

# How to Increase HPV Vaccination Rates

Although human papillomavirus (HPV) vaccine is a safe and effective means of preventing most HPV-related cancers, HPV vaccination rates lag well behind those of other vaccines recommended for children and adolescents. Understanding the barriers to HPV vaccine acceptance and effective strategies for overcoming them will improve vaccine uptake and completion in adolescents.

**Tyler Cole, BSN, DNP, FNP-C, Marie C. Thomas, BS, BSN, Katlyn Straup, BSN, DNP, FNP-C, Ashlyn Savage, MD, MSCR**

**Tyler Cole** practices at Coastal Community Health Services in Brunswick, Georgia, and is a clinical instructor in the DNP-APRN program at the Medical University of South Carolina (MUSC). **Marie C. Thomas** is a registered nurse on a surgical oncology unit at MUSC and will receive her DNP-FNP from MUSC in December 2017. **Katlyn Straup** practices at Roper St. Francis Healthcare and Southern Care Hospice in Charleston, South Carolina; she is also a clinical associate faculty member in the MUSC College of Nursing. **Ashlyn Savage** is an Associate Professor of Obstetrics and Gynecology at MUSC College of Nursing and is certified by the American Board of Obstetrics and Gynecology.

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## LEARNING OBJECTIVES

- Understand and identify the low- and high-risk human papillomavirus (HPV) types that can lead to benign and malignant manifestations.
- Know the recommended age range and dosing schedule for individuals who can and should receive the vaccine.
- Recognize important barriers to HPV vaccination in the health care setting.
- Understand how to promote HPV vaccination to parents/caregivers and patients.
- Find resources and educational material from national organizations that recommend and support HPV vaccination.



**H**uman papillomavirus (HPV) infection is the most common sexually transmitted infection in the United States.<sup>1,2</sup> HPV causes approximately 30,700 new cancer cases in the US annually.<sup>3</sup> It is the primary cause of cervical cancer, which resulted in more than 4,000 deaths in the US in 2016.<sup>4</sup> HPV is also associated with some vaginal, vulvar, penile, anal, and oropharyngeal cancers and causes anogenital warts.<sup>3</sup>

Although HPV vaccines are available to protect against infection with the HPV types that lead to these sequelae, HPV vaccination rates remain low compared with other routinely administered vaccines.<sup>5</sup> Reasons for these lower rates include vaccine cost, lack of patient and provider education, providers' failure to recommend, stigmas related to sexual behavior, and misconceptions about the vaccine, such as concerns about harm.<sup>5</sup> This article discusses these barriers to better educate providers about the HPV vaccine and encourage them to assist in increasing vaccination rates.

## EPIDEMIOLOGY

Approximately 79 million Americans are currently infected with HPV, and 14 million new cases are reported each year.<sup>2</sup> In the US, the prevalence of HPV is highest among sexually active adolescents and young adults, especially those ages 20 to 24.<sup>2</sup> Of

the more than 150 types of HPV that have been identified, 40 infect the genital area. HPV genital infections are mainly spread through sexual intercourse but can also be spread through oral-to-genital contact.<sup>2</sup>

The genital HPV types are categorized as *low-risk* and *high-risk* based on their association with cervical cancer.<sup>2</sup> High-risk types 16 and 18 are the most troublesome, accounting for 63% of all HPV-associated cancers, with HPV 16 posing the highest risk for cancer.<sup>3</sup> High-risk types HPV 31, 33, 45, 52, and 58 account for another 10% of these cancers.<sup>3</sup> Low-risk types, such as HPV 6 and 11, can cause low-grade cervical intraepithelial lesions, and HPV 6 and 11 account for more than 90% of genital warts.<sup>2</sup>

Most HPV infections, whether with high- or low-risk types, do not cause symptoms and resolve spontaneously in about two years.<sup>2</sup> Persistent high-risk HPV infection is necessary for the development of cervical cancer precursor lesions—and therefore, once the infection has cleared, the risk for cancer declines.<sup>2</sup>

