HUMAN PAPILLOMAVIRUS VACCINE RECOMBINANT

Human Papillomavirus Vaccine Recombinant

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On January 5, 2026, the US Department of Health and Human Services (HHS) announced the approval of a revised US childhood and adolescent immunization schedule ([Web]). Under the revised recommendations, CDC continues to organize the childhood immunization schedule in three distinct categories (Immunizations Recommended for All Children, Immunizations Recommended for Certain High-Risk Groups or Populations, and Immunizations Based on Shared Clinical Decision-Making) but changes individual vaccine placement within those categories. For additional information, see [Web] .

Introduction

Human papillomavirus (HPV) vaccine is an inactivated (recombinant) virus vaccine containing virus-like particles (VLPs) of the major capsid (L1) proteins of certain HPV types and is used to stimulate active immunity to the HPV serotypes represented in the vaccine.[1,]

Uses

■ Prevention of Disease Caused by Human Papillomavirus (HPV)

Human papillomavirus (HPV) vaccine recombinant is used to prevent diseases caused by HPV serotypes represented in the vaccine.[1,] HPV vaccine is commercially available in the US as human papillomavirus 9-valent vaccine recombinant (9vHPV; Gardasil® 9) containing VLPs of HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58.[1,] The previous HPV quadrivalent vaccine (4vHPV; Gardasil®) and HPV bivalent vaccine (2vHPV; Cervarix®) are no longer commercially available in the US.[2,3,207,] The 9vHPV vaccine is used for the prevention of cervical, vulvar, vaginal, anal, oropharyngeal, and other head and neck cancers caused by HPV types 16, 18, 31, 33, 45, 52, and 58 and for the prevention of genital warts (condyloma acuminata) caused by HPV types 6 and 11 in females 9–45 years of age.[1,] The 9vHPV vaccine is also used for the prevention of the following precancerous or dysplastic lesions caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 in females 9–45 years of age: cervical intraepithelial neoplasia (CIN) grade 2/3 and cervical adenocarcinoma in situ (AIS), CIN grade 1, vulvar intraepithelial neoplasia (VIN) grade 2 and grade 3, vaginal intraepithelial neoplasia (VaIN) grade 2 and grade 3, and anal intraepithelial neoplasia (AIN) grades 1, 2, and 3.[1,] The 9vHPV vaccine is also used for the prevention of anal, oropharyngeal, and other head and neck cancers caused by HPV types 16, 18, 31, 33, 45, 52, and 58, and genital warts (condyloma acuminata) caused by HPV types 6 and 11 in males 9–45 years of age.[1,] The 9vHPV vaccine is also used for the prevention of the following precancerous or dysplastic lesions caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 in males 9–45 years of age: AIN grades 1, 2, and 3.[1,] The oropharyngeal, head, and neck cancer indication is approved under accelerated approval based on the vaccine's effectiveness in preventing HPV-related anogenital disease; continued approval for this indication may be contingent on verification and description of clinical benefit in confirmatory studies.[1,] Vaccination with 9vHPV does not eliminate the necessity of screening for cervical, vulvar, vaginal, anal, oropharyngeal and other head and neck cancers as recommended by healthcare providers.[1,]

The 9vHPV vaccine has not been demonstrated to provide protection against disease caused by HPV types not covered by the vaccine nor HPV types to which a person has been previously exposed through sexual activity.[1,] Not all vulvar, vaginal, anal, oropharyngeal, and other head and neck cancers are caused by HPV and the 9vHPV vaccine only

protects against these cancers caused by HPV types 16, 18, 31, 33, 45, 52, and 58.[1] The 9vHPV vaccine is not a treatment for external genital lesions; cervical, vulvar, vaginal, anal, oropharyngeal, and other head and neck cancers; CIN; VIN; VaIN; or AIN.[1] Vaccination with 9vHPV may not result in protection in all vaccine recipients.[1]

Anogenital HPV is the most common sexually transmitted infection in the US.[166,201] Before the introduction of the HPV vaccine, there were an estimated 79 million individuals in the US who were already infected with genital HPV, and approximately 14 million more were newly infected annually (about 50% of these cases occurred in adolescents and young adults 15–24 years of age).[166,201] Within a decade after the introduction of the HPV quadrivalent vaccine (4vHPV) in 2006, the prevalence of HPV types 6, 11, 16, and 18 decreased 86% and 71% among females 14–19 and 20–24 years of age, respectively.[166] More than 150 HPV types have been identified, and about 40 of these can cause anogenital infections.[166,201,344] Although most HPV infections are asymptomatic and resolve spontaneously without causing clinical disease or complications, persistent HPV infections can develop into anogenital warts, precancers, and cervical, anogenital, or oropharyngeal cancers.[105,166,201] HPV types have been categorized according to their epidemiologic association with cervical cancer.[166,201] Low-risk (nononcogenic) types (e.g., HPV types 6 and 11) can cause anogenital warts, benign or low-grade cervical cell changes, recurrent respiratory papillomatosis, and conjunctival papillomas.[105,166,201,344] These low-risk HPV types cause over 90% of cases of anogenital warts.[166,202] High-risk (oncogenic) types (e.g., HPV types 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68) have the potential to act as carcinogens and can cause low-grade cervical cell abnormalities, high-grade cervical abnormalities that are precursors to cancer, and anogenital cancers.[166,201,344] Almost all cervical precancers and invasive cervical cancers are caused by high-risk HPV types; the majority of cervical cancers (about 66–70%) are caused by HPV types 16 and 18.[105,166,201,344] High-risk HPV infection can also cause penile, vulvar, vaginal, anal, and oropharyngeal cancers and precancers.[201,344] In the US, for any invasive HPV-associated cancer, about 64% of cases are attributable to HPV 16 or 18, and about 10–11% of cases are attributable to the high-risk HPV types 31, 33, 45, 52, and 58.[166,202]

Clinical Experience

Females and Males 9–14 Years of Age (2-Dose Regimen)

