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RESEARCH PAPER

Understanding primary care physician perspectives on recommending HPV vaccination and addressing vaccine hesitancy

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ABSTRACT

HPV vaccination rates have improved in recent years, but remain suboptimal in the United States. Physician recommendation is associated with increased uptake; however, specific strategies used by physicians to recommend the vaccine and address hesitancy are underexplored. We iteratively conducted qualitative in-depth interviews with family medicine and pediatrics/adolescent medicine physicians recruited from four primary care settings (federally qualified health centers and hospital-affiliated practices) within a large academic-hospital system in New Jersey. Interviews aimed to understand factors influencing physician recommendations. Transcripts were analyzed iteratively using a team-based, thematic content analysis approach. All physicians reported strong support for HPV vaccination, intention to recommend for target age groups, and providing factsheets to parents. Many physicians used electronic medical records and/or the state immunization registry for monitoring vaccinations, but few were able to report their own clinic-level rates. The majority said they needed to overcome both hesitancy for at least 10–30% of parents and misinformation from the internet. Most cited having their own children vaccinated for HPV as a first-line strategy for addressing parental hesitancy. Other strategies included using data or professional authority to address safety concerns, linking HPV to cervical cancer, highlighting only needing two doses if vaccinated younger, and normalizing the vaccine. While our findings indicate physicians are knowledgeable about HPV vaccination and recommend it to parents, strategies to overcome parental hesitancy varied. Physician, clinic, and health-system-based strategies need to be adopted to overcome parental hesitancy for HPV vaccination.

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HPV vaccination; vaccine hesitancy; physician recommendation; cancer prevention; multilevel context

Introduction

Human papillomavirus (HPV) is the most prevalent sexually transmitted infection in the United States (US), affecting 45.2% of the population.[1] Although HPV vaccination rates have improved in recent years, with an average annual increase of 5.1% since 2013,[2] uptake is still suboptimal and lower than the HealthyPeople 2020 goals of 80%. In 2017, only 5 of 10 adolescents were up-to-date on the HPV vaccine.[3] Strategies are needed to improve HPV vaccine initiation and completion as a solution to long-term disparities in cervical cancer burden.[4] This is of particular importance among underserved populations where persistent disparities in incidence continue to persist, with African American (8.4 per 100,000), Hispanic (9.1 per 100,000), and low-income women experiencing higher rates compared to non-Hispanic white (7.0 per 100,000) women at the national level.[5–8]

Multiple studies have shown clinician and health-care system-based interventions successfully increase HPV vaccine uptake among adolescents[1,9–13] and have stronger impact than efforts addressing parental knowledge or beliefs alone.[14] Physician recommendation and providing high quality recommendation[15–17] can influence parental decisions to initiate HPV vaccination for their teens, including among hesitant or undecided parents.[9,18] A systematic review of recent studies concluded that clinicians who perceived parents as being unsupportive of HPV vaccination did not adhere to the ACIP recommendations for HPV vaccination, resulting in 48% of parents receiving no HPV vaccine recommendation.[16] Understanding barriers for HPV vaccine communication and recommendation from the perspectives of physicians, in addition to parents, are necessary for the development of evidence-based strategies to address vaccine hesitancy and improve uptake.[19,20] To date, there is limited in-depth understanding of physician and other clinical team member perceptions on barriers to HPV vaccination aside from parental attitudes.

We report on a qualitative research study using in-depth interviews of family medicine and pediatric/adolescent physicians in New Jersey, where HPV vaccination rates lag behind the national average, to explore physician perspectives on HPV vaccination, including aspects of parental hesitancy toward vaccination, clinic-level considerations, and external barriers at the community and policy levels. We aimed to understand multilevel factors that contribute to physician recommendation and

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communication strategies for HPV vaccination and to compare and contrast these strategies across practice settings.