## HPV VACCINES

Three HPV vaccines are licensed for use in the US: bivalent (Cervarix), quadrivalent (Gardasil), and 9-valent (Gardasil 9) vaccines (see Table 1, page 42).<sup>2,6,7</sup> The bivalent, Cervarix, has recently been removed from the US market due to a decrease in product demand.<sup>6,8</sup>

To ensure optimal protection, the vaccines must be administered in a series of scheduled doses over six to 12 months. The Advisory Committee on Immunization Practices (ACIP) recently updated their recommendations to include a two- or three-dose series based on age (see Table 2, page 43).<sup>7</sup>

HPV vaccines are recommended for males and females between the ages of 9 and 26 years, but the ACIP and the American College of Obstetricians and Gynecologists (ACOG) strongly promote a targeted



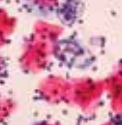
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age range for vaccination between 11 and 12 years for both genders.<sup>6,7</sup> Earlier vaccination is preferred because clinical data show a more rapid antibody response at a younger age, and because the vaccines are more effective if administered before an individual is exposed to or infected with HPV (ie, before the start of sexual activity).<sup>6,7</sup>

## LOW VACCINATION RATES

HPV vaccination rates in the US are significantly lower than rates for other regularly administered vaccines; furthermore, they do not meet the *Healthy People 2020* national goal of 80% for all vaccines.<sup>9</sup> Immunization rates for most childhood vaccines range from 80% to 90%, but in 2015 only 28.1% of males and 41.9% of females ages 13 to 17 had completed the entire HPV vaccine series.<sup>9-11</sup>

The total HPV vaccination rates for male and female adolescents combined were 56.1% for one dose or more, 45.4% for two or more doses, and 34.9% for all three doses.<sup>9</sup> In comparison, coverage rates for the meningococcal and Tdap (tetanus, diphtheria, and pertussis) immunizations, also recom-



**TABLE 1**  
**FDA-approved HPV Vaccines**

Vaccine	Coverage (HPV types)	Gender and age range
Cervarix (bivalent HPV vaccine)*	HPV 16 and 18	Females, 9-25 y
Gardasil (quadrivalent HPV vaccine)	HPV 6, 11 (genital warts), 16, and 18	Males and females, 9-26 y
Gardasil 9 (9-valent HPV vaccine)	HPV 6, 11 (genital warts), 16, 18, 31, 33, 45, 52, and 58	Males and females, 9-26 y

\*Recently taken off the market in the United States.

Abbreviation: HPV, human papillomavirus.

Sources: Markowitz et al. *MMWR Recomm Rep*. 2014<sup>2</sup>; ACOG. 2017<sup>6</sup>;

Meites et al. *MMWR Morb Mortal Wkly Rep*. 2016.<sup>7</sup>

mended at the same age range as the HPV vaccine, were 81.3% and 86.4%, respectively.<sup>9</sup>

In addition to variation by gender and age, factors such as race, insurance coverage, and socioeconomic status influence vaccination rates.<sup>11</sup> For the HPV vaccine specifically, Hispanic, non-Hispanic black, and American Indian/Alaska Native adolescents have higher rates of receiving each of the vaccine doses and higher rates of completing the vaccine series, compared to non-Hispanic white adolescents.<sup>9</sup> Adolescents with Medicaid insurance and those living below the federal poverty level have better HPV vaccination coverage compared with adolescents with commercial insurance plans or those living at or above the poverty level.<sup>9,11</sup>

The HPV vaccine series completion rates in 2015 for males and females ages 13 to 17 living below the poverty level were 31.0% and 44.4%, respectively, compared to 27.4% and 41.3% for those living at or above the poverty level.<sup>9</sup> One reason for increased rates among those living in lower-income households may be their eligibility for vaccinations at no cost through the Vaccines for Children (VFC) program, a federal program that provides vaccines to children who might otherwise forgo vaccination because of inability to pay.<sup>9</sup>

## BARRIERS TO VACCINATION

Impediments that prevent adolescents and young adults from receiving the HPV vaccine exist throughout the vaccination process, with providers, parents, and the medical system itself contributing to low rates. Barriers to vaccination include fear and misconceptions, costs and socioeconomic status, lack of understanding and education, and logistic obstacles to completing the full series.<sup>5</sup> Understanding these barriers, as well as discussing methods to overcome them, is key to increasing HPV vaccination rates and preventing the spread of this cancer-causing infection.