Efficacy of 9vHPV given in a 2-dose series in individuals 9–14 years of age is inferred from immunogenicity data.[1,207,208] In a randomized, parallel-group study, immunogenicity of 9vHPV given in a 2-dose series (second dose given at 6 or 12 months after the first dose) to females and males 9–14 years of age was compared with immunogenicity of 9vHPV given in a 3-dose series (second and third doses given 2 and 6 months, respectively, after the first dose) in females 16–26 years of age.[1,207,208] For all 9 HPV types contained in the vaccine, the immune response 1 month after the last dose in females and males 9–14 years of age who received 2 doses of the vaccine was noninferior to that in females 16–26 years of age who received 3 doses of the vaccine.[1,207,208] More than 98% of individuals enrolled in the study had an antibody response (seroconversion) to each of the 9 HPV types contained in the vaccine by 1 month after completion of the 2- or 3-dose vaccination series.[1,207,208] In addition, geometric mean titers (GMTs) of antibodies to the 9 HPV vaccine types that were attained in individuals who received the 2-dose vaccination series were noninferior to GMTs attained in those who received the 3-dose vaccination series.[1,207,208] In a 3-year follow-up study, females and males 9–14 years of age who received 2 doses of the 9vHPV vaccine maintained antibody responses (based on GMTs) over 2–2.5 years after administration of the second dose; the GMTs over 2–2.5 years were generally similar to or greater than the GMTs of females 16–26 years of age who received the 3-dose vaccination series with 9vHPV.[354]

Females 9–15 Years of Age (3-Dose Regimen)

Efficacy of 9vHPV given in a 3-dose series in females 9–15 years of age is inferred from immunogenicity data.[1] In one study, 600 females 9–15 years of age were randomized to receive 9vHPV or 4vHPV (no longer available in the US).[1,352] Results from this study found that females 9–15 years of age who received a 3-dose regimen of 9vHPV had GMTs of antibodies to the HPV types 6, 11, 16, and 18 by 1 month after dose 3 that were noninferior to those attained in females 9–15 years of age who received 4vHPV.[1,352] All patients who received 3 doses of either the 9vHPV or 4vHPV vaccine seroconverted for HPV types 6, 11, 16, and 18.[352] In another immunogenicity study, females 9–15 years of age who received a 3-dose regimen of 9vHPV became seropositive for antibodies to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 by 1 month after dose 3 and GMTs of these antibodies attained in this age group were noninferior to those attained in females 16–26 years of age (i.e., immunogenicity bridging).[1,347] Results from this study reported GMTs of these antibodies 1 month after the third vaccine dose of 714–6980 mMU/mL in females 9–15 years of age, and GMTs of 272–3523 mMU/mL in females 16–26 years of age.[347] In a 10-year follow-up, females 9–15 years of age who received a 3-dose regimen of the 9vHPV vaccine were actively followed from 16 years of age onward for clinical endpoints related to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 persistent infection and disease.[1,348] The median follow-up from the last dose of the 9vHPV vaccine was 10 years.[1,348] Overall, seropositivity rates remained at ≥81% across the 9 HPV types at 10 years post-dose 3 of the vaccine.[1,348] In females 9–15 years of age, there were no cases of HPV related CIN 2/3, AIS, VIN, VaIN, external genital warts, cervical cancer, vulvar cancer, or vaginal cancer for the HPV types covered by the 9vHPV vaccine.[1,348] One case of CIN 1 was observed that tested positive for HPV types 16, 39, and 59 by PCR.[1,348]

Males 9–15 Years of Age (3-Dose Regimen)

Efficacy of 9vHPV given in a 3-dose series in males 9–15 years of age is inferred based on evidence that more than 99% of males 9–15 years of

age became seropositive for antibodies to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 by 1 month after the third vaccine dose and GMTs of these antibodies attained in this age group are noninferior to those attained in females 16–26 years of age (i.e., immunogenicity bridging).[1,202,347] Immunogenicity studies in males 9–15 years of age indicate that GMTs of these antibodies 1 month after the third vaccine dose range from 907–8629 mMU/mL in this age group.[1] In a 10-year follow-up, males 9–15 years of age who received a 3-dose regimen of the 9vHPV vaccine were actively followed from 16 years of age onward for clinical endpoints related to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 persistent infection and disease.[1,348] The median follow-up from the last dose of the 9vHPV vaccine was 10 years.[1,348] Overall, seropositivity rates remained at ≥81% across the 9 HPV types at 10 years post-dose 3 of the vaccine.[1,348] In males 9–15 years of age, there were no cases of HPV related penile intraepithelial neoplasia (PIN), external genital warts, penile cancer, perineal cancer, or perianal cancer for the HPV types covered by the 9vHPV vaccine.[1,348]

Females 16–26 Years of Age (3-Dose Regimen)

Safety and efficacy of 9vHPV for the prevention of disease caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 have been evaluated in a double-blind, randomized, active comparator-controlled study in 14,204 women 16–26 years of age at the time of enrollment.[1,204] Study participants were randomized to receive a 3-dose series of either 9vHPV or 4vHPV (no longer available in the US).[1,204] The second and third vaccine doses were given 2 and 6 months, respectively, after the first dose, and the median duration of follow-up was 3.3 years.[1,204] The efficacy analysis was based on clinical endpoints including high-grade CIN, AIS, high-grade VIN, high-grade VaIN, invasive cervical carcinoma, vulvar cancer, or vaginal cancer related to HPV types 31, 33, 45, 52, and 58.[1,204] For HPV types 6, 11, 16, and 18, efficacy of 9vHPV was inferred from immunogenicity data comparisons with 4vHPV.[1,202] The per-protocol efficacy (PPE) population consisted of those who completed the 3-dose vaccine series within 1 year of enrollment, did not have major study protocol deviations, and were naïve (seronegative and cervicovaginal specimens PCR negative) to the relevant vaccine HPV types when tested prior to the first vaccine dose and at 1 month after the third dose.[1,204]

Results from the efficacy analysis found that 9vHPV was effective in preventing HPV disease caused by HPV types 31, 33, 45, 52, and 58 in individuals who were seronegative and PCR negative to these HPV types at baseline.[1,204] In the PPE population, the vaccine was 96.7% effective in preventing CIN 2/3, AIS, VIN 2/3, VaIN 2/3, cervical cancer, vulvar cancer, or vaginal cancer related to HPV types 31, 33, 45, 52, and 58 and 98.6% effective in preventing CIN 1 related to HPV types 31, 33, 45, 52, and 58.[1,202,204] For HPV types 6, 11, 16, and 18, the 9vHPV vaccine was noninferior to the 4vHPV vaccine based on the GMTs attained 1 month after the third dose.[1,202,204] A follow-up study reported efficacy of 9vHPV for up to 6 years following first administration of the vaccine; the median follow-up was 4.0 years after the first dose and 3.5 years after the third dose.[346] In the PPE population, 9vHPV had a 97.4% efficacy, compared to 4vHPV, against high-grade cervical, vulvar, and vaginal disease related to HPV 31, 33, 45, 52, and 58.[346]