Methods

We conducted in-depth, semi-structured interviews with family medicine and pediatrics physicians from four purposefully selected sites, by specialty and practice type, in a large, academic health system in New Jersey from July to September 2019. Eligible physicians included those who routinely see adolescents in the 11–12-year-old age group and who practice at least 50% time each week. Introduction e-mails were sent to practice administrators inviting select physicians to participate in an in-person interview. A total of 25 physicians were contacted by practice administrators across the four practices. Interested physicians emailed our study team, and a time and location for the approximately 30-min interview was arranged. Potential participants were selected iteratively, based on ongoing analysis of interview data until saturation was reached, the point at which interviews stop yielding new information.[21,22]

Data collection

An interview guide was developed by the study team based on the primary research question and gaps in the literature about high quality physician recommendations for HPV vaccination. Four "grand tour" questions were designed to elicit descriptions about physicians' recommendation practices for HPV vaccination for adolescents in the target age group: (1) "Could you please tell me about your background and experience working at this practice?" (2) "Could you please tell me about your perspectives on HPV vaccination?" (3) "Could you tell me about how HPV vaccination is done at your office?" (4) "How does administration of HPV vaccine compare with the administration of other vaccines?" Interviews were conducted by a 2nd Year medical student who completed a literature review on HPV vaccination and received training in conducting interviews. After obtaining informed consent, interviews were audio-recorded and later transcribed verbatim.

Data analysis

Interview transcripts were analyzed iteratively by a multidisciplinary team using a combination of immersion/crystallization and coding.[23] The team met weekly or bi-weekly and read transcripts aloud and discussed emerging patterns. The research team proceeded through several phases of qualitative interpretative analysis.[23] After the first three interviews, the interview guide was slightly modified based on insights from initial analyses. During the iterative analysis, we discussed and highlighted various strategies across three different levels mentioned by respondents for introducing and recommending the vaccine to patients: physician, clinic/medical team, and health system/policy. Based on this initial immersion process, a codebook was developed and the team then coded all 12 transcripts before interpreting coded segments using thematic content analysis.[24] After multiple rounds of reading and reflecting on the transcripts and identified codes, the team determined the most salient themes and selected illustrative quotes.

Results

Our sample consisted of 12 physicians recruited from four academic clinical settings, including a hospital research institute, an FQHC, a hospital-owned family medicine practice, and a hospital-owned pediatric practice (Table 1). Over half of the sample had been in practice for at least 10 years and the majority were female. Analyses of these interviews revealed different themes related to communication strategies at the parent/patient, clinic/medical team, and health system/policy levels.

Physician to parent strategies

Three themes emerged that depict strategies physicians used to communicate directly with parents and/or adolescents about the HPV vaccine: 1) expressing support for the HPV vaccine and using data and/or personal experience in communicating with parents; 2) using a normalizing approach in communicating about the HPV vaccine; 3) addressing vaccine misinformation for some patient populations.

Theme 1: Physicians employ a combination of scientific data and personal experience to address HPV vaccine hesitancy with parents

All of these physicians stated that they encountered some hesitancy from parents when introducing the vaccine. What

Table 1. Characteristics of physician participants.

Interview #	Practice Type	Specialty	Years in Practice	Gender
1	Academic owned FQHC	Pediatrics	unknown	Female
2	Academic owned FQHC	Family Medicine	unknown	Male
3	Academic hospital owned pediatric practice	Pediatrics	10	Male
4	Academic owned FQHC	Pediatrics	20	Female
5	Academic hospital research institute	Adult Medicine	22	Female
6	Academic hospital owned pediatric practice	Pediatrics	23	Male
7	Academic owned FQHC	Family Medicine	unknown	Female
8	Academic hospital owned pediatric practice	Pediatrics	21	Female
9	Academic hospital owned Family Medicine practice	Family Medicine	13	Female
10	Academic hospital owned pediatric practice	Pediatrics	1	Female
11	Academic hospital owned Family Medicine practice	Family Medicine	3	Female
12	Academic hospital owned pediatric practice	Pediatrics	19	Female

differed across the physicians were the approaches they used to convince the parents to give the vaccine to their child. These included referring to websites of the Centers for Disease Control and Prevention and other professional medical organizations. A physician explained how she uses data to help hesitant parents feel confident with the vaccine:

