

RESEARCH PAPER



Human papillomavirus dose reminder preferences among parents from a diverse clinical sample: a qualitative study

Jacqueline M. Hirth^a, Kayla A. Eboreime^b, Leslie E. Cofe^c, Richard E. Rupp^d, and Abbey B. Berenson^e

^aDepartment of Family and Community Medicine, Baylor College of Medicine, Houston, TX, USA; ^bSchool of Medicine, The University of Texas Medical Branch, Galveston, TX, USA; ^cDepartment of Health Education and Promotion, College of Health and Human Performance, East Carolina University, Greenville, NC, USA; ^dDepartment of Pediatrics, The University of Texas Medical Branch, Galveston, TX, USA; ^eCenter for Interdisciplinary Research in Women's Health Department of Obstetrics and Gynecology, The University of Texas Medical Branch, Galveston, TX, USA

ABSTRACT

Reminders are an important method for encouraging patients to return for follow-up visits, such as for successive doses of the human papillomavirus (HPV) vaccine. However, patients may have preferences for different types of reminders. This study examined which reminder methods parents of pediatric patients found most useful and their thoughts on how the reminders helped them to complete their children's HPV vaccine series. This qualitative study was conducted on a purposively sampled group of parents who participated in a multi-level intervention intended to improve uptake and completion of the HPV vaccine series. Parents who agreed to participate were interviewed by phone using semi-structured interviews about their satisfaction with different program components, including reminders they received. Interviews were conducted between May 26, 2016 and October 18, 2017. Thematic analyses of data were conducted using NVivo software. Among 269 program participants invited to participate in the interviews, 157 agreed (58.4%) and 89 were successfully interviewed (33.1%). Participants thought that reminders were effective at helping them return for follow-up visits to ensure their children received all recommended HPV vaccine doses. Although most parents preferred texts, many also favored other reminder methods by themselves or in combination with texts. Parents suggested that the reminders indicate the purpose of the appointment and for which child. Reminders are an important part of a multi-component intervention that aims to increase completion of the HPV vaccine series. Program enrollees prefer different types of reminders, so offering several options may improve returns for follow-up doses.

ARTICLE HISTORY

Received 4 November 2021
Revised 6 January 2022
Accepted 18 January 2022

KEYWORDS



HPV vaccine program;
program evaluation;
appointment reminders;
intervention

Introduction

The Advisory Committee on Immunization Practices (ACIP) recommends 2 doses of the human papillomavirus (HPV) vaccine for children and teens initiating the series before 15 years of age and 3 doses for those who initiate at 15 years or later, but only 56.8% of females and 51.8% of males 13–17 years old had received the recommended number of doses as of 2019.¹ To ensure their child completes the recommended dosing schedule of the HPV vaccine, parents are often required to remember to make follow-up appointments, as well as the day and time when they are scheduled to return. This frequently leads to missed appointments which delay or prevent completion of the series. The issue will be compounded if the healthcare provider misses opportunities to vaccinate during other types of visits.

Methods that have been studied to help patients return for follow-up vaccination after initiating the HPV vaccine series include texts, educational messaging, letters, clinician reminder prompts, and phone messages.^{2–7} HPV vaccination reminders, as an individual component of an intervention, have been shown to have only small effects on series initiation or completion.^{3–7} This could be due to the proliferation of automatic calls and texts that many people receive, thus decreasing