Males 16–26 Years of Age (3-Dose Regimen)

Efficacy of 9vHPV for the prevention of disease caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 in males 16–26 years of age is inferred based on evidence from an open-label study that included males (including heterosexual males and men having sex with men [MSM]) and females 16–26 years of age who received 9vHPV in a 3-dose series (second and third dose given 2 and 6 months, respectively, after first dose).[1,349] Results from this study demonstrated that the immune response observed in heterosexual males 16–26 years of age after the third vaccine dose was noninferior to that observed in females 16–26 years of age (i.e., immunogenicity bridging).[1,349] More than 99% of males (including heterosexual males and MSM) and females 16–26 years of age became seropositive for antibodies to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58.[202,349] Results from this study reported GMTs of these antibodies 1 month after the third vaccine dose of 236–3346 mMU/mL in heterosexual males 16–26 years of age, GMTs of 158–2294 mMU/mL in MSM 16–26 years of age, and GMTs of 186–2788 mMU/mL in females 16–26 years of age.[1,349]

Females 27–45 Years of Age (3-Dose Regimen)

Efficacy of 9vHPV for the prevention of disease caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 is based on immunobridging comparison data from an open-label study that included females 27–45 years of age and females 16–26 years of age who received 9vHPV in a 3-dose series (second and third dose given 2 and 6 months, respectively, after first dose).[1,359] Results from this study found that females 27–45 years of age who received a 3-dose regimen of 9vHPV had GMTs of antibodies (attained 1 month after dose 3) to the HPV types 16, 18, 31, 33, 45, 52, and 58 that were noninferior to those attained in females 16–26 years of age.[1,359] More than 99% of all vaccine recipients became seropositive for antibodies to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58.[359]

Males 27–45 Years of Age (3-Dose Regimen)

Efficacy of 4vHPV for the prevention of HPV disease in males 27–45 years of age is inferred from efficacy data from the clinical trial in females 27–45 years of age and is supported by immunogenicity data from a clinical trial that included 150 males 27–45 years of age who received a 3-dose regimen of 4vHPV (second and third doses given 2 and 6 months, respectively, after the first dose).[1] *In addition, results of a cross-study analysis of per-protocol immunogenicity populations that compared HPV 6, 11, 16, and 18 GMTs at month 7 in males 27–45 years of age (study A) to GMTs in males 16–26 years of age in whom efficacy of 4vHPV had been established (study B) indicated that GMT ratios (study A/study B) for antibodies to HPV 6, 11, 16, and 18 were 0.82, 0.79, 0.91, and 0.74, respectively.*[1]

Prevention of HPV-related Oropharyngeal and Other Head and Neck Cancers

Efficacy of the 9vHPV vaccine in males and females 9–45 years of age against oropharyngeal and other head and neck cancers caused by HPV types 16, 18, 31, 33, 45, 52, and 58 is based on the efficacy of the 4vHPV and 9vHPV vaccines to prevent anogenital disease caused by HPV types covered by the vaccine.[1]

Clinical Perspective

The US Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) and other organizations (e.g., American Academy of Pediatrics [AAP]), American College of Obstetricians and Gynecologists [ACOG]), provide recommendations for the prevention of diseases caused by HPV types represented in HPV vaccines.[26,27,28,155,156,199,200,212,310,345] HPV vaccination is most effective in individuals with few or no sex partners prior to vaccination; however, vaccination in those with multiple sex partners can still help prevent infection of HPV subtypes these patients have not been exposed to yet.[155] According to ACIP and ACOG, routine primary immunization against HPV-related diseases is recommended at 11–12 years of age; immunization can occur as early as 9 years of age.[28,199] AAP recommends starting HPV vaccination between 9–12 years of age, at an age the pediatric healthcare professional deems optimal for acceptance and completion of the vaccination series.[310] The American Cancer Society (ACS) states that healthcare providers are encouraged to start offering HPV vaccination at 9 or 10 years of age, as routine HPV vaccination between 9–12 years of age is expected to achieve higher on-time vaccination rates and result in increased numbers of cancers prevented.[345]

AAP recommends catch-up vaccination for adolescents 13–18 years of age who have not been adequately vaccinated.[310] ACIP also recommends routine HPV vaccination for adults 19–26 years of age who lack documentation of vaccination or lack evidence of immunity.[200] ACOG states that obstetrician-gynecologists should assess and vaccinate female adolescents with the HPV vaccine during the catch-up period (13–26 years of age) if not previously vaccinated, regardless of sexual activity, prior exposure to HPV, or sexual orientation.[28] ACS additionally states that adults 22–26 years of age who have not been previously vaccinated or who have not completed the series should be informed that HPV vaccination at older ages is less effective in lowering cancer risk.[345]

ACIP states that decisions regarding HPV vaccination in adults 27–45 years of age should be based on shared clinical decision-making and discussion between the patient and clinician regarding the benefits and risks of the vaccine.[200,212] ACOG also states that for some females 27–45 years of age who are previously unvaccinated, healthcare professionals may use shared clinical decision-making regarding HPV vaccination, considering the patient's risk of acquiring a new HPV infection and whether the HPV vaccine may provide benefit.[28] ACS does not endorse ACIP's recommendation for shared clinical decision-making for HPV vaccination in adults 27–45 years of age, due to low effectiveness and low cancer prevention potential in this age group, the burden of decision-making on patients and healthcare providers, and the lack of sufficient guidance on the individuals who might benefit.[345]

For routine and catch-up HPV vaccination, AAP and ACOG recommend a 2- or 3-dose series depending on the age of the individual at initial vaccination.[28,310] For patients 9–14 years of age at initial vaccination, a 2-dose series (second dose given 6–12 months after the first dose) is recommended.[28,310] A minimum of 5 months is recommended between doses; the second dose should be repeated if it was administered too soon after initial vaccination.[28,310] For patients ≥15 years of age, AAP and ACOG recommend a 3-dose series (second dose 1–2 months after first dose, and third dose 6 months after first dose).[28,310] A minimum interval of 4 weeks, 12 weeks, and 5 months is recommended between dose 1 and 2, dose 2 and 3, and dose 1 and 3, respectively.[310] A dose should be repeated if it was administered too soon after the previous vaccination.[310] No additional dose is recommended when any HPV vaccine series of any valency has been completed using the dosing intervals recommended.[310] For adults 27–45 years, if indicated based on shared clinical decision-making, a 2-dose series should be completed if the series was initiated between 9–14 years of age; if the HPV vaccination series was initiated at ≥15 years of age, a 3-dose series should be completed.[200]

