Human Papillomavirus and HPV Vaccines

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Human Papillomavirus (HPV) Disease

- Most common sexually transmitted infection in the U.S.
- Small DNA virus
- More than 150 types
- First vaccine was licensed in 2006
Human Papillomavirus Type and Disease Association

Mucosal (~40 types)

“High-risk” Types
16, 18, others

“Low-risk” Types
6, 11, others

Cutaneous (other types)
“Common” Warts (hands/feet)

- Low grade cervical abnormalities
- High grade abnormalities/
- Cancer precursors
- anogenital cancers

- Low grade cervical abnormalities
- Genital warts
- Respiratory papillomas
Natural History of HPV Infection

Within 1 Year
- Initial HPV Infection
- Persistent Infection
- CIN* 1
- Cleared HPV Infection

1-5 Years
- CIN* 2/3

Up to Decades
- Cervical Cancer

*CIN = cervical intraepithelial neoplasia
HPV Clinical Features

- Most HPV infections are asymptomatic and result in no clinical disease

- Clinical manifestations of HPV infection include:
  - Anogenital warts
  - Recurrent respiratory papillomatosis
  - Cervical cancer precursors (cervical intraepithelial neoplasia)
  - Cancer (cervical, anal, vaginal, vulvar, penile, and some oropharyngeal cancers)
<table>
<thead>
<tr>
<th>Cancer site</th>
<th>Average number of cancers per year probably caused by HPV&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Percentage per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Anus</td>
<td>1,600</td>
<td>3,000</td>
</tr>
<tr>
<td>Cervix</td>
<td>0</td>
<td>10,700</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>9,100</td>
<td>2,000</td>
</tr>
<tr>
<td>Penis</td>
<td>700</td>
<td>0</td>
</tr>
<tr>
<td>Vagina</td>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td>Vulva</td>
<td>0</td>
<td>2,400</td>
</tr>
<tr>
<td>TOTAL</td>
<td>11,400</td>
<td>18,700</td>
</tr>
</tbody>
</table>

<sup>1</sup>HPV types detected in genotyping study; most were high-risk HPV types known to cause cancer (Saraiya M et al. US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. Journal of the National Cancer Institute 2015;107:dv086).

CDC, United States Cancer Statistics (USCS), [www.cdc.gov/cancer/hpv/statistics/cases.htm](http://www.cdc.gov/cancer/hpv/statistics/cases.htm)
HPV Epidemiology

- **Reservoir**: Human
- **Transmission**: Direct contact (usually sexual)
- **Temporal pattern**: None
- **Communicability**: Presumed to be high
Cumulative Incidence of any HPV Infection Months after Sexual Initiation

Am J Epidemiol 2003;157(3):218-26
HPV Disease Burden in the U.S.

- Estimated 79 million persons are infected
  - ~ 14 million new infections annually
- Common among adolescents and young adults
  - 50% of new infections occur in persons 15–24 years of age
- About $8 billion spent annually on management of sequelae of HPV infections
Cervical Cancer Screening

- Revised in 2012
- Screening should begin at age 21 years
- Screen women 21 to 65 years of age with Pap test every 3 years
- Co-testing (Pap and HPV testing) every 5 years in women 30 to 65 years of age
Correct and consistent condom use may have a protective effect on HPV acquisition, reduce the risk for HPV-associated diseases, and mitigate the adverse consequences of infection with HPV.
Human Papillomavirus Vaccine

- HPV L1 major capsid protein of the virus is antigen used for immunization
- L1 protein produced using recombinant DNA technology
- L1 proteins self-assemble into virus-like particles
- VLPs are noninfectious and nononcogenic
### Human Papillomavirus Vaccine