patients' willingness to listen or respond to calls and texts from unknown numbers.⁸ Texting may be a preferred method among parents for receiving reminders about their child's upcoming HPV vaccination appointment, but this reminder method may not be equally effective for all populations. In Rochester NY, a parallel randomized controlled trial was conducted to examine the impact of phone and text reminders on HPV vaccination rates. The results showed an increase in vaccination completion of 18% and 9% for text and phone, respectively, as compared to controls. The study also showed that phone calls were only effective for those who enrolled in the trial after the 1st dose.⁵ A Cochrane Systematic review noted that different reminders improved immunization rates among children and adolescents.⁹ Although vaccine reminders, such as appointment reminder letters for hepatitis B vaccines in high-risk adults, have had promising results, these vaccines are not directly comparable to HPV vaccine reminders for adolescents. In addition, other vaccines that are mandatory for attendance at daycares and public schools are not directly comparable to the HPV vaccine, as follow-up doses are usually mandated for participation in daycares and schools. The HPV vaccine is currently not mandated in most states and is very easy to opt out of in jurisdictions that do mandate it.¹⁰ Therefore, reminders are an important part of ensuring HPV

CONTACT Abbey B. Berenson  abberens@utmb.edu  Center for Interdisciplinary Research in Women's Health Department of Obstetrics and Gynecology, The University of Texas Medical Branch, 301 University Blvd. Rte 0587, Galveston, TX 77555, USA

© 2022 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

vaccination series completion, particularly among adolescents from racial/ ethnic groups that have experienced disproportionate morbidity and mortality from HPV-related cancers, including Hispanics and Blacks.¹¹

However, it is important to consider how well these reminders may work for real-world application among historically marginalized communities. For example, Hispanic and Black adolescents have higher rates of initiation compared to other racial/ ethnic groups, but low rates of HPV vaccine series completion, similar to other racial/ ethnic groups.¹¹ In a randomized study in rural northeast NC among predominantly Black (60%) and Hispanic (28%) uninsured patients, provider recommendation resulted in 1.8 times greater odds of completing HPV vaccination, whereas those who received texts and e-mail reminders did not have an increase in initiation or completion of the series.¹² Even though many studies showed little increase in HPV vaccination initiation or completion, a study that followed 5 Indian reservation health clinics observed a significant impact. The snowball-sampled clinics implemented provider education, expanded access to health-care, made phone calls, and provided electronic provider reminders. The clinics showed a mean initiation increase of 24% and mean completion increase of 22%.¹³ These mixed findings indicate that more understanding is needed of patient preference for different types of reminders to determine what reminder methods would work best for different communities.

For this study, caretakers of pediatric patients, including foster parents and grandparents, hereafter described as parents, participated in an HPV vaccination program that achieved a 93% completion rate among enrolled pediatric patients in clinics serving a highly diverse community with a high proportion of low-income households.¹⁴ Achieving a better understanding of reminder methods that were most useful to parents will assist future programs to offer the methods that patients find most useful in helping them return for follow-up HPV vaccine doses. The purpose of this study was to examine what reminder methods parents of pediatric patients found most useful, and to examine their thoughts on how the reminders assisted them in completing their children's HPV vaccine series.

Methods

This study examined qualitative evaluation results of a multicomponent program intervention designed by Abbey B. Berenson at The University of Texas Medical Branch to increase HPV vaccine uptake in pediatric clinics located in Southeast Texas between 2015 and 2018. We utilized an action research method in order to better understand the effects of different components of the HPV vaccine program on parent decision-making and to evaluate how to improve the program moving forward. The vaccination program details have previously been published.¹⁴ An important component of the program was the use of patient navigators (PNs) to increase completion of the entire series through education and reminders among a population of patients largely from marginalized communities, of which approximately 67% were Black or Hispanic and from low-income households. Briefly, PNs hired for this project gave the parents of all patients who

received the HPV vaccine that day a handout with the time and date of their next appointment before they left the clinic. Following this initial visit, they reminded parents twice during the week before their next scheduled appointment by phone or by mail if the phone number was not in service. Parents also received an automated phone call sent by the university. The PNs called parents of patients who missed appointments and offered a new appointment date which was followed up with a letter stating the new time. In addition, parents had the option of receiving a text reminder and/or an e-mailed reminder from the PNs.