> *I try to clarify that the evidence shows … It depends on what their concern is. But if it's safety, 'The evidence shows it's safe; I'm happy to give you some of the papers if you'd like to read about the safety." (Ped. 03, Academic Pediatrician)*

In addition, physicians described using data selectively, as parents respond differently to different kinds of information, ranging from personal experience to population-based numbers. As one family medicine physician put it:

> *Some patients like more hard evidence and facts, and some are more, 'Well, would you do it for your loved ones?' So it definitely depends on the patient. But I think most people appreciate if you can relate to them. So I would say, like, 'I called my sister to get it'. (Fam. 11, Academic Family Medicine Physician)*

Nearly all physicians mentioned that they tell parents they would give (or have given) the HPV vaccination to their own children. One physician explained that this is a powerful way of communicating that "*I believe so much in these vaccines that I give … I've had my children get them*" *(Ped. 03, Academic Pediatrician)*. Another physician who did not have children also described using this as a strategy with parents:

> So, I don't have kids yet … when I have kids, I'm sure it would be more helpful. My answer is yes. That will I be vaccinating my child? Absolutely … I think parents appreciate that because if I am – and I'm being honest. (Ped. 08, Academic Pediatrician)

Theme 2: Physicians use a normalizing approach in communicating with parents about the HPV vaccine

In describing their communication approach, the physicians commonly made intentional efforts to minimize conversation around the HPV vaccine by presenting it as routine. The strategy of normalizing the HPV vaccine could be summarized as a less-is-more approach. As one physician described it: *"My number one strategy is don't overdo it." (Ped. 05, Academic Research Institute Pediatrician)*. One physician explained her rationale for this approach:

> *I guess when you present something as routine, which it is, then they will think of it as routine versus if you highlight it and make a big deal about it … they're going to be like, 'Well, why is there such a highlight in this?' There shouldn't be, either … (Fam. 07, Academic FQHC, Family Medicine Physician)*

Some physicians explained that presenting the HPV vaccine along with the other standard vaccines also helps to normalize it. One physician explained:

> *I think we have to destigmatize the vaccine and normalize it as a part of regular vaccines, just like you get measles vaccines, just like you get tetanus vaccines. (Ped. 05, Academic Research Institute Pediatrician)*

Theme 3: Physicians have to address vaccine misinformation at varying degrees for different patient populations

Most physicians indicated that what parents read on the internet fuels hesitancy about the HPV vaccine. While they all noted this as a barrier to vaccine acceptance, they characterized it differently. Some physicians described it generally about "the false information out there" that negatively influences some parents. Others were more specific, referencing videos or social media posts of unsubstantiated information related to side effects from HPV vaccines. One physician described how a specific video has caused a lot of parental hesitancy over the years:

> *[The parent] saw all the stuff on the TV, people getting really sick after the vaccine, all this … the major thing was that big video out of Texas where they put that on the news …. Where someone got the vaccine and then supposedly was walking backwards or couldn't walk … That was really a big thing that struck a lot of people, and it was just crazy. (Adol. 05, Academic Research Institute, Adolescent Medicine Physician)*

Another pediatrician highlighted the residual effect of some early, negative media attention the HPV vaccination received:

> *When Gardasil first came out it was in the news a lot, and the children that were getting some of the severe side effects were – it was reported on. So people kind of grabbed onto those things, and they're holding onto it when in fact the numbers show that, as with any vaccine, it's really a small minority of kids. (Ped. 08, Academic Pediatrician)*

Clinic/Medical team strategies

Two themes emerged that depict HPV vaccination workflows used by clinics or medical teams, as described by physicians in this study: 1) capacity to track HPV vaccination rates, although none reported knowing clinic level rates and 2) roles of other clinic staff in communication and administration of the HPV vaccination workflow.