Specific recommendations for HPV vaccination have also been made for specific high-risk groups and populations.[28,156,155,200,310] For immunocompromised individuals, including those with HIV infection (regardless of CD4 percentage or count), a 3-dose series of the HPV vaccine is recommended even if vaccination is initiated at 9–14 years of age.[28,156,155,200,310] For individuals with a history of sexual abuse or assault, HPV vaccination is recommended to be initiated at 9 years of age.[28,310] HPV vaccination during pregnancy is not recommended; however pregnancy testing is not needed prior to vaccination.[28,200,310] If an individual is inadvertently vaccinated while pregnant, no intervention is needed.[28,200,310] If an individual initiates the HPV vaccination series prior to pregnancy and then becomes pregnant, the completion of the series should be delayed until that pregnancy is complete.[28] For individuals who are breastfeeding, not previously vaccinated, and ≤26 years of age, the HPV vaccine should be given.[28]

The Center for Infectious Disease Research and Policy (CIDRAP) has established the Vaccine Integrity Project to provide evidence-based guidance on vaccines.[77] The Vaccine Integrity Project is an initiative dedicated to providing trusted, science-based information for informed vaccine choices.[77] A multi-disciplinary group of experts was convened by the Vaccine Integrity Project to independently review the available data on safety, effectiveness, and immunogenicity of HPV vaccines available in the US.[77,78] A total of 274 studies, including randomized controlled trials, cohort studies, ecological studies, case-control studies, and immunogenicity studies, comprised the total evidence base for analysis.[78,79,80] Results of the evidence review are largely consistent with prior findings and continue to support a strong efficacy and safety profile for HPV vaccines.[78]

Vaccination was associated with significantly lower rates of invasive cervival cancer, high-grade cervical lesions, and persistent infection with high-risk HPV strains (e.g., HPV 16/18).[78] Greater protection against cervical cancer was observed when the vaccine was given at younger ages.[78] There was no evidence of an increased risk of serious adverse events including neurological conditions (e.g., Guillain-Barre syndrome, complex regional pain syndrome, chronic fatigue syndrome), adverse pregnancy outcomes, or other long-term health risks, following vaccination.[78] While pooled evidence suggests that a single dose of HPV vaccine may provide comparable protection to 2- or 3-dose regimens for certain outcomes in females, additional study is needed to determine the long-term effects of a single-dose regimen and the effectiveness in males.[78] For additional information, see [Web] .

HPV vaccination has been used as an **adjuvant in previously unvaccinated individuals 27–45 years of age who are undergoing treatment for CIN grade 2 or higher [off-label]†**.[26,27] A committee opinion by the American Society for Colposcopy and Cervical Pathology (ASCCP) recommends consideration of the possible benefit of adjuvant HPV vaccination in shared decision-making for previously unvaccinated, immunocompetent individuals 27–45 years of age who are undergoing treatment for CIN 2+.[26] This recommendation is based on long-term pooled data that found that individuals with a history of treatment for CIN 2+ are at increased risk for cervical cancer for ≥25 years after treatment, as well as preliminary data that suggests vaccination reduces the risk of recurrence of disease.[26] Individuals should still be counseled that vaccination does not treat existing HPV disease or prevent all future HPV-related disease.[26] An ACOG practice advisory also recommends considering adjuvant HPV vaccination for immunocompetent, previously unvaccinated individuals 27–45 years of age who are undergoing treatment for CIN 2+.[27]

Dosage and Administration

■ General

Dispensing and Administration Precautions

- Appropriate medical treatment used to manage immediate allergic reactions must be available in the event an acute anaphylactic reaction occurs following vaccine administration.[1]
- Ensure procedures are in place to avoid a falling injury from syncope following vaccination.[1] An observation period of 15 minutes after administration is recommended.[1]

■ Administration

The only commercially available human papillomavirus (HPV) vaccine in the US is human papillomavirus 9-valent vaccine recombinant (9vHPV; Gardasil® 9).[1] The previous HPV quadrivalent vaccine (4vHPV; Gardasil®) and HPV bivalent vaccine (2vHPV; Cervarix®) are no longer commercially available in the US.[2,3,207]

Human papillomavirus 9-valent vaccine recombinant (9vHPV) is administered only by IM injection.[1] IM injections of 9vHPV should be made in the deltoid region of the upper arm or anterolateral aspect of the upper thigh.[1]

9vHPV may be given simultaneously with other age-appropriate vaccines.[105,134,166,199,200,201] When multiple vaccines are administered during a single health-care visit, each parenteral vaccine should be given using separate syringes and different injection sites.[134,307] Injection sites should be separated by at least 1 inch (if anatomically feasible) to allow appropriate attribution of any local adverse effects that may occur.[134,307]

IM Administration

To ensure delivery of vaccine into muscle, IM injections should be made at a 90° angle to the skin using a needle length appropriate for the individual's age and body mass, thickness of adipose tissue and muscle at the injection site, and injection technique.[308]

Immediately prior to administration, 9vHPV should be shaken well to obtain a uniform, cloudy, white suspension.[1] The vaccine should be discarded if it contains particulates, appears discolored, or cannot be resuspended with thorough agitation.[1]

9vHPV should *not* be diluted and should *not* be mixed with any other vaccine or solution.[1]

9vHPV is provided in 0.5-mL single-dose vials or single-dose prefilled syringes.[1] The vaccine does not contain any preservatives or antibiotics.[1]

9vHPV should be stored at 2–8°C and protected from light.[1] The vaccine should be administered as soon as possible after removal from refrigeration, but can be used if kept at temperatures between 8–25°C for no more than 72 hours.[1] Repeated temperature fluctuations between 0–2°C are permitted, provided the total cumulative time within this range does not exceed 72 hours.[1] Do not freeze; do not use vaccine that has been frozen.[1]

■ Dosage

The manufacturer recommends a 2- or 3-dose series if HPV vaccination is initiated at 9–14 years of age and a 3-dose series if HPV vaccination is initiated at 15–45 years of age.[1] 9vHPV is administered IM in 0.5 mL doses.[1]