As part of the program evaluation, all HPV vaccination program participants were asked to participate in an interview after being approached about vaccinating their children. Those who agreed filled out a contact form. Participants were parents, grandparents, or guardians of pediatric patients who decided on whether their child(ren) get vaccinated. Potential participants were contacted after their child(ren) had: 1. completed the HPV vaccine series, or 2. missed at least 1 appointment for HPV vaccination without rescheduling before the day of the appointment. To be included in this study, a parent who filled out the contact form and indicated they were interested in participating also needed to agree to a time to participate in the interview. This study included English speakers with children who had received at least one dose of the HPV vaccine at participating clinics and recalled talking to a PN during at least one visit with their children. Participants were interviewed only one time via telephone. They were informed that they did not have to answer any questions they did not want to on either the demographic survey or as part of the interview. This qualitative study was approved by the University of Texas Medical Branch (UTMB) Institutional Review Board (approval number, 16-0045). The interviewer reviewed information about the risks and benefits of the study with each participant, as well as the procedures and how confidential information would be maintained. Patients consented to participate orally. A copy of the study information was mailed to all participants.

Data collection

Data were collected through audio-recorded telephone interviews using semi-structured interview guides between May 26, 2016 and October 18, 2017.¹⁵ Questions that focused on reminders for follow-up doses asked about satisfaction with reminders, reminder preferences, and how reminders assisted parents in getting additional doses for their children.

Three female research assistants (Lena Matsushita, Megan Hotard, Vivian Tat) were trained by JM Hirth to conduct phone-based interviews. Patient interviews averaged 15–20 minutes during a single telephone call but did not last more than 1 hour. Participants were compensated with a \$25 gift card for their time. Transcripts were made of each audio-recording and were checked for accuracy by a second transcriber. All conversations were held in English. Transcripts were iteratively discussed as interviews were being conducted to identify programmatic issues that could be addressed by the team to improve the HPV vaccine program. Although saturation of themes occurred after 22 interviews, data collection continued to identify program issues that evolved over the

course of the vaccination program. Formal analyses of data focused on vaccine reminders were conducted between May 1, 2020 and September 1, 2020, at UTMB.

Analysis

Throughout the data collection phase, the data evaluation team (JM Hirth, L Cofie) iteratively discussed and developed a preliminary coding scheme based on the participants' responses to questions on HPV vaccine appointment reminders. All interviews were included because it allowed for quantitative examination of preferred reminder methods. During the analysis phase evaluators (JM Hirth, L Cofie, K Eboime) started with a preliminary close reading of all the transcripts and maintained written memos. This enabled refinement of deductive codes based on interview guides and inductive codes from emerging themes. JM Hirth and K Eboime applied the codes to transcripts using NVivo software (QSR International Pty Ltd. Version 10). They met regularly to conduct coding checks to maintain coding accuracy and consistency, as well as to further refine the codebook. The evaluation team used the code summaries and written memos to conduct the thematic analyses related to satisfaction with and preference for the different HPV vaccine reminder methods.

Results

Among the 269 parents who were invited to participate in the interviews, 157 agreed (58.4%) and 89 were successfully interviewed (33.1%) for this study. The remaining 68 parents either declined to participate when called to schedule an interview, did not respond to voice messages, or their phone number was no longer in service and could not be contacted. The ethnic composition of the included sample was diverse, reflecting the diversity of the community served by the pediatric clinics. Thirty-one participants identified their race/ ethnicity as non-Hispanic Black (35%), 33% as non-Hispanic White, 28% as Hispanic, and 4% as Asian/ Pacific Islander or American Indian. Most children represented in this study were insured through Medicaid (78%); only 13% of the children were insured through a private medical insurance policy. The sample included 8 parents with children who missed their appointment for a follow-up dose at least 1 time but had not rescheduled.