Theme 1: Physicians have the capacity to track HPV vaccination rates for their practice, but none reported clinic level rates

All physicians described clinics having the capacity to track HPV vaccination status in the electronic health record (EHR) and/or the state immunization registry system. Despite these systematic ways of tracking, none of the physicians were aware of the rates of HPV vaccine uptake in their practices or if their practices were monitoring HPV vaccine rates. One physician described their tracking process:

> *On a practice level, we have an … Electronic health record. So all the vaccinations are kept in there. There's a flow sheet where we can see all the vaccines, a summary. But as a back up, there's the immunization registry … [if] they come in without a record. (Ped. 03, Academic Pediatrician)*

Nevertheless, when asked what percentage of patients agree to get the vaccine, one physician said they would have to "guess" the acceptance rate. Similarly, another physician from a different practice also guessed vaccination rates, despite their advanced electronic tracking system:

We did, recently we made a change to our EMR making it a lot easier to see … The computer people just built a little box that has just HPV status in the there. (Ped. 08, Academic Pediatrician)

Across the board, having the capacity to electronically track HPV vaccination did not translate to monitoring of HPV vaccination rates or need for follow-up for specific parents who initially may have declined the HPV vaccine for their adolescent.

Theme 2: Clinic staff have varying roles in communication and administration of the HPV vaccination workflow

Physicians described the role that nurses played in the HPV vaccination process in different ways. The most common workflow mentioned involved nurses identifying when a patient is due for the vaccine; physicians introducing and educating parents; and nurses subsequently administering the vaccine. One physician described relying so heavily on nurses in this process that the physician perceived the nurse as more qualified to speak about HPV vaccination:

I'm going to defer to [our nurses, regarding some interview questions] because they do a much better job than I could do with the vaccines … Like she will administer the vaccine, but she will also see that the patient needs the vaccine. (Ped. 01, Academic FQHC Pediatrician)

In addition, there were instances where physicians indicated that, at times, nurses may also take the initiative to introduce the HPV vaccine and/or provide education to the parents. One physician mentioned that the nurses' roles varied, depending on the patient flow:

Sometimes … if we're behind in our – in seeing patients, which often we are, the nurse will just go in and be like, oh, this patient's due for these vaccines, just get them ready. Sometimes they'll administer it before I even go in to see the patient, and then sometimes they'll see and get it after … we just have protocols in place so whenever patients are due for a vaccine, any vaccine, they just get it … (Fam. 07, Academic FQHC Family Medicine Physician)

Another physician highlighted the educational role nurses may potentially play, when needed:

So I think some nurses are comfortable answering the questions, and they are perfectly within the scope of their duty – their job – their educational training, they can do that. Otherwise, they can refer the mom back to the pediatrician before they administer the vaccine, because we're all right there. (Adol. 05, Academic Research Institute Adolescent Medicine Physician)

Overall variation in the HPV vaccination workflow between physicians and other clinic staff were observed, and in some cases, HPV vaccine education and addressing parental hesitancy was led by nurses.

Health system/Policy strategies

In discussing strategies at the system or policy levels, two themes emerged from the responses around the impact on communication about the HPV vaccine for parents and/or adolescents: 1) Physicians expressed frustration with the fact that school-required vaccine letters do not mention the HPV vaccine, and 2) physicians did not consider standard Vaccine Information Statements (VIS) factsheets as helpful in facilitating discussion with parents.

Theme 1: Omission of HPV vaccine information in school communication regarding adolescent vaccinations contributes to vaccine hesitancy

Several physicians expressed disagreement or frustration with the fact that letters from middle school nurses about required vaccines do not mention anything about the HPV vaccine. The general feeling was that the schools' silence creates a discrepancy with what physicians are recommending, which can cause confusion and suspicion for parents:

Patients' most common [concerns]: 'Why is this doctor offering one extra vaccine which is not required by the school?' … [School requirements] should say, 'These two vaccines are mandatory and this vaccine is recommended'." (Fam. 02, Academic FQHC Family Medicine Physician)

One physician who believed the HPV vaccine should be required by schools, suggested that if it were required, it would eliminate some extra work around administering this vaccine:

I think if the school required it, we wouldn't … I mean, we will still talk about it but I wouldn't have to really convince because it wouldn't be an option. (Ped. 10, Academic Pediatrician)