### Health care provider barriers

Even though accredited national institutions and committees such as the CDC, ACIP, and ACOG strongly recommend vaccination based on current evidence, some health care providers still do not recommend the HPV vaccine to parents and patients.<sup>2,6,7,11</sup> Lack of provider recommendation and the resulting lack of parental awareness of the vaccine account for many adolescents not receiving the vaccination.<sup>10,12</sup>

Providers do not recommend the vaccine for a number of reasons. Some have limited knowledge or conflicting ideas about the specific disease protection of the HPV vaccine, while others are hesitant to administer the vaccine before the onset of sexual activity, because they feel the suggested age for vaccination (11 to 12 years) is too young.<sup>10,11</sup> Still other providers report difficulty approaching parents who they perceive as having concerns about the vaccine's association with a sexually transmitted infection or believing that it might promote sexual activity.<sup>10</sup>

Some professionals simply claim that they forget to address the HPV vaccine at health visits, or that they propose it as optional and up to the parent's discretion.<sup>5,10</sup> Many providers do recommend and administer the initial dose of the vaccine, but have difficulties ensuring that patients complete the full multidose series.<sup>13</sup> Evidence has shown that a strong provider recommendation is one of the most important incen-

tives for parents and patients to accept vaccination.<sup>14</sup>

**Parental and caregiver barriers**

Lack of knowledge about the HPV vaccine and lack of recommendation from providers are two top reasons parents and caregivers cite for not vaccinating their children.<sup>5,10,14,15</sup> In a national survey, almost all parents whose daughters completed the full vaccination series reported being counseled by their provider on the appropriate age for vaccination and the timeline of the series.<sup>14</sup>

Fears and apprehensions about side effects, especially with newer vaccines, can prevent some parents from having their children vaccinated.<sup>15</sup> Although there is some stigma related to the vaccine’s association with the sexually transmitted HPV, this is a much less significant barrier than lack of provider recommendation or knowledge about the vaccine.<sup>5,11</sup>

**Health care system barriers**

Both providers and parents agree that system-level issues such as access, follow-up, and cost are barriers to initiating or completing the vaccination series.<sup>11,13</sup> Many adolescents have few opportunities to receive the vaccine because they do not have a primary care provider.<sup>11</sup> For those with access to primary care, visits are often problem-focused and frequently do not include a review of immunization history.<sup>13</sup> Health care professionals also report challenges with scheduling follow-up visits for the second and third doses to complete the series within the recommended timeframe.<sup>13</sup>

Cost, insurance coverage, and reimbursement pose additional hurdles for both providers and patients, with some providers citing concerns about the cost of stocking the vaccine.<sup>16</sup> Providers, both family practice providers and gynecologists, agree that reimbursement for administering the HPV vaccine in office poses a barrier when recommending the vaccine to patients.<sup>17</sup> Lack of insurance coverage and type of insurance also pose barriers, with Medicaid patients more often completing the full series compared to those with private or no insurance,

**TABLE 2**  
**HPV Vaccine Dosing Schedules Based on Age**

Age (males and females)	Doses	Schedule
9-14 y*	2-dose series†	Dose 1: 0 mo Dose 2: 6-12 mo
15-26 y	3-dose series	Dose 1: 0 mo Dose 2: 1-2 mo Dose 3: 6 mo