All participants were included, as we wanted to gain insight into the reminder preferences for all HPV vaccination program enrollees. Main findings for this study included evaluation of preferred reminder methods, including texts, personal phone calls placed by the PNs to the parents, automated phone calls, e-mails, and preference to receive more than one type of reminder. We also examined themes related to how parents perceived the effectiveness of the reminders in helping them to complete the vaccine series in their children. Finally, we evaluated themes related to how reminders could be improved to help other parents have their children complete the HPV vaccine series.

Overall, parents of pediatric patients thought reminders were effective at helping them return to the clinic to ensure their children received all recommended HPV vaccine doses

Table 1. Effectiveness of HPV vaccine program follow-up visit recall system.

Effectiveness of recall	
<i>Didn't really need it</i>	"I'm always writing down his appointments in the calendar and so I would remember that he has an appointment."
<i>Very effective</i>	"Yeah, I think it's effective. I mean, I'm a mother of three, so our lifestyles are pretty busy and chaotic. So I just need as many reminders as possible for what I need to do the next day."

(Table 1). One common theme among this group was that they were busy and welcomed reminders because they helped them remember to come back to the clinic. Many also mentioned that they were forgetful. One parent stated, "*Good, because I do forget. So the calls and texts are good,*" (Hispanic female). Most patients thought reminders were helpful and only 2 of 51 patients thought reminders were supplemental or not necessary. Among 78 parents who commented on how likely it would have been for their child to complete their HPV vaccine series, 56 stated that it was "not likely" they would have completed it, and 9 thought that it "wouldn't have been as easy" without the reminders offered by the HPV vaccination program.

Parents reported receiving a variety of reminders, with most recalling receipt of texted reminders (Table 2). Most parents thought texts were most helpful (42/75 responders). Parents who preferred texts said they liked that method because they could refer to it to help them remember. "*I tend to forget and I (go) to my messages every day, numerous times a day. So when I get the text messages I don't delete it (sic) leave it there. And that way I see it, and I know what it's for,*" (non-Hispanic white female). Many also indicated that multiple reminders were preferred, or any methods were acceptable (22 of 75). One mother, when asked which method she preferred said, "*All of them. Because a lot happened in that time frame that I was supposed to come back. I preferred all of them,*" (non-Hispanic Black female). Several (17 of 75) preferred personal phone call reminders. They thought it would give them the opportunity to discuss questions. One said, "*I'm just saying because you can ask questions or if I have concerns or something I won't have to wait, I can ask that question instead of waiting on a line to get to a person,*" (Hispanic female). Other parents mentioned that they do not pay attention to texts, so personal phone calls are more likely to get through to them. They also liked these calls because it gave them an immediate opportunity to change the

Table 2. HPV vaccination follow-up appointment reminder types reported by participants in program evaluation interviews.

Type of reminders used (recalled)	Count	Percentage ^a
Text	46	57.50%
Personal Call	27	33.75%
Automated Call	23	28.75%
Phone Call (unspecified)	11	13.75%
Mail	9	11.25%
E-Mail	4	0.05%
None	11	13.75%
Multiple reminder methods ^b	15	18.75%

80 responses on types of reminders received.

^aPercentage does not add up to 100% because respondents may have mentioned receiving more than one method.

^bThe number of those who mentioned recalling more than one reminder method was included in multiple reminder methods count.

appointment if needed. Although parents mentioned other methods, such as automated phone calls (9/75), e-mails (3/75), refrigerator magnets (1/75), and mailed reminders (2/75), these parents also said they did not strongly support these reminder methods.

Although they found reminders helpful, parents also had suggestions on how to improve the reminders or services that could supplement the reminders. Parents with multiple children thought additional information about the appointment, or at least including the child's name, would be helpful to them (Table 3). They noted that they may have multiple types of appointments in one visit or across several visits. Further, including educational reminders might help parents to remember why getting multiple doses of the HPV vaccine is important for their children. Several parents had transportation issues or needed additional incentives to return. Some mentioned their children feared needles and reducing the number of visits required to get fully vaccinated would be helpful. Parents also requested educational information to be provided in different forms, such as through video or online, rather than in paper form.