Theme 2: Physicians viewed routine information fact sheets as not helpful for facilitating discussion with parents

While physicians mentioned that the CDC-VIS fact sheet was frequently provided to parents, it was usually described as routine with little indication that it was used to facilitate discussion about the HPV vaccine. One physician's comments were characteristic of the common attitude:

The nurses … put [the VIS] as part of their handout … Every time you come in and get a vaccine, you get a handout … We kill a lot of trees, I think. (Ped. 08, Academic Pediatric)

Another reason was related to the workflow and that the VIS factsheet would be provided to parents at the time of administering the vaccine, as described here:

So there's [a VIS] for an HPV vaccine which is given at the time of the nurse administration. But that's just informational at the end. I mean, usually the parent's either convinced or not by the time that happens, because that's only if the nurse has actually been coming in to do the shot. (Fam. 09, Academic Family Medicine)

While physicians commonly noted that their patients/parents consistently receive the CDC-VIS factsheet for the HPV vaccine, it was exceedingly clear that it was not viewed or used as a useful educational aid for communicating with parents about HPV vaccination in these practices.

Discussion

In our study about HPV vaccine communication strategies among physicians in a large academic hospital system, it is apparent HPV vaccination is different from other adolescent

vaccinations and causes physicians to anticipate needing strategies to inform and persuade patients/parents of patients to get the vaccine that is beyond what is needed for other routine adolescent immunizations. While physician recommendation is known to be a primary predictor in vaccine initiation, strength of the recommendation matters and can vary widely across physicians and other health-care providers.[12,15] Prior work related to provider perceptions and HPV vaccine hesitancy also indicate physician self-efficacy,[17] physician outcome expectations of parental discussions,[25] and persistence in discussing the vaccine with parents[18] lead to increased uptake. Our results contribute to this prior work by demonstrating a comprehensive, systematic understanding is needed about on the ground HPV vaccine acceptability, misinformation, and hesitancy. Furthermore, this systematic assessment of physician experiences focus on the context of multiple levels, including the local community, clinic-team and practice culture.

Our discussion with physicians highlight the need to better understand clinic and health system/policy level strategies to increase HPV vaccination rates. In several interviews, physicians noted that nurses and other clinic staff may be the initial contact with patients when introducing the HPV vaccine to adolescent patients. However, specific workflows of vaccine introduction/recommendation and administration between physicians and clinic staff did not appear to be systematic within clinics. Furthermore, physicians in our study noted the ineffective use of VIS factsheets. As evidence for effective clinic-based strategies and physician community strategies to promote HPV vaccination continue to grow, beyond the use of factsheets, it will be important to promote access to these strategies for providers within the community. The HPV Vaccination Roundtable, for example, provides guidance for evidence-based strategies, including presumptive recommendations, standing orders, provider prompts, and patient reminders, that can improve HPV vaccination rates within health systems and clinic settings.[26] Another example is the American Academy of Pediatrics' HPV Project Extension for Community Health-care Outcomes (ECHO), which connects providers to HPV information, multidisciplinary mentors, and evidence-based and capacity-building resources. Providers in our study did not mention these or other resources, warranting the need to examine implementation of evidence-based strategies into clinic settings to address HPV vaccination.

Physicians also noted inconsistencies with the broader medical community. For example, letters from school nurses regarding mandated vaccinations in middle school for Tdap and meningococcal did not have any mention of HPV vaccinations, which is also routinely recommended for adolescents in the age group. Physicians mentioned some parents questioned the discussion around HPV vaccinations once they reached the doctor's office as it conflicted with school mandates. This type of inconsistent messaging, where physicians are recommending three adolescent vaccines during the clinic visit while school letters only mentioning two vaccines are confusing for parents and may lead to mistrust of providers. While schools are not required to provide information on non-mandated adolescent vaccinations, there is an opportunity for stakeholders across health-care delivery and school settings to partner in providing information about HPV vaccines. Providing HPV vaccine information in school settings and encouraging partnerships across stakeholders groups have been suggested in studies conducted in other states.[27–30] These examples suggest more systematic assessments of interactions across health care and communities are also warranted to inform population-level strategies for increased vaccine uptake.