If interruptions occur resulting in an interval between doses longer than recommended, there is no need to restart the vaccination series.[105,166,201,207]

An accelerated schedule for the HPV vaccination series (i.e., using intervals between doses shorter than recommended) should *not* be used.[105,166,207]

Consult the US Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) and American Academy of Pediatrics (AAP) vaccination schedules for specific dosage information, including detailed recommendations for certain scenarios (e.g., catch-up vaccination) and high-risk conditions.[199,200,310]

Prevention of Disease Caused by HPV

Females and Males 9 through 14 Years of Age

If a 2-dose regimen of 9vHPV is used in individuals 9–14 years of age, the manufacturer recommends that the second dose be given 6–12 months after the first dose (i.e., 0 and 6–12 months); if the second dose is given earlier than 5 months after the first dose, a third dose should be given at least 4 months after the second dose.[1] If a 3-dose regimen is used in this age group, the manufacturer recommends that the second dose be given 2 months after the first dose and that the third dose be given 6 months after the first dose (i.e., 0, 2, and 6 months).[1]

For routine or catch-up vaccination in immunocompetent individuals 9–14 years of age, AAP recommends that a 2-dose regimen of 9vHPV be used.[310] AAP recommends that the first dose be given at 11–12 years of age (but may be given as early as 9 years of age) and that the second dose be given 6–12 months after the first dose (i.e., 0 and 6–12 months).[310] The minimum interval between the first and second doses is 5 months; if the second dose is given earlier than 5 months after the first dose, AAP, and other organizations recommend that a third dose be given at least 12 weeks after the second dose and at least 5 months after the first dose.[310] The CDC recommends a ***single dose [off-label]***[†] *of the HPV vaccine for children at 11 or 12 years of age versus the series recommended by other organizations.[7,199]*

For routine or catch-up vaccination in immunocompromised individuals 9–14 years of age, AAP recommends that a 3-dose regimen of 9vHPV be used.[310] The second dose should be given 1–2 months after the first dose and the third dose should be given 6 months after the first dose (i.e., 0, 1–2, and 6 months).[310] The minimum interval between the first and second doses is 4 weeks; the minimum intervals for the third dose are 12 weeks after the second dose and 5 months after the first dose.[310]

Females and Males 15–18 Years of Age

For routine or catch-up vaccination in immunocompetent or immunocompromised individuals 15–18 years of age, the manufacturer, AAP, and other experts recommend a 3-dose regimen of 9vHPV.[1,105,207] The second dose should be given 1–2 months after the first dose and the third dose should be given 6 months after the first dose (i.e., 0, 1–2, and 6 months).[1,105,207] The minimum interval between the first and second doses is 4 weeks; the minimum intervals for the third dose are 12 weeks after the second dose and 5 months after the first dose.[105,207]

Females and Males 19–45 Years of age

HPV vaccination is most effective when administered in early adolescence, before potential exposure to the virus through sexual activity.[212] Catch-up HPV vaccination is advised for all individuals up to 26 years of age who have not completed the recommended vaccination series.[212] For adults 27–45 years of age who have not been fully vaccinated, clinicians may choose to discuss HPV vaccination with those who are most likely to benefit.[212]

For routine or catch-up vaccination in immunocompetent individuals 19– 45 years of age, a 3-dose regimen of 9vHPV is recommended by the manufacturer.[1] The second dose should be given 1–2 months after the first dose and the third dose should be given 6 months after the first dose (i.e., 0, 1–2, and 6 months).[1] Depending on their age at the first dose and specific circumstances, ACIP recommends that all individuals up to 26 years of complete either a 2-dose or 3-dose HPV vaccination series depending on their age at initial vaccination.[200] Individuals who were 9–14 years of age at initial vaccination and received 1 dose or 2 doses less than 5 months apart should receive 1 additional dose.[200] Individuals who were 9–14 years of age at initial vaccination and received 2 doses at least 5 months apart are considered to have completed the HPV series and do not need another dose.[200] Individuals who were 15 years of age or older at initial vaccination should receive a 3-dose series at 0, 1–2 months, and 6 months.[200]

For routine or catch-up vaccination in immunocompromised individuals, it is recommended to complete a 3-dose series, even for those who received initial vaccination at 9–14 years of age.[200]

> *9vHPV can be used to continue or complete the vaccination series in individuals who previously received 1 or more doses of an HPV vaccine that is no longer available in the US (4vHPV, 2vHPV).*[105,207]

Special Populations

Hepatic Impairment

The manufacturer makes no specific dosage recommendations for patients with hepatic impairment.[1]

Renal Impairment

The manufacturer makes no specific dosage recommendations for patients with renal impairment.[1]

Geriatric Patients

The manufacturer makes no specific dosage recommendations for geriatric patients.[1]

Cautions

■ Contraindications

- Hypersensitivity to any vaccine component (including severe allergic reactions to yeast) or hypersensitivity following a previous dose of human papillomavirus (HPV) vaccine.[1]

■ Warnings/Precautions

Hypersensitivity Reactions

There have been postmarketing reports of hypersensitivity reactions (e.g., anaphylactic/anaphylactoid reactions, bronchospasm, urticaria) after administration of human papillomavirus 9-valent vaccine recombinant (9vHPV).[1] Appropriate medical treatment and supervision must be available in case an anaphylactic reaction occurs following the administration of the vaccine.[1]

9vHPV is manufactured using fermentation cultures of a recombinant strain of *Saccharomyces cerevisiae* (yeast).[1] Data from the Vaccine Adverse Event Reporting System (VAERS) indicate that recombinant yeast-derived vaccines pose a minimal risk for anaphylactic reactions in individuals with a history of allergic reactions to yeast.[23]

Syncope

Syncope, sometimes associated with tonic-clonic movements and other seizure-like activity, has been reported following vaccination with HPV vaccine.[1] Tonic-clonic movements are transient and typically respond to restoration of cerebral perfusion by maintaining vaccinee in a supine or Trendelenburg position.[1] Syncope also has been reported with other vaccines and occurs most frequently in adolescents and young adults.[134]

The vacacine recipient should be observed for 15 minutes following vaccination and procedures should be in place to avoid falls and restore cerebral perfusion if syncope occurs.[1,134]