Although most respondents preferred text reminders, a significant portion preferred multiple reminders or other reminder types. Thus, it is important that clinic staff keep in mind that patients may have differing preferences for reminders (Table 4). For example, patients who preferred personal phone calls wanted to be able to ask questions when being reminded about the visit. These parents may have ignored or forgotten information relayed via automated calls. Conversely, those who preferred texts mentioned they could store the message to remind them of the appointment. Some of the parents lived in rural areas or areas with higher density of lower socioeconomic status households. These parents found texting to be preferable, as other types of reminders might not reach them.

Patients also discussed methods they did not prefer. For example, some patients said that automated reminders filled up their voicemail and considered them impersonal (Table 4). Those who reported texting as a less preferred method thought texts were not helpful or filled up their phone with unnecessary messages. Voicemail and e-mails were also described as not likely to be read or listened to, as they filled up the participants' voicemail boxes, making it more difficult to manage them.

Table 3. Improvements to HPV vaccine follow-up appointment recall program.

<i>Call day before appointment</i>	"Maybe a day before call"
<i>Education</i>	"Y'all should make a 30-second- or minute-long video so that when the teens come in to get the vaccination, they can watch a video, and it can tell them a little bit more about it."
<i>Include Incentive for Return</i>	"Would suggest like a small reward from them, like a small prize. Maybe a toy or a souvenir, something to encourage kids to come back."
<i>Make reminders include child name</i>	"Because a lot of [people], with different appointments, especially with people who have more than one child, like I do, keeping up with their appointments is kind of hard"
<i>Make sure reminders sent out</i>	"Just make sure that there's reminders sent out"
<i>None</i>	"You guys have done everything you would need to possibly do for a parent, so I wouldn't change it at all."

Table 4. Preferences for and against HPV vaccination follow-up visit recall methods.

<i>Preferred methods</i>	
<i>Any methods work</i>	"Yeah, it's nice, I think it's the same. It's all the same as long as the message gets through."
<i>Automated phone call</i>	"Either one's fine. Because they both reminded you of the same thing."
<i>E-mail</i>	"I prefer the email because again we have a calendar in our hallway, and I was able to print the email. The email had the date the time and where to park. It had all the detailed information."
<i>Mail</i>	"Yes, I did. I asked them could they mail, call me or mail me because like I said, I have (a) bad memory."
<i>Multiple</i>	"So, it didn't really matter they all was (sic) great – to calling, the mailing, the one on one talking. They always good (sic), so I prefer them all."
<i>Personal phone call</i>	"I would rather talk to a person. You know hear something."
<i>Text</i>	"Text messages I'll hear it and know it's there, but I could check it maybe in 20 to 30 minutes. Whereas phone call, I could miss it and things like that."
<i>Less preferred recall method</i>	
<i>Automated phone calls</i>	"I hate automated phone calls."
<i>Text</i>	"The only thing it did was remind me, you know and as far as being helpful, I could have done without it. I think we still would have made it and benefitted the same way with or without the texting."
<i>Voicemail</i>	"I don't listen to voicemail. And I don't, and then half the time I don't see my emails because they're just so many that come through."

Even though reminders were perceived as effective, some patients still missed follow-up appointments. For the most part, there was little that clinics could do to address these issues. Some parents noted that children were afraid of needles and that it was difficult to convince them to go to the doctor's office for shots or that they needed additional time to prepare their child (Table 5). Others described their lives as busy and couldn't miss going to work or forgot the appointment despite reminders. However, parents often noted how accommodating the clinics were in their flexibility in permitting parents to come in when it was convenient for them. Other parents noted there was

Table 5. Reasons for missing HPV vaccine follow-up appointment.

