



Bringing the HPV vaccination rate into line with other adolescent immunizations

Use simple practice measures and counsel parents with compelling evidence to help correct the low uptake of this vital vaccine.

Pamela G. Rockwell, DO, FAAFP
University of Michigan School of Medicine, Ann Arbor

prockwel@umich.edu
The author reported no potential conflict of interest relevant to this article.

PRACTICE RECOMMENDATIONS

- › Review vaccination status at every adolescent health care visit. **C**
- › Give a clear, unambiguous, strong recommendation to vaccinate with human papillomavirus (HPV) to prevent infection; cervical, oropharyngeal, and other cancers; and genital warts. **A**
- › Schedule follow-up appointments at checkout following initiation of HPV vaccination to help ensure completion of the series. **C**

Strength of recommendation (SOR)

- A** Good-quality patient-oriented evidence
- B** Inconsistent or limited-quality patient-oriented evidence
- C** Consensus, usual practice, opinion, disease-oriented evidence, case series

Overall adolescent vaccination coverage is improving in the United States.¹ But for adolescents up to 15 years of age, there's a large gap between the rate of vaccination for human papillomavirus (HPV) and the higher rates of coverage for tetanus, diphtheria, and acellular pertussis (Tdap) and meningococcal conjugate (MenACWY) vaccines.¹ Adopting or refining practice customs reviewed in this article can increase HPV vaccination rates and continue to improve coverage of all vaccines recommended by the Advisory Committee on Immunization Practices (ACIP) for adolescents between the ages of 11 and 12.

The evolution of ACIP's HPV vaccine recommendations

Before December 2016, ACIP recommended a 3-dose HPV series for all adolescents between the ages of 11 and 12, given on a 0, 1-2, and 6-month schedule.² The series could be started at 9 years of age. It could be administered to females as old as 26 years, and to males through 21 years (or ages 22-26 years for those who wish to be vaccinated, who have certain medical conditions, or who are included in special populations—ie, gay and bisexual men, men who have sex with men, immunocompromised men, men with human immunodeficiency virus [HIV], and transgender men).

In 2016, ACIP revised its recommendation for adolescents who initiate vaccination before their 15th birthday: a 2-dose schedule is adequate, with the second dose given 6 to 12 months after the first dose. For those who initiate vaccination on or after their 15th birthday, and for those with certain medical conditions, the recommendation remains 3 doses on a 0, 1-2, and 6-month schedule.³

As of August 2019,⁴ ACIP now recommends that all women and men receive catch-up HPV vaccination through age 26.

CONTINUED

>
In 2016, 45.4% of 15-year-olds had completed the HPV vaccine series—far below the *Healthy People 2020* goal of 80%.

For individuals 27 to 45 years of age who have not been adequately vaccinated, HPV vaccine may be given based on shared clinical decision making with their physician.

How are we doing?

Overall, adolescent vaccination coverage is improving in the United States (see “Vaccination goals from ACIP and *Healthy People 2020*”^{1,5,6} on page E5), but the rate of improvement of HPV coverage is lower than that for Tdap and MenACWY coverage by age 15 years (although completion of the MenACWY vaccine series is low). From 2015 to 2016, coverage increased for 1 or more doses of Tdap, from 86.4% to 88% among 17-year olds (87.9% for 15-year olds), and coverage for 1 or more doses of MenACWY increased from 81.7% to 83.5% among 17-year olds (80.4% among 15-year olds).¹ Both Tdap and MenACWY coverage rates have surpassed *Healthy People 2020* goals of 80%, and the focus now is on maintenance of coverage. Data from the 2016 National Immunization Survey (NIS)-Teen show that completion of the HPV vaccine series (applying updated HPV vaccine recommendations retrospectively) increased to 45.4% for 15-year-olds,¹ still far below the *Healthy People 2020* goal of 80%. Completion rates for 2 or more doses of MenACWY also increased from 33.3% to 39.1%.¹