Some limitations of our study should be noted. We included physicians who were affiliated or employed by a single large academic-hospital system. While the hospital serves a racial/ethnic and socioeconomically diverse population in a state with increasing, but average, HPV vaccination rates compared to the rest of the country, our findings may not be generalizable to other regions of the US. Nonetheless, we included physicians in various specialties and practice settings (e.g., FQHCs vs. hospital-owned primary care practice). While our physician sample may not be generalizable, the purpose of this qualitative study was to gain an in-depth understanding of the strategies used by physicians to address HPV vaccine uptake. Our study also interviewed physicians only and did not include other clinic staff, such as medical assistants and nurses, who may have differing perspectives on communication and clinic strategies for HPV vaccination. Lastly, we did not obtain HPV vaccination rates for the clinics or the patients of providers who participated in this study. Thus, we are unable to associate physician experiences and attitudes with rates of HPV vaccine uptake within each physician's practice. New Jersey, where this study was conducted, ranking the state among the 15 states with lowest HPV vaccine uptake with only 67.1% of adolescents ages 13–17 years receiving one or more doses of the vaccine. Future research should examine the relationship between physician communication strategies to address HPV vaccine hesitancy and misinformation and actual uptake of the vaccine, particularly in areas with low vaccination rates.

Conclusions

As HPV vaccination rates continue to lag behind other adolescent vaccinations, we need to better understand the elements required for improving HPV vaccination within health-care settings.[31,32] Although evidence has pointed to multi-component strategies for HPV vaccine improvement within health-care settings, few HPV vaccine intervention studies have systematically measured factors beyond patient and provider levels associated with HPV vaccination.[13,32–36] An understanding of the impact of provider, interpersonal and practice level factors[33] and the interdependencies among clinics and system/policy influences on implementation of EBS for HPV vaccination are needed.[37,38] While our findings indicate physicians are knowledgeable about HPV vaccination and recommend it to parents, strategies to overcome parental hesitancy were varied. More focus on physician, clinic, and health-system

-based strategies to overcome parental hesitancy and improve communication for HPV vaccination are warranted.

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Disclosure of potential conflicts of interest

The authors have no conflicts of interest.