<i>Child afraid of needles</i>	"Yeah, it's the fear of the needle."
<i>Couldn't miss work</i>	"They were real nice about it. They understood, you know how your work scheduling, they understood. So they was real nice about it. And they you know, they just, um, they just sent me letters, you know trying to remind me about coming and stuff like that and they would call or whatever. You know."
<i>Forgot</i>	"We missed the third one and we just had to go in the next day and get it done. But they were very accommodating, the nurse just let us come right in."
<i>Miscommunication</i>	"We were there and there was just a miscommunication about when he was supposed to get the shot, so we rescheduled the shot."
<i>Scheduled at inconvenient time</i>	"They were very nice about rescheduling it. They understood why I wasn't like couldn't just drive up there, you know, just for a shot because (sic) on disability."
<i>School</i>	"I didn't have a problem scheduling, for the last shot I had to reschedule a couple of appointments because of school."
<i>Transportation</i>	"Yes, I had a transportation problem because my mom works out of town and she's the only person that can take me up there. So I had to wait for her on a day that was good for her to take me."

miscommunication about when the vaccine appointment was scheduled, or it was scheduled at an inconvenient time. Transportation was also noted to be a barrier that was difficult to overcome in a region with few options for public transportation services.

The overall reaction to the HPV vaccination program was very positive, with most patients indicating that they were “very satisfied” or “satisfied” with the program and the reminders. In addition to the reminder services, parents noted that the staff were accommodating to their schedules and that the staff did their best to comfort children who feared needles.

Discussion

Previous studies of reminder interventions to increase HPV vaccine completion rates have had mixed results in different populations. In a 3-arm pragmatic randomized controlled trial in New York and Colorado, patients randomly received 0, 1, 2 or 3 calls for each dose of the vaccine.¹⁶ In the New York study arm, there was no significant increase in series completion. In Colorado, the vaccine initiation rates only increased from 31.2% to 33.5% for the 1 call per dose group.

The New York State Health Department monitored the effects of mailed HPV vaccination reminders on initiation rates over a 6-month period.¹⁷ The subjects were all parents of children between the ages of 11–13 who were eligible for the HPV vaccine series. The subjects were separated into an intervention group, which received mailed educational material with a letter to discuss vaccination with their children’s doctor and a control group which received the same material 6 months later. The researchers observed a mere 2% increase in vaccination initiation before letters were sent to the control group.¹⁷ Kaiser Permanente Washington conducted a randomized trial in which the intervention group received automated calls as well as mailed letter reminders, texts and brochures explaining HPV vaccination.¹⁸ The 23.6% initiation rate for the intervention group was not substantially higher than the 18.8% rate for the control group. The completion rate for the intervention group was 10.3% compared to 6.8% for the control. These studies demonstrate that although these methods increase initiation and completion of the HPV vaccine series, the effects are modest. However, little information about the reminder preferences of pediatric parents has previously been available.

Our study helps contextualize previous findings through understanding what parents find helpful or unhelpful about different types of reminders. Further, their suggestions on how to improve reminders contribute to ideas about the future of appointment reminders for parents. This study indicates that one reminder type may not be adequate for a diverse group of parents, and that adopting multiple reminder methods for future appointments may be a better strategy to ensure that patients receive all doses of the HPV vaccine series.

We also found that parents forgot details of their conversations with PNs. The interviews often occurred several months after the PNs first approached and discussed the vaccine with the parents. Thus, offering HPV-related information in different media in addition to printed sheets could help parents remember details related to the vaccine for future needs, such as younger

children or discussion with family and friends. Much of the online information is not developed using current health education and design principles, and much is currently focused on healthcare providers or is not easily understood by parents.^{19,20} Therefore, interventions that focus on easily shared and easy-to-understand information about HPV for parents may provide an accessible source of information to encourage future vaccination among parents who make the choice for older children, but who may not remember their decision or information related to HPV from a previous vaccination appointment.