Common barriers to improved vaccine coverage

Barriers to improved vaccination rates include a lack of regular assessment of vaccine status; limited use of electronic records, tools, and immunization registries; lack of health care provider knowledge on current vaccine recommendations; vaccine costs; missed opportunities; and patient/parent refusals.^{7,8} The Community Preventive Services Task Force outlines several well-established evidence-based ways that administrators and physicians can counter these barriers:

- give a strong recommendation to vaccinate,^{9,10}
- incorporate an audit/feedback mechanism for health care providers who vaccinate,^{9,11}
- use electronic alerts to remind health

care providers to vaccinate,^{9,12}

- use your state’s electronic immunization information systems (IIS),^{7,13}
- appoint a vaccine practice team/vaccine champion,^{9,14} and
- implement standing orders and reminder/recall systems.^{7,9,15}

The passage of the Affordable Care Act (ACA)—which mandates that certain preventive services, including ACIP-recommended immunizations, be covered as part of basic care at no cost-sharing—reduces the once-common financial barrier to vaccine uptake.¹⁶ A key contributor to low uptake of HPV vaccination by adolescents is parental refusal.¹⁷

The threats posed by HPV

HPV infections are the most commonly transmitted infections in the United States and nearly all men and women will be exposed to one or more types of HPV at some point in their lives. Current data show that 79 million Americans, most in their late teens and early 20s, are infected with HPV, and about 14 million people in the United States become newly infected each year.¹⁸ HPV is a DNA tumor virus that causes epithelial proliferation at cutaneous and mucosal surfaces.

There are more than 100 types of the virus,¹⁹ including more than 40 strains that infect the human genital tract. Of the latter 40 strains, there are oncogenic or high-risk types and non-oncogenic or low-risk types.²⁰ HPV infection with high-risk types causes cervical, vaginal, and vulvar cancers in women; penile cancers in men; and oropharyngeal and anal cancers in both men and women. Low-risk HPV types cause genital warts in both men and women.²¹ The current available HPV vaccine in the United States is a 9-valent vaccine (9vHPV) that replaces the former 2- and 4-valent HPV vaccines and includes immunogenic coverage against high-risk HPV types 16, 18, 31, 33, 45, 52, and 58; and low-risk types 6 and 11.²²

Centers for Disease Control and Prevention (CDC) data from 2010 to 2014 show that approximately 23,700 women and approximately 17,300 men in the United States developed HPV-associated cancer. Most common in women are cervical cancers and in men,

oropharyngeal cancers (cancers of the back of the throat, base of the tongue, and tonsils). Using population-based data to genotype HPV types from cancer tissues, the CDC reports that HPV is responsible for about 90% of cervical and anal cancers, 70% of oropharyngeal, vaginal, and vulvar cancers, and 60% of penile cancers.²³ A significant percentage of these cancers could potentially be prevented by receipt of 9vHPV.^{23,24}

Make adolescent immunization a high priority

Anticipate opportunities to vaccinate and take steps to make your immunization and scheduling processes more prominent. With HPV specifically, you can strongly advocate for vaccination, address parental misgivings and educate them using clear communication styles, and acquire knowledge to answer concerns about potential vaccine adverse effects.

■ Every visit is an opportunity to vaccinate. The American Academy of Family Physicians and The American Academy of Pediatrics recommend that adolescents have annual preventive visits for screening, immunizations, and assessment and counseling for risky behaviors. However, many adolescents do not present annually for preventive visits, and fewer than half of adolescents receive regular preventive care.²⁵ In a study of 425 family physicians and pediatricians, almost all pediatricians endorsed the importance of annual well visits, while less than three-quarters of family physicians did.²⁶ An analysis of national surveillance systems shows rates for preventive health care visits range from 43% to 74% among adolescents 10 to 17 years of age, and 26% to 58% among young adults 18 to 25 years of age.²⁷ Overall, 67% of adolescent health care visits are for acute care, and 10% are for follow-up care.²⁸

■ Missed opportunities for the HPV vaccine. One study showed that at least 86% of unvaccinated adolescents had missed opportunities to receive HPV vaccine.²⁹ A study of 14,588 adolescent girls from January 2010 through August 2015 showed that HPV vaccine was given at only 37.1% of visits in which MenACWY or Tdap vaccines were adminis-

tered.³⁰ The rate of HPV vaccination was just 26% during well adolescent visits, and 41.8% during all other primary care visits.³⁰ Every adolescent health care visit—including visits for acute care, chronic care, follow-up, or office-based procedures—is an opportunity to review vaccination status.

