>
<tr>
<td>Proportion of patients with private insurance in practice, %</td>
<td>0%–24% 26 16</td>
<td>25 22</td>
</tr>
<tr>
<td></td>
<td>≥25% 74 84</td>
<td>75 78</td>
</tr>
<tr>
<td>HPV recommendation style</td>
<td>Yes 88% 51% Reference</td>
<td>86% 52% Reference</td>
</tr>
<tr>
<td></td>
<td>No 12% 49% 2.14 (1.50–3.04)</td>
<td>14% 48% 1.90 (1.43–2.53)</td>
</tr>
<tr>
<td>Use of a presumptive recommendation style</td>
<td>Frequently, occasionally, rarely, or never 36% 66% 1.61 (1.11–2.32)</td>
<td>34% 67% 1.74 (1.27–2.38)</td>
</tr>
<tr>
<td></td>
<td>Almost always or always 64% 34% Reference</td>
<td>66% 33% Reference</td>
</tr>
<tr>
<td>Delivery experiences and attitudes</td>
<td>Perceive less resistance from parents and patients to beginning the HPV series at age 13 y versus at age 11 y</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strongly agree 20% 54% 2.33 (1.69–3.22)</td>
<td>20% 47% 1.84 (1.42–2.38)</td>
</tr>
<tr>
<td></td>
<td>Other 80% 46% Reference</td>
<td>80% 53% Reference</td>
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<tr>
<td>Do not push hard for adolescents to be vaccinated with HPV vaccine if they are not engaging in risky sexual behaviors, %</td>
<td>Strongly or somewhat agree 8 23</td>
<td>8 20</td>
</tr>
<tr>
<td></td>
<td>Strongly or somewhat disagree 92 77</td>
<td>92 80</td>
</tr>
<tr>
<td>Anticipate having an uncomfortable conversation when recommending HPV vaccine for adolescents 11–12 y old</td>
<td>Strongly or somewhat agree 30% 51% 1.82 (1.17–2.44)</td>
<td>30% 46% 1.32 (1.02–1.72)</td>
</tr>
<tr>
<td></td>
<td>Strongly or somewhat disagree 70% 49% Reference</td>
<td>70% 54% Reference</td>
</tr>
</tbody>
</table>

CI, confidence interval; IQR, interquartile range; MV, multivariable regression; RR, relative risk; N/A, not applicable. a Variables were not significant in the multivariable model and were therefore excluded from the final model.
although national guidelines allow for either. This may reflect an understanding of the importance of series completion as soon as possible. Importantly, primary care physicians strongly endorsed the belief that the 2-dose schedule was facilitating both initiation and completion of the HPV series.

There are important strengths and limitations to our data. We surveyed large, nationally representative samples of pediatricians and FPs and achieved high response rates. Responses of our sentinel physicians may not be fully generalizable, although previous work has revealed that the survey methods described yield similar responses to the most commonly employed method of sampling physicians nationally.24 Nonrespondents might have different views than respondents, although our high response rates help to mitigate against this source of bias. Most importantly, our data are based on self-report rather than direct observation and may not entirely reflect actual physician practice.

This snapshot of HPV vaccine delivery in primary care demonstrates room for improvement in the way physicians are communicating about the HPV vaccine and in their delivery practices. Most important in this regard is the continued finding that physicians who experience or expect to experience high rates of deferral or refusal may be anticipating and accommodating refusals by altering their recommendation strength and style. Such accommodations by physicians may perpetuate a lack of acceptance of the HPV vaccine among parents. Greater physician awareness about the potential of overestimating the degree of parental resistance to HPV vaccination and about the effectiveness of a strong recommendation for the HPV vaccine, delivered in the same way as for other adolescent vaccines and on same day as other adolescent vaccines, may be key to increasing acceptance among parents of 11- to 12-year-old patients. Increased use of available communication training materials and applications as well as further development of evidence-based messages for parents may be helpful in improving the way HPV vaccination is introduced.74–78

Our data are encouraging in revealing substantial increases over the past 5 years in the percentage of physicians who report strongly recommending the HPV vaccine to 11- to 12-year-old patients. Increased use of available communication training materials and applications as well as further development of evidence-based messages for parents may be helpful in improving the way HPV vaccination is introduced.74–78

FIGURE 5
Physician knowledge regarding 2-dose HPV vaccine schedules (pediatricians: n = 302; FPs: n = 228). * P < .05 for comparison between FPs and pediatricians (χ² test). 2vHPV, 2 valent HPV; 4vHPV, 4 valent HPV; 9vHPV, 9 valent HPV.
increases in HPV vaccination initiation and completion among adolescents, leading to greater protection against HPV-associated cancers in the United States.

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FIGURE 6

Primary care physicians’ attitudes regarding the 2-dose HPV vaccine (pediatricians: n = 302; FPs: n = 228). Some bars do not add up to 100% because of rounding. * Fisher’s exact test.* P < .05 for comparison between FPs and pediatricians (χ² test). 9vHPV, 9 valent HPV.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Pediatrician</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe the 2-dose schedule is as efficacious as a 3-dose schedule for adolescents &lt;15 years.*</td>
<td>78%</td>
<td>62%</td>
</tr>
<tr>
<td>The 2-dose schedule facilitates completion because the doses can be given 1 year apart at regular health maintenance visits.*</td>
<td>70%</td>
<td>48%</td>
</tr>
<tr>
<td>More of the adolescents &lt;15 years in our practice are completing the HPV series now that only 2 doses are required.*</td>
<td>50%</td>
<td>22%</td>
</tr>
<tr>
<td>The need for only 2 vs 3 doses for younger adolescents has meant that parents and patients are more receptive to beginning the HPV series.</td>
<td>39%</td>
<td>27%</td>
</tr>
<tr>
<td>The 2-dose schedule has reduced the amount of money parents have to pay out of pocket.</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>It is challenging for me to determine which patients qualify as having an immunocompromising condition that would necessitate a third dose of 9vHPV.</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Different recommendations for patients ≥15 years and younger adolescents have created confusion among parents and patients.*</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td>Different recommendations for patients ≥15 years and younger adolescents have resulted in confusion among practice staff.*</td>
<td>4%</td>
<td>17%</td>
</tr>
<tr>
<td>I am concerned that the 2-dose schedule might not have as long a duration of protection as the 3-dose schedule previously recommended for patients younger than 15 years</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Our practice staff has made mistakes in the number of doses delivered because of the existence of different schedules for different-aged adolescents.*</td>
<td>23%</td>
<td>22%</td>
</tr>
</tbody>
</table>

ABBREVIATIONS

AAFP: American Academy of Family Physicians
AAP: American Academy of Pediatrics
ACIP: Advisory Committee on Immunization Practices
FP: family physician
HPV: human papillomavirus

0%  20%  40%  60%  80%  100%
and reviewed and revised the manuscript; Dr Brtnikova contributed to the study design and data collection instrument design, coordinated and supervised all data collection, and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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