Limitations

This study had some limitations. It consisted of several interviews among a population of parents who initiated and completed their children’s HPV vaccination at a high rate. We were able to ask them what they found to be most helpful about reminders and which reminders were best for them, which were strengths of this study. However, this study also addressed different types of recall methods in the setting of a multi-component HPV vaccination program. Other factors than automatic scheduling and reminders likely affected the vaccine series completion rate. For example, one strategy that reduced missed opportunities to vaccinate was to place patient navigators in the clinic. These navigators identified incompletely vaccinated patients by examining electronic medical records and offering the parents individualized educational counseling that made the patient population aware of the need for follow-up doses.

Future research should examine multiple reminder types used together to evaluate whether they can increase vaccination follow-up significantly in the absence of other program components that were used for this project. In addition, the use of reminders for additional doses of vaccines that are mandatory for school attendance among adolescents, such as meningococcal, as compared to non-mandated vaccines, such as the HPV vaccine and the COVID vaccine, could be compared to evaluate the differences in response by mandate status.

In conclusion, in a diverse population of patients, parents may require multiple appointment reminders from a variety of methods to help them remember to attend appointments. Although multiple strategies are ideal, some clinics may not have the resources to employ them. Therefore, automatic scheduling of follow-up appointments and reminder services using a variety of methods as well as including educational information could be an important way to improve patient attendance for HPV vaccine follow-up appointments.

Acknowledgments

We would like to thank the following individuals for their work conducting interviews, organizing efforts to collect contact forms, and assisting with the program organization effort: Megan Hotard, Lena Matsushita, Margarita Morgado, and Vivian Tat.

Disclosure statement

ABB reports receiving grant funding from CPRIT during conduct of the study. JHM, KAE, LEC, and RER report no conflicts of interest.

Funding

This work was supported by the Cancer Prevention and Research Institute of Texas (CPRIT) under grants [PP150004 and PP190004] awarded to A.B. Berenson.