■ Give vaccines concomitantly (simultaneously or same-day). ACIP counsels that minor illnesses, such as mild upper respiratory infections with or without low-grade fever, are not contraindications to routine vaccination.³⁰ Also, the safety of simultaneous vaccine administration, often a concern of both parents and health care providers, has been well established. Each vaccine's immunogenicity and safety profile are maintained when given concomitantly with other vaccines, and fewer visits are needed to complete an adolescent's vaccination status.^{31,32}

■ Immediately schedule follow up visits and use reminder/recall systems. Parents of adolescents who opt for HPV vaccination are not always aware of the timing of the 2- or 3-dose schedule and may not even be aware that more than 1 dose of vaccine is recommended.

A qualitative study of pediatric primary care providers and parents/guardians of adolescent patients showed that for HPV vaccination series completion, 65% of parents/guardians expected to be reminded of any needed doses, while 52% of the pediatric primary care providers relied on parents to schedule subsequent immunizations, and often the HPV series was not completed.³³ Higher completion rates of the HPV vaccination series were achieved when follow-up appointments were scheduled at checkout for the 2nd or 3rd vaccine dose after initiation of HPV vaccination.³³ The use of patient reminder/recall systems using telephone calls or mailings (phone usage is more effective than mailings) is also shown to improve vaccination completion rates.³⁴

Recommend HPV vaccination clearly and resolutely

In a cross-sectional survey of 800 parents of adolescents ages 9 to 14 years, HPV vaccine was deemed the least likely vaccine to have



In a study of 14,588 adolescent girls who had vaccinations at an office visit, only 37.1% also received the HPV vaccine.



The CDC reports that HPV is responsible for about 90% of cervical and anal cancers, 70% of oropharyngeal, vaginal, and vulvar cancers, and 60% of penile cancers.

been “very strongly” recommended by their health care provider, compared with the strength of recommendations for influenza, Tdap, and MenACWY vaccines.³⁵ The strength of a health care provider’s recommendation to vaccinate is the single most influential factor in vaccine uptake.^{10,36,37} Most family physicians self-report “always recommending standard pediatric vaccines”; however, only a minority are following ACIP recommendations.³⁸ A national study reported that only about two-thirds of parents who received HPV vaccine recommendations perceived a high level of health care provider endorsement.³⁹ The takeaway point: Give a clear, unambiguous, strong recommendation to vaccinate with HPV to prevent infection; cervical, oropharyngeal, and other cancers; and genital warts.

■ **Tell parents why the timing is important.** Inform parents that the HPV vaccine must be administered while their child is young (before the adolescent’s first sexual contact) to ensure the most robust immune response to the vaccine.⁴⁰ Unsolicited explanations about sexual activity need not be offered when discussing HPV vaccination, as it is fair to assume that sexual contact is a reality for nearly all people in their adolescent or adult life; and by extension, most sexually active people will likely have exposure to HPV at some time in their lives. By adulthood, sexual activity is nearly universal: The National Longitudinal Study of Adolescent Health showed that only about 3% of participants tracked since adolescence reported no sexual experience by (average age) 28.5 years.⁴¹