Altered Immunocompetence

Like other inactivated vaccines, HPV vaccine may be administered to individuals immunosuppressed as a result of disease (e.g., congenital immunodeficiency, human immunodeficiency virus [HIV] infection, hematologic or generalized malignancy, solid organ transplantation) or medical therapy.[105,135,155,156,166,200,207] However, the immune response to the vaccine and efficacy may be reduced in these patients.[1,105,135,155,156,166,200,201,207] Immunosuppressed individuals should receive a 3-dose HPV vaccination series.[199,200,207,310]

Although data are not available regarding safety, efficacy, and immunogenicity in individuals with HIV infection, the US Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP), American Academy of Pediatrics (AAP), National Institutes of Health (NIH), HIV Medicine Association of the Infectious Diseases Society of America (IDSA), and other experts state that recommendations regarding use of HPV vaccine in HIV-infected individuals are the same as those for individuals who are not infected with HIV.[135,155,156,200] However, HIV-infected individuals 9–26 years of age should receive a 3-dose HPV vaccination series.[155,156,200,207]

Inactivated vaccines generally should be administered prior to initiation of immunosuppressive therapy or deferred until immunosuppressive therapy is discontinued.[105,134]

Limitations of Vaccine Effectiveness

HPV vaccine may not protect all vaccine recipients against HPV infection.[1]

Vaccination with HPV vaccine does not substitute for routine screening for cervical, vulvar, vaginal, anal, oropharyngeal, and other head and neck cancers as recommended by a healthcare provider.[1,19]

HPV vaccine does not provide protection against disease due to HPV types not represented in the vaccine and does not provide protection from vaccine and nonvaccine HPV types an individual has previously been exposed to through sexual activity.[1]

HPV vaccine is *not* used for *treatment* of active genital warts.[1]

HPV vaccine is *not* used for *treatment* of precancerous or dysplastic lesions (e.g., anal intraepithelial neoplasia [AIN], cervical intraepithelial neoplasia [CIN], vulvar intraepithelial neoplasia [VIN], vaginal intraepithelial neoplasia [VaIN]) or cervical, vulvar, vaginal, anal cancer, oropharyngeal, or other head and neck cancers.[1]

Specific Populations

Pregnancy

There are no adequate and well-controlled studies using 9vHPV in pregnant women.[1] The manufacturer states that human data to date have not demonstrated any vaccine-associated risk of major birth defects and miscarriages when 9vHPV is administered during pregnancy.[1]

ACIP, AAP, American College of Obstetricians and Gynecologists (ACOG), and other organizations state that HPV vaccine is not recommended for use in pregnant women.[105,134,155,166,200,201,202,207,212]

Although pregnancy testing is not needed before initiation of the HPV vaccination series,[105,166,200,201,202,207,212] health-care providers should question sexually active individuals about the possibility of pregnancy.[105] HPV vaccination should be deferred until pregnancy is completed.[166,200,212] If a woman is found to be pregnant after the HPV vaccine series is initiated, ACIP, AAP, ACOG, and other organizations state that no intervention is needed, but any remaining doses of the series should be deferred until after completion of the pregnancy.[105,166,200,201,202,212]

Lactation

Data are insufficient to assess the effects of 9vHPV on the breast-fed infant or on milk production/excretion.[1]

The manufacturer of 9vHPV states that the benefits of breast-feeding and the importance of the vaccine to the woman should be considered along with the potential adverse effects on the breast-fed child from the vaccine or from the underlying maternal condition (i.e., susceptibility to HPV infection).[1]

ACIP states that inactivated vaccines do not pose any unusual risks for the mother or her breast-fed infant.[134] ACIP and other organizations state that HPV vaccine may be administered to women who are breast-feeding.[28,105,134,166,201,212]

Pediatric Use

Safety and efficacy of 9vHPV have not been established in females or males younger than 9 years of age.[1]

Geriatric Use

Safety and efficacy of 9vHPV have not been established in females or males 65 years of age or older.[1]

■ Common Adverse Effects

In females 9–15 years of age, the most common adverse reactions to 9vHPV are injection-site pain (89.3%), injection-site swelling (47.8%), injection-site erythema (34.1%) and headache (11.4%).[1]

In females 16–26 years of age, the most common adverse reactions to 9vHPV are injection-site pain (89.9%), injection-site swelling (40.0%), injection-site erythema (34.0%) and headache (14.6%).[1]

In females 27–45 years of age, the most common adverse reactions to 9vHPV are injection-site pain (82.8%), injection-site swelling (23.3%), injection-site erythema (16.9%), and headache (13.6%).[1]

In males 16–26 years of age, the most common adverse reactions to 9vHPV are injection-site pain (63.4%), injection-site swelling (20.2%), and injection-site erythema (20.7%).[1]

In males 9–15 years of age, the most common adverse reactions to 9vHPV are injection-site pain (71.5%), injection-site swelling (26.9%), and injection-site erythema (24.9%).[1]

Drug Interactions

■ Estrogens or Progestins

Human papillomavirus vaccine (HPV) vaccine has been used in women receiving hormonal contraceptives.[1] The manufacturer of human papillomavirus 9-valent vaccine recombinant (9vHPV) states that use of hormonal contraceptives in women in clinical studies did not alter the immunologic response to the vaccine.[1]

■ Immunosuppressive Agents

Individuals receiving immunosuppressive therapy (e.g., irradiation, antimetabolites, alkylating agents, cytotoxic drugs, and corticosteroids) may have a diminished response to HPV vaccine.[1,105,134,135]

The US Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) and other organizations state that age-appropriate patients who are immunocompromised either from disease or drug therapy may receive HPV vaccine;[105,134,155,135,156,201,202] however, the immune response to the vaccine and vaccine efficacy may be decreased compared with that observed in immunocompetent vaccinees.[105,134,135,201,202,207]

Inactivated vaccines generally should be administered at least 2 weeks prior to initiation of immunosuppressive therapy and, because of possible suboptimal response, should not be administered during immunosuppressive therapy and for certain periods of time after such therapy is discontinued.[105,134,135] Because the intervals between discontinuance of immunosuppressive therapy and restoration of immune competence vary depending on the type and intensity of immunosuppressive therapy, underlying disease, and other factors, optimal timing for vaccine administration following discontinuance of immunosuppressive therapy has not been identified for every situation.[105]