ORCID

Richard E. Rupp  <http://orcid.org/0000-0002-9659-1217>

References

- Elam-Evans LD, Yankey D, Singleton JA, Sterrett N, Markowitz LE, Williams CL, Fredua B, McNamara L, Stokley S. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years — United States, 2019. *MMWR Morb Mortal Wkly Rep.* 2020;69(33):1109–16. doi:10.15585/mmwr.mm6933a1.
- Tull F, Borg K, Knott C, Beasley M, Halliday J, Faulkner N, Sutton K, Bragge P. Short message service reminders to parents for increasing adolescent human papillomavirus vaccination rates in a secondary school vaccine program: a randomized control trial. *J Adolesc Health.* 2019;65(1):116–23. doi:10.1016/j.jadohealth.2018.12.026.
- Chao C, Preciado M, Slezak J, Xu L. A randomized intervention of reminder letter for human papillomavirus vaccine series completion. *J Adolesc Health.* 2015;56(1):85–90. doi:10.1016/j.jadohealth.2014.08.014.
- Zimet G, Dixon BE, Xiao S, Tu W, Kulkarni A, Dugan T, Sheley M, Downs SM. Simple and elaborated clinician reminder prompts for human papillomavirus vaccination: a randomized clinical trial. *Acad Pediatr.* 2018;18(2):S66–S71. doi:10.1016/j.acap.2017.11.002.
- Rand CM, Vincelli P, Goldstein NPN, Blumkin A, Szilagyi PG. Effects of phone and text message reminders on completion of the human papillomavirus vaccine series. *J Adolesc Health.* 2017;60(1):113–19. doi:10.1016/j.jadohealth.2016.09.011.
- Rand CM, Brill H, Albertin C, Humiston SG, Schaffer S, Shone LP, Blumkin AK, Szilagyi PG. Effectiveness of centralized text message reminders on human papillomavirus immunization coverage for publicly insured adolescents. *J Adolesc Health.* 2015;56(5):S17–20. doi:10.1016/j.jadohealth.2014.10.273.
- Kang HS, De Gagne JC, Son YD, Chae SM. Completeness of human papilloma virus vaccination: a systematic review. *J Pediatr Nurs.* 2018;39:7–14. doi:10.1016/j.pedn.2017.12.003.
- Geoghegan S, Feemster K. Optimizing human papillomavirus immunization: the role of centralized reminder and recall systems. *Pediatrics.* 2020;145(5):e20193596. doi:10.1542/peds.2019-3596.
- Jacobson Vann JC, Jacobson RM, Coyne-Beasley T, Asafu-Adjei JK, and Szilagyi PG. Patient reminder and recall interventions to improve immunization rates. *Cochrane Database Syst Rev.* 2018;1(1):CD003941. doi: 10.1002/14651858.CD003941.
- Hoss A, Meyerson BE, Zimet GD. State statutes and regulations related to human papillomavirus vaccination. *Hum Vaccin Immunother.* 2019;15(7–8):1519–26. doi:10.1080/21645515.2019.1627817.
- Hirth J. Disparities in HPV vaccination rates and HPV prevalence in the United States: a review of the literature. *Hum Vaccin Immunother.* 2019;15(1):146–55. doi:10.1080/21645515.2018.1512453.
- Richman AR, Torres E, Wu Q, Carlston L, O'Rorke S, Moreno C, Olsson J. Text and email messaging for increasing human papillomavirus vaccine completion among uninsured or medicaid-insured adolescents in Rural Eastern North Carolina. *J Healthcare Poor Underserved.* 2019;30(4):1499–517. doi:10.1353/hpu.2019.0090.
- Jacobs-Wingo JL, Jim CC, Groom AV. Human papillomavirus vaccine uptake: increase for American Indian Adolescents, 2013–2015. *Am J Prev Med.* 2017;53(2):162–68. doi:10.1016/j.amepre.2017.01.024.
- Berenson AB, Rupp R, Dinehart EE, Cofie LE, Kuo Y-F, Hirth JM. Achieving high HPV vaccine completion rates in a pediatric clinic population. *Hum Vaccin Immunother.* 2019;15(7–8):1562–69. doi:10.1080/21645515.2018.1533778.
- Hirth JM, Berenson AB, Cofie LE, Matsushita L, Kuo Y-F, Rupp RE. Caregiver acceptance of a patient navigation program to increase human papillomavirus vaccination in pediatric clinics: a qualitative program evaluation. *Hum Vaccin Immunother.* 2019;15(7–8):1585–91. doi:10.1080/21645515.2019.1587276.
- Gurfinkel D, Kempe A, Albertin C, Breck A, Zhou X, Vangala S, Beaty B, Rice J, Tseng C-H, Campbell JD, et al. Centralized reminder/recall for human papillomavirus vaccination: findings from two states—a randomized clinical trial. *J Adolesc Health.* 2021. doi:10.1016/j.jadohealth.2021.02.023.
- Coley S, Hoefler D, Rausch-Phung E. A population-based reminder intervention to improve human papillomavirus vaccination rates among adolescents at routine vaccination age. *Vaccine.* 2018;36(32 Pt B):4904–09. doi:10.1016/j.vaccine.2018.06.056.
- Henrikson NB, Zhu W, Baba L, Nguyen M, Berthoud H, Gundersen G, Hofstetter AM. Outreach and reminders to improve human papillomavirus vaccination in an integrated primary care system. *Clin Pediatr (Phila).* 2018;57(13):1523–31. doi:10.1177/0009922818787868.
- Rosen BL, Bishop JM, McDonald SL, Kahn JA, Kreps GL. Quality of web-based educational interventions for clinicians on human papillomavirus vaccine: content and usability assessment. *JMIR Cancer.* 2018;4(1):e3. doi:10.2196/cancer.9114.
- Maclean SA, Basch CH, Ethan D, Garcia P. Readability of online information about HPV immunization. *Hum Vaccin Immunother.* 2019;15(7–8):1505–07. doi:10.1080/21645515.2018.1502518.