■ **How you say it matters.** Many pediatricians and family physicians report recommending HPV vaccine inconsistently, behind schedule, or without urgency,⁴² sending mixed messages by failing to endorse HPV vaccination strongly, failing to differentiate it from other vaccines, and presenting it as an “optional” vaccine that could be delayed.⁴³ Physicians and other health care providers who begin conversations about HPV vaccine by saying that the adolescent is “due” for the vaccine show higher vaccine recommendation quality scores than those who give unsolicited information about the vaccine, elicit questions before recommendation, or pres-

ent the vaccine as an “option.”⁴² Parents who are “on the fence” may hesitate and decline HPV vaccination with a halfhearted recommendation.⁴⁴

“Your child is due for his/her Tdap, HPV, influenza, and meningococcal vaccinations to prevent potentially devastating disease and several cancers. I highly recommend all 4 vaccinations today” is more persuasive than, “I recommend your child receive his/her Tdap, meningococcal, and influenza vaccines. And we can also discuss the HPV vaccine.”

Direct presumptive language that assumes vaccine delivery is associated with higher odds of HPV vaccine acceptance and same-day agreement to vaccination than is an open-ended participatory conversational style.⁴⁵ Saying, “I believe in the importance of this cancer-preventing vaccine for your child” is more persuasive than saying, “What do you think about starting the HPV vaccination series today?”⁴⁶

■ **Don’t give up** when parents initially refuse HPV vaccinations for their adolescents. Parents’ decisions about HPV vaccination may change over time. Repeated positive recommendations and counseling for HPV vaccination over multiple visits have been shown in a large multivariable analysis to increase parent acceptance of HPV vaccination: 45% of parents reported secondary acceptance of HPV vaccination, and an additional 24% intended to vaccinate in the next 12 months.⁴⁷ Combining a presumptive communication style with motivational interviewing and a fact sheet has contributed to higher clinician-perceived levels of parental HPV vaccine acceptance and increased vaccination rates.⁴⁸

Know how to address parents’ concerns about safety

Be prepared to discuss and answer parents’ questions or concerns regarding any vaccine, especially the HPV vaccine. Social networks are important in parents’ vaccination decision-making,⁴⁹ and they may seek information from such sources as Twitter, Facebook, Google, and YouTube, where misinformation may be disseminated. A quantitative analysis of 560 YouTube videos relaying a false link be-

tween vaccines and autism or other serious adverse effects on children were uploaded between December 2007 and July 2017, with a peak of 224 videos uploaded in the first 7 months of 2017.⁵⁰ Most were negative in tone and dispensed misinformation.⁵⁰

■ **The National Vaccine Information Center (NVIC)** is an organization that takes a skeptical view of the US government and pharmaceutical companies. NVIC is widely criticized by scientists and leaders in vaccine science and public health as spreading false information on the risks of vaccines and, specifically, that HPV vaccination causes chronic disease. NVIC reports that receipt of HPV vaccine may increase the risk for cervical cancer and death.⁵¹ Pediatrician and vaccine researcher Dr. Paul Offit, interviewed by *The Lancet* in response to NVIC and other anti-vaccine groups' messages, stated: "anti-vaccination organizations are unequivocally threatening public health."⁵²

■ **Describe the robust safety-monitoring system.** The CDC is aware of public concern about the safety of HPV vaccine. Ongoing monitoring of vaccine safety and studies conducted by the CDC, the Food and Drug Administration (FDA), and other organizations has documented a reassuring safety record since the vaccine's introduction in 2006.⁵³ Assure parents that the Vaccine Adverse Event Reporting System (VAERS) summary of 7244 reports following 9vHPV vaccination (December 1, 2014 - December 31, 2017) showed that most (97%) reports were nonserious: No new safety signals or unexpected patterns were observed, confirming consistency of the safety profile of 9vHPV with data from pre-licensure trials and post-licensure data on 4vHPV.⁵⁴

Acknowledge the usually mild, transient potential risks of HPV vaccination as reported to VAERS: local injection site symptoms such as pain, redness, or swelling in the arm where the injection was given (most common adverse effect), dizziness, fainting, headache, nausea, and fever.⁵³ Point out that fainting after vaccination is common in adolescents⁵⁵ and that the CDC and ACIP recommend observation of adolescents for 15 minutes following HPV vaccination.⁵⁶ Consider this 15-minute observation period after adoles-