ACIP and the Infectious Diseases Society of America (IDSA) recommend that inactivated vaccines be administered at least 2 weeks before initiation of cancer chemotherapy or radiation therapy, if possible, and avoided during such therapy.[134,135] Individuals vaccinated during or within 14 days of starting chemotherapy or radiation therapy should be considered unimmunized and should be revaccinated at least 3 months after such therapy is discontinued if immunocompetence has been restored.[134,135]

Inactivated vaccines should be administered at least 2 weeks prior to treatment with anti-B-cell antibodies (e.g., rituximab).[105,134] The optimal time to administer vaccines in patients who have received treatment with anti-B-cell antibodies is unclear.[134,135] Some experts state that administration of inactivated vaccines should be deferred until at least 6 months after treatment with anti-B-cell antibodies has been discontinued.[105,134,135]

Inactivated vaccines should be administered at least 2 weeks prior to initiation of therapy with certain other immunosuppressive biologic response modifiers (e.g., colony-stimulating factors, interleukins, tumor necrosis factor [TNF; TNF-α] blocking agents).[105,134] Some experts state that, if an inactivated vaccine is indicated in a patient with a chronic inflammatory illness who is receiving maintenance therapy with a biologic response modifier, the vaccine should not be withheld because of concern about exacerbation of the inflammatory illness.[105,135]

Corticosteroids given in greater than physiologic doses may reduce immune responses to vaccines.[134] ACIP and the American Academy of Pediatrics (AAP) state that inactivated vaccines preferably should be administered at least 2 weeks prior to initiation of corticosteroid therapy that is considered immunosuppressive;[105,134] however, if this is not feasible in patients receiving long-term corticosteroid therapy for inflammatory or autoimmune diseases, inactivated vaccines can be administered during such therapy.[105]

■ Vaccines

Limited data are available to date to evaluate the concomitant use of HPV vaccine with other vaccines.[1,201] Although specific studies may not be available evaluating concurrent administration with each antigen, simultaneous administration with other age-appropriate vaccines, including live virus vaccines, toxoids, or inactivated or recombinant vaccines, during the same health-care visit is not expected to affect immunologic responses or adverse reactions to any of the preparations.[105,134] However, each parenteral vaccine should be administered using separate syringes and different injection sites.[105,134]

Diphtheria and Tetanus Toxoids and Pertussis Vaccine

HPV vaccine may be administered concurrently with tetanus toxoid and reduced diphtheria toxoid and acellular pertussis vaccine adsorbed (Tdap) using different syringes and different injection sites.[1,134,199]

Tdap (Adacel®) was administered concurrently with 9vHPV and meningococcal (groups A, C, Y, and W-135) polysaccharide diphtheria toxoid conjugate vaccine (MenACWY-D; Menactra®) in a randomized study in 1237 boys and girls 11–15 years of age.[1] These adolescents received 9vHPV in one limb concurrently with Tdap (Adacel®) and MenACWY-D (Menactra®) given at different sites in the opposite limb or received 9vHPV followed 1 month later by Tdap (Adacel®) and MenACWY-D (Menactra®) given concurrently at different sites.[1] Although overall rates of adverse reactions at the injection sites in those who received all 3 vaccines on the same day (at separate sites) were similar to the overall rates reported when 9vHPV was given 1 month before the other 2 vaccines, an increased rate of swelling at the HPV vaccine injection site occurred when all 3 vaccines were administered concurrently compared with administration of HPV vaccine alone.[1] Concurrent administration of all 3 vaccines did not interfere with antibody responses to HPV vaccine or the other vaccines compared with administration 1 month apart.[1]

Hepatitis B Vaccine

HPV vaccine (4vHPV; no longer available in the US) has been administered concurrently with hepatitis B vaccine (Recombivax HB®) at a different site in women 16–23 years of age without a decrease in antibody response to either vaccine or a clinically important increase in adverse effects compared with administration during separate visits.[25] Hepatitis B vaccine (Recombivax HB®) may be administered currently with HPV vaccine using different syringes and different injection sites.[25,134]

Meningococcal Vaccines

Meningococcal Groups A, C, Y, and W-135 Vaccine

MenACWY-D (Menactra®) has been administered concurrently with Tdap (Adacel®) and either 9vHPV or 4vHPV (no longer available in the US) in randomized studies in adolescent boys and girls 11–15 years of age.[1,233] Concurrent administration of the 3 vaccines at different injection sites did not interfere with the antibody response to any of the vaccine antigens.[1,233] Although the overall incidence of adverse reactions in those who received all 3 vaccines concurrently at different sites was similar to that reported when 9vHPV or 4vHPV was given alone followed by MenACWY-D (Menactra®) and Tdap (Adacel®) 1 month later, concurrent administration was associated with an increased incidence of swelling at the HPV vaccine injection sites compared with administration of the HPV vaccine alone.[1,233]

HPV vaccine may be administered concurrently with meningococcal (groups A, C, Y and W-135) polysaccharide diphtheria toxoid conjugate vaccine (MenACWY-D; Menactra®) using different syringes and different injection sites.[1,134,199]

Meningococcal Group B Vaccine

Meningococcal group B vaccine (MenB-FHbp; Trumenba®) has been administered concurrently with 4vHPV (no longer available in the US) in adolescents 11 to less than 18 years of age without a decrease in antibody response to the meningococcal serogroup B antigens and without a decrease in antibody response to 3 of the 4 HPV antigens (i.e., HPV types 6, 11, 16);[209,210,211] at 1 month after the third dose of 4vHPV, the antibody response to HPV type 18 was decreased,[209,210,211] but at least 99% of vaccinees achieved seroconversion for all 4 HPV antigens.[210,211]

Description

Human papillomavirus (HPV) vaccine is an inactivated (recombinant) virus vaccine containing virus-like particles (VLPs) of the major capsid (L1) proteins of certain HPV types associated with anogenital infections.[1] Some HPV types are classified as high-risk (oncogenic) types and can cause low-grade cervical cell abnormalities or high-grade cervical cell abnormalities that are precursors to cancer;[105,166,201] other HPV types are classified as low-risk types and can cause genital warts, benign or low-grade cervical cell changes, and recurrent respiratory papillomatosis.[105,166,201] HPV vaccine is used to stimulate active immunity to the HPV types represented in the vaccine.[1,4,5,12,14,166,201,202] VLPs contained in HPV vaccine are produced using recombinant DNA technology[1,4,5,12,14,166] and are structurally indiscernible from native HPV virions; the VLPs are noninfectious because they do not contain DNA.[4,5,12,14]