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References

1. Chao C, Velicer C, Slezak JM, Jacobsen SJ. Correlates for human papillomavirus vaccination of adolescent girls and young women in a managed care organization. Am J Epidemiol. 2010;171(3):357–67. doi:10.1093/aje/kwp365.
2. Lau M, Lin H, Flores G. Factors associated with human papillomavirus vaccine-series initiation and healthcare provider recommendation in US adolescent females: 2007 National Survey of Children's Health. Vaccine. 2012;30(20):3112–18. doi:10.1016/j.vaccine.2012.02.034.
3. Cook RL, Zhang J, Mullins J, Kauf T, Brumback B, Steingraber H, Mallison C. Factors associated with initiation and completion of human papillomavirus vaccine series among young women enrolled in Medicaid. J Adolesc Health. 2010;47(6):596–99. doi:10.1016/j.jadohealth.2010.09.015.
4. Burger EA, Lee K, Saraiya M, Thompson TD, Chesson HW, Markowitz LE, Kim JJ. Racial and ethnic disparities in human papillomavirus-associated cancer burden with first-generation and second-generation human papillomavirus vaccines. Cancer. 2016;122(13):2057–66. doi:10.1002/cncr.30007.
5. American Cancer Society. Cancer facts & figures 2018. [Accessed 2018, Jan 24]. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2018/cancer-facts-and-figures-2018.pdf.
6. US Cancer Statistics Working Group. United States Cancer Statistics: 1999–2007 Incidence and Mortality Web-based Report. 2010. [Accessed 2011, Nov 17. www.cdc.gov/uscs.
7. Benard VB, Johnson CJ, Thompson TD, Roland KB, Lai SM, Cokkinides V, Tangka F, Hawkins NA, Lawson H, Weir HK. Examining the association between socioeconomic status and potential human papillomavirus-associated cancers. Cancer. 2008;113(10 Suppl):2910–18. doi:10.1002/cncr.23742.
8. Freeman H, Wingrove B. Excess cervical cancer mortality: a marker for low access to health care in poor communities. Rockville (MD): National Cancer Insitute; 2005.
9. Dempsey AF, Pyrznawoski 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.
10. Niccolai LM, Hansen CE. Practice- and community-based interventions to increase human papillomavirus vaccine coverage: a systematic review. JAMA Pediatr. 2015;169(7):686–92. doi:10.1001/jamapediatrics.2015.0310.
11. Perkins RB, Brogly SB, Adams WG, Freund KM. Correlates of human papillomavirus vaccination rates in low-income, minority adolescents: a multicenter study. J Womens Health (Larchmt). 2012;21(8):813–20. doi:10.1089/jwh.2011.3364.
12. Perkins RB, Zisblatt L, Legler A, Trucks E, Hanchate A, Gorin SS. Effectiveness of a provider-focused intervention to improve HPV vaccination rates in boys and girls. Vaccine. 2015;33:1223–29.
13. Smulian EA, Mitchell KR, Stokley S. Interventions to increase HPV vaccination coverage: A systematic review. Hum Vaccin Immunother. 2016;12(6):1566–88. doi:10.1080/21645515.2015.1125055.
14. Fu LY, Bonhomme LA, Cooper SC, Joseph JG, Zimet GD. Educational interventions to increase HPV vaccination acceptance: a systematic review. Vaccine. 2014;32(17):1901–20. doi:10.1016/j.vaccine.2014.01.091.
15. Gilkey MB, Malo TL, Shah PD, Hall ME, Brewer NT. Quality of physician communication about human papillomavirus vaccine: findings from a national survey. Cancer Epidemiol Biomarkers Prev. 2015;24(11):1673–79. doi:10.1158/1055-9965.EPI-15-0326.
16. Gilkey MB, McRee AL. Provider communication about HPV vaccination: A systematic review. Hum Vaccin Immunother. 2016;12(6):1454–68. doi:10.1080/21645515.2015.1129090.
17. McRee AL, Gilkey MB, Dempsey AF. HPV vaccine hesitancy: findings from a statewide survey of health care providers. J Pediatr Health Care. 2014;28(6):541–49. doi:10.1016/j.pedhc.2014.05.003.
18. Shay LA, Baldwin AS, Betts AC, Marks EG, Higashi RT, Street RL, Persaud D, Tiro JA. Parent-Provider Communication of HPV Vaccine Hesitancy. Pediatrics. 2018;141(6):e20172312. doi:10.1542/peds.2017-2312.
19. Attwell K, Dube E, Gagneur A, Omer SB, Suggs LS, Thomson A. Vaccine acceptance: science, policy, and practice in a 'post-fact' world. Vaccine. 2019;37(5):677–82. doi:10.1016/j.vaccine.2018.12.014.
20. Dubé E, Gagnon D, MacDonald NE. Strategies intended to address vaccine hesitancy: review of published reviews. Vaccine. 2015;33(34):4191–203. doi:10.1016/j.vaccine.2015.04.041.
21. Hennink MM, Kaiser BN, Marconi VC. Code Saturation Versus Meaning Saturation: how Many Interviews Are Enough? Qual Health Res. 2017;27(4):591–608. doi:10.1177/1049732316665344.
22. Spradley J. The Ethnographic Interview. Forth Worth (Texas): Harcourt Brace Jovanovich College Publishers; 1979.
23. Crabtree BF, Miller W. Doing qualitative research. Thousand Oaks (USA): SAGE Publications; 1999.
24. Crabtree BF, Miller W. Doing qualitative research. In: *Using codes and code manuals: A template for organizing style of interpretation*.. Newbury Park (CA): SAGE Publications; 1999; 163–78.
25. Cunningham-Erves J, Koyama T, Huang Y, Jones J, Wilkins CH, Harnack L, McAfee C, Hull PC. Providers' perceptions of parental human papillomavirus vaccine hesitancy: cross-sectional study. JMIR Cancer. 2019;5(2):e13832. doi:10.2196/13832.
26. National HPV Vaccine Roundtable. Clinician & Health Systems Action Guides. 2019. [Accessed 2020 Oct, 23. https://hpvroundtable.org/action-guides/.
27. Baezconde-Garbanati L, Lienemann BA, Robles M, Johnson E, Sanchez K, Singhal R, Steinberg J, Jaque JM, Pentz MA, Gruber S. Implementation of HPV vaccination guidelines in a diverse population in Los Angeles: results from an environmental scan of local HPV resources and needs. Vaccine. 2017;35(37):4930–35. doi:10.1016/j.vaccine.2017.07.080.
28. Carhart MY, Schminkey DL, Mitchell EM, Keim-Malpass J. Barriers and Facilitators to Improving Virginia's HPV vaccination rate: a stakeholder analysis with implications for pediatric nurses. J Pediatr Nurs. 2018;42:1–8.
29. Dilley SE, Peral S, Straughn JM, Scarinci IC. The challenge of HPV vaccination uptake and opportunities for solutions: lessons learned from Alabama. Prev Med. 2018;113:124–31. doi:10.1016/j.ypmed.2018.05.021.
30. National Center for Immunization and Respiratory Diseases. 2008 through 2019 Adolescent Human Papillomavirus (HPV) Vaccination Coverage Trend Report. 2020. Accessed Oct 23,