Vaccination goals from ACIP and *Healthy People 2020*

The Advisory Committee on Immunization Practices (ACIP) recommends that adolescents routinely receive several vaccines between the ages of 11 and 12 years: an annual influenza vaccine, Tdap, the first dose of MenACWY, and initiation of the HPV series. ACIP also advises a booster dose of MenACWY at age 16 years, and teens and young adults (16-23 years) also may be vaccinated with a multidose serogroup B meningococcal vaccine, preferably before age 18. For those adolescents not up to date with their childhood vaccines, ACIP recommends the following catch-up vaccinations: measles, mumps, rubella (MMR, 2 doses); hepatitis B (HepB, 3 doses); and varicella (VAR, 2 doses).⁵

Healthy People 2020. In December 2010, the US Department of Health and Human Services released *Healthy People 2020*, a wide-ranging initiative on health promotion and disease prevention that includes 10-year objectives of increasing coverage with Tdap, at least one dose of MenACWY, and completion of the HPV series among 80% of those ages 13 to 15 years.⁶ This initiative reflects extensive feedback from more than 2000 organizations and authorities in public health and prevention at federal, state, and local levels—as well as from the public. Adolescent vaccination coverage is estimated by the Centers for Disease Control and Prevention using data from the National Immunization Survey (NIS)-Teen annual survey conducted among parents and guardians of adolescents ages 13 to 17 years.¹

cent receipt of any vaccine to be part of standard practice in your vaccination setting.⁵⁶

■ **Contest unfounded views.** Other common parental concerns about effects of HPV vaccine include supposed promotion of promiscuity, increased incidence of premature ovarian failure or insufficiency (POI), and increased risk of Guillain-Barré Syndrome (GBS), often propagated through published reports, media coverage, Web sites, and social media. Assure worried parents that many studies have shown that receipt of the vaccine is safe and does not lead to initiation of sexual activity or promiscuity, and, in fact, safer sexual health practices have been observed following vaccination.⁵⁷⁻⁵⁹

A large longitudinal adolescent health survey administered in British Columbia looked at sexual health behaviors and risk factors in adolescent girls before and after receipt of HPV vaccination (2003, 2008, 2013).⁵⁹ Results showed no significant change in the reported number of sexual partners (2003-

2013), increased reported use of contraception and condoms, and lower pregnancy rates.⁵⁹ There is no evidence that HPV vaccines cause reproductive problems in women⁵³; a review of VAERS reports from 2009 through 2015 did not detect any safety concerns for POI or other reproductive problems in females.⁶⁰ A 2018 population-based study of nearly 200,000 women observed no increase of POI following receipt of HPV vaccination.⁶¹ In addition, several recent studies have shown no increased risk for GBS following receipt of HPV vaccine.⁶²⁻⁶⁴ **JFP**

CORRESPONDENCE

Pamela G. Rockwell, DO, FAAFP, 24 Frank Lloyd Wright Drive, SPC 5795, Room 2300, Lobby H, Ann Arbor, MI 48105; prockwel@umich.edu.