HPV vaccine is commercially available in the US as a 9-valent vaccine (9vHPV) that contains the purified VLPs of the L1 proteins of 9 HPV types (types 6, 11, 16, 18, 31, 33, 45, 52, and 58).[1] The type-specific L1 proteins are prepared by separate fermentations in recombinant *S. cerevisiae* and self-assemble into VLPs.[1] The VLPs are released from the yeast cells by cell disruption; purified by a series of chemical and physical methods; and adsorbed onto preformed aluminum-containing adjuvant (amorphous aluminum hydroxyphosphate sulfate).[1] In addition to the 9 HPV type-specific VLPs, each 0.5 mL dose of 9vHPV contains approximately 500 mcg of aluminum (provided as amorphous aluminum hydroxyphosphate sulfate), 9.56 mg of sodium chloride, 0.78 mg of L-histidine, 50 mcg of polysorbate 80, 35 mcg of sodium borate, less than 7 mcg of yeast protein, and water for injection.[1]

Administration of a 3-dose vaccination series of 9vHPV can prevent disease caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58, including genital warts caused by HPV types 6 and 11; cervical, vulvar, vaginal, and anal cancer caused by HPV types 16, 18, 31, 33, 45, 52, and 58; and precancerous anal and genital lesions caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58.[1,202,204] Data indicate that at least 99.5% of all female and male vaccine recipients 9–26 years of age develop antibodies to HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 by 1 month following the third dose of 9vHPV.[1,202] The immune response to a 2-dose regimen of 9vHPV administered to females and males 9–14 years of age is noninferior to that reported with a 3-dose regimen of 9vHPV administered to females 16–26 years of age.[1,207,208] The minimum titer of anti-HPV antibody that provides protection against disease caused by HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 and the duration of immunity following vaccination with 9vHPV have not been established to date.[1] HPV vaccines appear to provide long-term protection against HPV infection and the diseases it can cause.[360] Studies on the bivalent and quadrivalent vaccines have tracked vaccinated individuals for over 10 years, showing no decline in protection over time.[360] Ongoing studies continue to monitor how long the protection from HPV vaccination lasts.[360]

Advice to Patients

The following information contains important points for the clinician to discuss with patients during counseling. For more comprehensive monographs suitable for distribution to the patient, please refer to the *AHFS Patient Medication Information* monographs available from MedlinePlus (in English and Spanish; written at a 6th- to 8th-grade reading level).

- Prior to administration of each 9vHPV vaccine dose, provide a copy of the manufacturer's patient information to the patient and/or patient's parent or guardian.[1], Also provide a copy of the appropriate Centers for Disease Control and Prevention (CDC) Vaccine Information Statement (VIS) to the patient or patient's legal representative (VISs are available at [Web]).[1,59],
- Advise the patient and/or patient's parent or legal guardian of the risks and benefits of vaccination with human papillomavirus (HPV) vaccine.[1],
- Advise the patient and/or patient's parent or guardian that vaccination with HPV vaccine does not provide protection against disease from vaccine and nonvaccine HPV types that an individual has previously been exposed to through sexual activity.[1],
- Advise the patient and/or patient's parent or legal guardian that vaccination with HPV vaccine is not a substitute for routine cervical cancer screening.[1], Vaccine recipients should continue to receive routine cervical cancer screening according to current guidelines for such testing.[1,105,201,202],
- Advise vaccine recipients not to discontinue anal cancer screening that has been recommended by a health-care provider.[1],
- Advise vaccine recipients to continue to practice behaviors that limit the risk of exposure to HPV (e.g., sexual abstinence, monogamy, limited number of sexual partners, use of condoms).[19,201],
- Advise patients about the importance of completing the vaccination series of HPV vaccine, unless contraindicated.[1],
- Advise the patient and/or patient's parent or guardian that fainting, sometimes resulting in falling with injury, has been reported following vaccination with HPV vaccine and that the patient should be observed for 15 minutes after the dose.[1],
- Advise patients to inform their clinician if a hypersensitivity reaction (difficulty breathing, wheezing, hives, rash, swollen glands [neck, armpit, or groin], joint pain, weakness, chest pain) occurs following a vaccine dose.[1], Clinicians or individuals can report any adverse reactions that occur following vaccination to the Vaccine Adverse Event Reporting System (VAERS) at 800-822-7967 or [Web] .[1],
- Advise patients to inform their clinician if they are or plan to become pregnant or plan to breast-feed.[1],
- Advise patients to inform their clinician of existing or contemplated concomitant therapy, including prescription and OTC drugs and dietary and herbal supplements, as well as any concomitant illnesses.[1],
- Advise patients of other important precautionary information.[1],

Additional Information

The American Society of Health-System Pharmacists, Inc. represents that the information provided in the accompanying monograph was formulated with a reasonable standard of care, and in conformity with professional standards in the field. Readers are advised that decisions regarding use of drugs are complex medical decisions requiring the independent, informed decision of an appropriate health care professional, and that the information contained in the monograph is provided for informational purposes only. The manufacturer's labeling should be consulted for more detailed information. The American Society of Health-System Pharmacists, Inc. does not endorse or recommend the use of any drug. The information contained in the monograph is not a substitute for medical care.

Preparations

Excipients in commercially available drug preparations may have clinically important effects in some individuals; consult specific product labeling for details.

Human Papillomavirus 9-valent (Types 6, 11, 16, 18, 31, 33, 45, 52, 58) Vaccine, Recombinant

ROUTES	FORMS	STRENGTHS	BRAND NAMES	MANUFACTURER
Parenteral	*Injectable suspension, for IM use*	*30 mcg of HPV type 6 L1, 40 mcg of HPV type 11 L1, 60 mcg of HPV type 16 L1, 40 mcg of HPV type 18 L1, 20 mcg of HPV type 31 L1, 20 mcg of HPV type 33 L1, 20 mcg of HPV type 45 L1, 20 mcg of HPV type 52 L1, and 20 mcg of HPV type 58 L1 protein per 0.5 mL*	*Gardasil 9®*	*Merck*

† Use is not currently included in the labeling approved by the US Food and Drug Administration.

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ABOUT ASHP

ASHP is the national professional organization whose more than 43,000 members include pharmacists, student pharmacists, and pharmacy technicians who serve as patient care providers on healthcare teams in acute and ambulatory settings.

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