\*Populations with primary or secondary immunocompromising conditions should receive the 3-dose series regardless of age.  
†If a second dose is given earlier than five months after the first dose, a third dose is needed at least four months after the second dose. If the first dose of any type of vaccine is given before age 15 and six months have passed, only a second dose is needed. The 9-valent vaccine can be used to complete the schedule if started with bivalent or quadrivalent vaccine.  
Source: Meites et al. *MMWR Morb Mortal Wkly Rep.* 2016.<sup>7</sup>

because Medicaid covers the cost of vaccination for men up to age 19.<sup>9,18</sup> A national survey of males ages 9 to 17 found that the percentage of HPV vaccine initiation was double for those with public insurance compared to those with private insurance.<sup>19</sup> Changes at the system-level, such as participation in the VFC program, in coordination with better provider recommendation should help increase HPV vaccination rates.<sup>9,11</sup>

**STRATEGIES TO IMPROVE VACCINATION RATES**

Many strategies for increasing HPV vaccination acceptance, decreasing barriers to access, and improving compliance with vaccine completion have been reported in the literature, with some strategies achieving more success than others. This section discusses interventions and strategies designed to help overcome provider-, parent-, and system-related barriers that have been shown to be effective (see Table 3, page 44).

**Health care provider interventions**

Evidence supports a number of provider-level strategies to increase HPV vaccination rates (see Table 3). An improvement in vaccination acceptance was observed when providers promoted the vaccine as a safe, effective way to prevent cancer, rather than

TABLE 3

### Interventions to Improve Vaccination Awareness, Uptake, and Rates

	Provider-focused interventions	System-level interventions
<b>Evidence inconclusive</b> (results vary, more research recommended)	Educational materials for providers (when used alone)  Educational materials for patients, parents, and caregivers (when used alone)	Mailed reminder letters
<b>Recommended based on evidence</b> (further research still warranted)	Provider assessment and feedback programs	Electronic alert systems (electronic medical record, text messaging, emails) for both providers and patients/parents
	Multifaceted interventions involving provider education programs, provider reminders, patient/parent education and reminders	

Sources: Sussman et al. *Ann Fam Med*. 2015<sup>13</sup>; Ackerman and Serrano. *Am Fam Physician*. 2015<sup>15</sup>; Perkins et al. *Vaccine*. 2015<sup>20</sup>; Smulian et al. *Hum Vaccin Immunother*. 2016<sup>21</sup>; Walling et al. *Pediatrics*. 2016<sup>22</sup>; Fu et al. *Vaccine*. 2014<sup>25</sup>; Kennedy et al. *J Health Commun*. 2011<sup>26</sup>; Spleen et al; ACTION Health Cancer Task Force. *J Cancer Educ*. 2012<sup>27</sup>; Conroy et al. *J Womens Health (Larchmt)*. 2009<sup>28</sup>; National Vaccine Advisory Committee. *Public Health Rep*. 2016<sup>29</sup>; Aragonés et al. *Prev Med Rep*. 2015<sup>30</sup>; Chao et al. *J Adolesc Health*. 2015.<sup>31</sup>

as a means to prevent a sexually transmitted infection.<sup>10,11,20</sup>

Some primary care providers found that encouraging the HPV vaccine at the same time as the meningococcal and Tdap vaccinations, which are also recommended at age 11 to 12 years, increased vaccination rates as well.<sup>13,20</sup> Another successful strategy is reviewing vaccination history at every visit, whether the visit is for an acute event or an annual well exam.<sup>10,13,20</sup> These tactics are most useful when providers practice them consistently, which may require them to change or adapt their way of practice.