References

- Walker TY, Elam-Evans LD, Singleton JA, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13-17 years—United States, 2016. *MMWR Morb Mortal Wkly Rep.* 2017;66:874-882.
- Markowitz LE, Dunne EF, Saraiya M, et al. Human papillomavirus vaccination: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Morb Mortal Wkly Rep.* 2014;63:1-30.
- Meites E, Kempe A, Markowitz LE. Use of a 2-dose schedule for human papillomavirus vaccination updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep.* 2016;65:1405-1408.
- Meites E, Szilagyi PG, Chesson HW, et al. Human papillomavirus vaccination for adults: updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep.* 2019;68:698-702.
- Robinson CL, Romero JR, Kempe A, et al. Advisory Committee on Immunization Practices (ACIP) Child/Adolescent Immunization Work Group. Advisory Committee on Immunization Practices recommended immunization schedules for persons aged 18 years or younger—United States, 2017. *MMWR Morb Mortal Wkly Rep.* 2017;66:134-135.
- US Department of Health and Human Services Office of Disease Prevention and Health Promotion. *Healthy People 2020*. www.healthypeople.gov/node/4654/data_details. Accessed December 4, 2019.
- Rockwell PG. What you can do to improve adult immunization rates. *J Fam Pract.* 2015;64:625-633.
- Kimmel Sr, Burns IT, Wolfe RM, et al. Addressing immunization barriers, benefits, and risks. *J Fam Pract.* 2007;56:S61-S69.
- Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based guide to community preventive services—methods. The Task Force on Community Preventive Services. *Am J Prev Med.* 2000;18:35-43.
- Ylitalo KR, Lee H, Mehta NK. Health care provider recommendation, human papillomavirus vaccination, and race/ethnicity in the U.S. National Immunization Survey. *Am J Public Health.* 2013;103:164-169.
- National Center for Immunization and Respiratory Diseases. General recommendations on immunization—recommendations of the Advisory Committee on Immunization Practices. *MMWR Recomm Rep.* 2011;60:1-64.
- Klatt TE, Hopp E. Effect of a best-practice alert on the rate of influenza vaccination of pregnant women. *Obstet Gynecol.* 2012;119:301-305.
- Jones KL, Hammer AL, Swenson C, et al. Improving adult immunization rates in primary care clinics. *Nurs Econ.* 2008;26:404-407.
- Hainer BL. Vaccine administration: making the process more efficient in your practice. *Fam Pract Manag.* 2007;14:48-53.
- Task Force on Community Preventive Services. Recommendations regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med.* 2000;18(suppl 1):92-96.
- US Department of Health and Human Services. Preventive care. www.hhs.gov/healthcare/about-the-aca/preventive-care/index.html. Accessed December 4, 2019.
- Gilkey MB, Calo WA, Marciniak MW, et al. Parents who refuse or delay HPV vaccine: differences in vaccination behavior, beliefs, and clinical communication preferences. *Hum Vaccin Immunother.* 2017;13:680-686.
- CDC. Genital HPV infection—fact sheet. www.cdc.gov/std/hpv/stdfact-hpv.htm. Accessed December 4, 2019.
- WHO. Human papillomavirus (HPV) and cervical cancer. www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer. Accessed December 4, 2019.
- Muñoz N, Bosch FX, de Sanjosé S, et al. Epidemiologic classification of human papillomavirus types associated with cervical cancer. *N Engl J Med.* 2003;348:518-527.