2020. https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/data-reports/hpv/trend/index.html.

31. Gaglio B, Shoup JA, Glasgow RE. The RE-AIM framework: a systematic review of use over time. Am J Public Health. 2013;103(6):e38–46. doi:10.2105/AJPH.2013.301299.
32. Walling EB, Benzoni N, Dornfeld J, Bhandari R, Sisk BA, Garbutt J, Colditz G. Interventions to Improve HPV Vaccine Uptake: A Systematic Review. Pediatrics. 2016;138:1. doi:10.1542/peds.2015-3863.
33. Garbutt JM, Dodd S, Walling E, Lee AA, Kulka K, Lobb R. Barriers and facilitators to HPV vaccination in primary care practices: a mixed methods study using the Consolidated Framework for Implementation Research. BMC Fam Pract. 2018;19(1):53. doi:10.1186/s12875-018-0750-5.
34. Kasting ML, Christy SM, Sutton SK, Lake P, Malo TL, Roetzheim RG, Schechtman T, Zimet GD, Walkosz BJ, Salmon D, et al. Florida physicians' reported use of AFIX-based strategies for human papillomavirus vaccination. Prev Med. 2018;116:143–49. doi:10.1016/j.ypmed.2018.09.004.
35. Reno JE, O'Leary ST, Pyrzanowski J, Lockhart S, Thomas J, Dempsey AF. Evaluation of the implementation of a multicomponent intervention to improve health care provider communication about human papillomavirus vaccination. Acad Pediatr. 2018;18(8):882–88. doi:10.1016/j.acap.2018.08.004.
36. Selove R, Foster M, Mack R, Sanderson M, Hull PC. Using an implementation research framework to identify potential facilitators and barriers of an intervention to increase HPV vaccine uptake. J Public Health Man. 2017;23:E1–E9.
37. Rodriguez SA, Mullen PD, Lopez DM, Savas LS, Fernández ME. Factors associated with adolescent HPV vaccination in the U.S.: a systematic review of reviews and multilevel framework to inform intervention development. Prev Med. 2020;131:105968. doi:10.1016/j.ypmed.2019.105968.
38. Bednarczyk RA, Chamberlain A, Mathewson K, Salmon DA, Omer SB. Practice-, Provider-, and Patient-level interventions to improve preventive care: development of the P3 Model. Prev Med Rep. 2018;11:131–38. doi:10.1016/j.pmedr.2018.06.009.