Provider-based trainings that educate and prepare them to consistently recommend the vaccine have demonstrated success in increasing HPV vaccination

uptake.<sup>21,22</sup> The CDC's Assessment/Feedback/Incentive/eXchange (AFIX) quality improvement program to increase vaccination rates, which includes Web-based or in-person consults, has been shown to increase HPV vaccination rates.<sup>20-23</sup> The Assessment phase of the AFIX program determines a practice's current immunization practices and rates, while the Feedback portion provides strategies for increasing vaccination rates.<sup>23</sup> A study by Perkins and colleagues utilized AFIX strategies, specifically for the HPV vaccine, such as focusing provider education on HPV-related cancers and vaccine efficacy, as well as preparing providers to discuss and answer questions through basic motivational interviewing tactics.<sup>20</sup>

The CDC also offers PowerPoint presentations, flyers, posters, videos, and other informational resources to guide and educate providers, parents, and patients about the HPV vaccine.<sup>24</sup> Educational resources, such as pamphlets, flyers, or fact sheets given to parents and patients, have been shown to improve intent to vaccinate as well as awareness of the vaccine.<sup>25-27</sup>

Although Fu and colleagues in a systematic review concluded that there was insufficient data to support a specific educational intervention for widespread use, the authors did recommend utilizing educational pieces and adapting them to specific populations.<sup>25</sup> These simple interventions help increase awareness and can be implemented with other interventions in health care offices by providers and other staff.

#### System-level interventions

The use of systems that track patients for necessary vaccines and remind providers, parents, and patients about vaccine appointments have increased vaccination rates.<sup>13,28</sup> Facility-based interventions, such as electronic medical records (EMR) that track patients for scheduled vaccines and remind providers when patients are due for vaccinations, will help increase provider recommendations and completion of the entire vaccination series.<sup>13</sup>

The National Vaccine Advisory Commit-

tee (NVAC) suggests that provider offices implement reminder-recall systems and provide educational material for parents and patients to increase vaccination rates.<sup>29</sup> One specific study using both educational material and text-message reminders for parents found that these interventions significantly increased vaccination rates.<sup>30</sup> Health care facilities could also incorporate reminder letters mailed to patients and parents to promote vaccine initiation and completion.<sup>31</sup> The evidence supports the use of reminder alerts and EMR tracking systems to increase rates, but more research is warranted to determine the most cost-effective approach.

National programs, committees, and organizations have provided recommendations for overcoming system-related barriers to HPV vaccination, such as access and cost.<sup>29,32</sup> The NVAC recommends incorporating alternative venues for vaccination delivery, such as pharmacies, schools, and health clinics, to increase availability to the adolescent population, especially to those who do not have primary care providers.<sup>29</sup> One study that addressed parental opinions of vaccination administration in schools found that the majority of parents were in favor of this type of program.<sup>33</sup> Although these recommendations seem promising and are accepted by parents, logistical barriers such as reimbursement to the pharmacies, schools, and clinics and accurate documentation of the doses received need to be addressed.<sup>29</sup> The NVAC recommends continued evaluation and efforts to develop these programs in the future.<sup>29</sup>

In addition to school-based interventions, providing home visits for vaccination and implementing standing orders are other suggestions to overcome access and cost barriers for vaccinations, including HPV.<sup>32</sup> Standing orders allow for individuals to receive a vaccine by a health care professional in an approved institution, where allowed by state law.<sup>32</sup> This provides easier access to vaccinations, especially for those who do not see a primary care provider.

Although some of the system-level interventions mentioned in this article are out-

side the realm of what providers can do in the office, understanding and advocating for these advancements will promote vaccine uptake.

## CONCLUSION

Lack of provider recommendation, coupled with poor or no parental knowledge about the HPV vaccine, are significant factors affecting vaccination uptake. Evidence supports the use of multifaceted interventions that promote and support provider recommendation and parent/patient education. Studies of interventions that incorporated educational resources and alert systems for both providers and patients or their caregivers have shown these strategies to be effective in increasing vaccination uptake and completion.

In addition to recommending the HPV vaccine, providers must educate parents/caregivers and patients about it, particularly by presenting the vaccine as a means of cancer prevention. Primary care facilities should implement reminder plans and provide educational literature to promote vaccine uptake. Although the interventions highlighted here have increased HPV vaccination rates, further research is warranted to evaluate more effective strategies for overcoming barriers and to determine which strategies are most cost-effective. **CR**

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