- Viens LJ, Henley SJ, Watson M, et al. Human papillomavirus-associated cancers—United States, 2008-2012. *MMWR Morb Mortal Wkly Rep.* 2016;65:661-666.
- CDC. Luxembourg A. Program summary and new 9-valent HPV vaccine trial data. Presented at the Advisory Committee on Immunization Practices (ACIP), October 30, 2014. Atlanta, Ga. 2014. www.cdc.gov/vaccines/acip/meetings/downloads/min-archive/min-2014-10.pdf. Accessed December 4, 2019.
- CDC. HPV and cancer. www.cdc.gov/cancer/hpv/statistics/cases.htm. Accessed December 4, 2019.
- Lowy DR, Schiller JT. Reducing HPV-associated cancer globally. *Cancer Prev Res (Phila).* 2012;5:18-23.
- Rand CM, Goldstein NPN. Patterns of primary care physician visits for US adolescents in 2014: implications for vaccination. *Acad Pediatr.* 2018;18:S72-S78.
- Taylor JL, Aalsma MC, Gilbert AL, et al. Perspectives of family medicine physicians on the importance of adolescent preventive care: a multivariate analysis. *BMC Fam Pract.* 2016;17:4.
- Harris SK, Aalsma MC, Weitzman ER, et al. Research on clinical preventive services for adolescents and young adults: Where are we and where do we need to go? *J Adolesc Health.* 2017;60:249-260.
- Gilkey MB, Moss JL, McRee AL, et al. Do correlates of HPV vaccine initiation differ between adolescent boys and girls? *Vaccine.* 2012;30:5928-5934.
- Espinosa CM, Marshall GS, Woods CR, et al. Missed opportunities for human papillomavirus vaccine initiation in an insured adolescent female population. *J Pediatric Infect Dis Soc.* 2017;6:360-365.
- CDC. Update: Vaccine side effects, adverse reactions, contraindications, and precautions. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 1996;45:1-35.
- Moss JL, Reiter PL, Brewer NT. Concomitant adolescent vaccination in the U.S., 2007-2012. *Am J Prev Med.* 2016;51:693-705.
- Noronha AS, Markowitz LE, Dunne EF. Systematic review of human papillomavirus vaccine coadministration. *Vaccine.* 2014;32:2670-2674.
- Perkins RB, Chigurupati NL, Apte G, et al. Why don't adolescents finish the HPV vaccine series? A qualitative study of parents and providers. *Hum Vaccin Immunother.* 2016;12:1528-1535.
- Jacobson Vann JC, Szilagyi P. Patient reminder and patient recall systems to improve immunization rates. *Cochrane Database Syst Rev.* 2005;(3):CD003941.
- Dempsey AF, O'Leary ST. Human papillomavirus vaccination: narrative review of studies on how providers' vaccine communication affects attitudes and uptake. *Acad Pediatr.* 2018;18:S23-S27.
- Rosenthal SL, Weiss TW, Zimet GD, et al. Predictors of HPV vaccine uptake among women aged 19-26: importance of a physician's recommendation. *Vaccine.* 2011;29:890-895.
- Gargano LM, Herbert NL, Painter JE, et al. Impact of a physician recommendation and parental immunization attitudes on receipt or intention to receive adolescent vaccines. *Hum Vaccin Immunother.* 2013;9:2627-2633.
- Bonville CA, Domachowski JB, Cibula DA, et al. Immunization attitudes and practices among family medicine providers. *Hum Vaccin Immunother.* 2017;13:2646-2653.
- Wilson R, Brown DR, Boothe MA, et al. Knowledge and acceptability of the HPV vaccine among ethnically diverse black women. *J Immigr Minor Health.* 2013;15:747-757.

➤
In one study, 65% of parents expected to be reminded of any needed HPV vaccine doses, while 52% of the pediatric PCPs relied on parents to schedule subsequent immunizations.

40. Iversen O, Miranda MJ, Ulied A, et al. Immunogenicity of the 9-valent HPV vaccine using 2-dose regimens in girls and boys vs a 3-dose regimen in women. *JAMA*. 2016;316:2411–2421.
41. Haydon AA, Cheng MM, Herring AH, et al. Prevalence and predictors of sexual inexperience in adulthood. *Arch Sex Behav*. 2014;43:221–230.
42. Gilkey MB, Malo TL, Shah PD, et al. Quality of physician communication about human papillomavirus vaccine: findings from a national survey. *Cancer Epidemiol Biomarkers Prev*. 2015;24:1673–1679.
43. Gilkey MB, McRee AL. Provider communication about HPV vaccination: a systemic review. *Hum Vaccin Immunother*. 2016;12:1454–1468.
44. American Academy of Family Physicians. Strong recommendation to vaccinate against HPV is key to boosting uptake. www.aafp.org/news/health-of-the-public/20140212hpv-vaccitr.html. Accessed December 4, 2019.
45. Sturm L, Donahue K, Kasting M, et al. Pediatrician-parent conversations about human papillomavirus vaccination: an analysis of audio recordings. *J Adolesc Health*. 2017;61:246–251.
46. Malo TL, Gilkey MB, Hall ME, et al. Messages to motivate human papillomavirus vaccination: national studies of parents and physicians. *Cancer Epidemiol Biomarkers Prev*. 2016;25:1383–1391.
47. Kornides ML, McRee AL, Gilkey MB. Parents who decline HPV vaccination: Who later accepts and why? *Acad Pediatr*. 2018;18:S37–S43.
48. Reno JE, Thomas J, Pyrzanowski J, et al. Examining strategies for improving healthcare providers' communication about adolescent HPV vaccination: evaluation of secondary outcomes in a randomized controlled trial. *Hum Vaccin Immunother*. 2018;15:1592–1598.
49. Brunson EK. The impact of social networks on parents' vaccination decisions. *Pediatrics*. 2013;131:e1397–e1404.
50. Donzelli G, Palomba G, Federigi L, et al. Misinformation on vaccination: a quantitative analysis of YouTube videos. *Hum Vaccin Immunother*. 2018;14:1654–1659.
51. National Vaccine Information Center. Human papillomavirus (HPV) disease and vaccine information. www.nvic.org/Vaccines-and-Diseases/hpv.aspx. Accessed December 4, 2019.
52. Shetty P. Experts concerned about vaccination backlash. *Lancet*. 2010;375:970–971.
53. CDC. Frequently asked questions about HPV vaccine safety. www.cdc.gov/vaccinesafety/vaccines/hpv/hpv-safety-faqs.html. Accessed December 4, 2019.
54. Arana J, Su J, Lewis P, et al. Post-licensure surveillance of 9-valent human papillomavirus vaccine (9vHPV) in the Vaccine Adverse Event Reporting System (VAERS), United States, 2014–2017. <https://idsa.confex.com/idsa/2018/webprogram/Paper69618.html>. Accessed December 4, 2019.
55. Braun MM, Patriarca PA, Ellenberg SS. Syncope after immunization. *Arch Pediatr Adolesc Med*. 1997;151:255–259.
56. Kroger AT, Duchin J, Vázquez M. General best practice guidelines for immunization. Best practices guidance of the Advisory Committee on Immunization Practices (ACIP). www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html. Accessed December 4, 2019.
57. Hansen BT. No evidence that HPV vaccination leads to sexual risk compensation. *Hum Vaccin Immunother*. 2016;12:1451–1453.
58. Smith LM, Kaufman JS, Strumpf EC, et al. Effect of human papillomavirus (HPV) vaccination on clinical indicators of sexual behaviour among adolescent girls: the Ontario Grade 8 HPV Vaccine Cohort Study. *CMAJ*. 2015;187:E74–81.
59. Ogilvie GS, Phan F, Pederson HN, et al. Population-level sexual behaviours in adolescent girls before and after introduction of the human papillomavirus vaccine (2003–2013). *CMAJ*. 2018;190:E1221–E1226.
60. Arana JE, Harrington T, Cano M, et al. Post-licensure safety monitoring of quadrivalent human papillomavirus vaccine in the Vaccine Adverse Event Reporting System (VAERS), 2009–2015. *Vaccine*. 2018;36:1781–1788.
61. Naleway AL, Mittendorf KE, Irving SA, et al. Primary ovarian insufficiency and adolescent vaccination. *Pediatrics*. 2018;142. pii: e20190943.
62. Deceuninck G, Sauvageau C, Gilca V, et al. Absence of association between Guillain-Barré syndrome hospitalizations and HPV-vaccine. *Expert Rev Vaccines*. 2018;17:99–102.
63. Mouchet J, Salvo F, Raschi E, et al. Human papillomavirus vaccine and demyelinating diseases – a systematic review and meta-analysis. *Pharmacol Res*. 2018;132:108–118.
64. Gee J, Sukumaran L, Weinstraub E, et al. Risk of Guillain-Barre Syndrome following quadrivalent human papillomavirus vaccine in the Vaccine Safety Datalink. *Vaccine*. 2017;35:5756–5758.