<table>
<thead>
<tr>
<th>HPV Vaccine Products</th>
<th>Bivalent 2vHPV (Cervarix)</th>
<th>Quadrivalent 4vHPV (Gardasil)</th>
<th>9-Valent 9vHPV (Gardasil 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 VLP Types</td>
<td>16, 18</td>
<td>6, 11, 16, 18</td>
<td>6, 11, 16, 18, 31, 33, 45, 52, 58</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>GSK</td>
<td>Merck</td>
<td>Merck</td>
</tr>
<tr>
<td>FDA Indications</td>
<td><strong>Females (9-26 yrs.):</strong> Cervical precancer and cancer</td>
<td><strong>Females (9-26 yrs.):</strong> Anal, cervical, vaginal, and vulvar precancer and cancer; genital warts</td>
<td><strong>Females (9-26 yrs.):</strong> Anal, cervical, vaginal, and vulvar precancer and cancer; genital warts</td>
</tr>
<tr>
<td></td>
<td><strong>Males:</strong> Not approved for use in males</td>
<td><strong>Males (9-26 yrs.):</strong> Anal precancer and cancer; genital warts</td>
<td><strong>Males (9-26 yrs.):</strong> Anal precancer and cancer; genital warts</td>
</tr>
</tbody>
</table>
Human Papillomavirus Vaccine Efficacy

- High efficacy among females without evidence of infection with vaccine HPV types (≥95%)
- No evidence of efficacy against disease caused by vaccine types participants were infected with at the time of vaccination
- Prior infection with one HPV type did not diminish efficacy of the vaccine against other vaccine HPV types
9vHPV (Gardasil9)

- Licensed by the FDA for persons, males and females 9-26 years of age
- Trials conducted with 3-dose schedule
- Targets 5 additional high-risk types:
  - 6, 11, 16, 18, 31, 33, 45, 52, 58
9vHPV (Gardasil 9) Efficacy and Safety

- **Efficacy**
  - ~97% protection against 31-,33-,45-,52-,58-related outcomes
  - Similar protection against 6-,11-,16-,18-related disease

- **Non-inferior immunogenicity to 4vHPV**

- **Five additional types account for 11% of invasive cancers**
  - Differences by gender: 14% for females; 5% for males

- **9vHPV can be administered at the same medical visit with MenACWY and Tdap**

- **Safety profile similar to 4vHPV across age, gender, race, ethnicity groups**
Human Papillomavirus Vaccine
Duration of Immunity

- The duration of immunity after a complete 3-dose schedule is not known
  - Available evidence indicates protection for at least 8 years for 4vHPV and at least 9 years for 2vHPV
  - Multiple cohort studies are in progress to monitor the duration of immunity
Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – United States, 2016.

(For those who fall behind or start late, see the catch-up schedule [Figure 2]).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16-18 yrs</th>
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</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
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<tr>
<td>Rotavirus (RV) RV1 (2-dose series); RV3 (3-dose series)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP; &lt;7 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
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<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<td>3rd or 4th dose; See footnote 2</td>
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<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<tr>
<td>Inactivated poliovirus (IPV; &lt;18 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<td>3rd dose</td>
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<td>4th dose</td>
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<tr>
<td>Influenza (IIV, LAIV)</td>
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<td>Annual vaccination (IIV only) 1 or 2 doses</td>
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<td></td>
<td></td>
<td>Annual vaccination (LAIV or IIV) 1 or 2 doses</td>
<td></td>
<td>Annual vaccination (LAIV or IIV) 1 dose only</td>
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<tr>
<td>Measles, mumps, rubella (MMR)</td>
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<td>See footnote 8</td>
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<tr>
<td>Varicella (VAR)</td>
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<td>1st dose</td>
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<td>2nd dose</td>
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<tr>
<td>Hepatitis A (HepA)</td>
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<td>2-dose series; See footnote 10</td>
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<tr>
<td>Meningococcal (11) (Hib-MenCY ≥ 6 weeks; MenACWY-D ≥ 9 mos; MenACWY-CRM ≥ 2 mos)</td>
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<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap; ≥7 yrs)</td>
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<td>2nd dose</td>
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<tr>
<td>Human papillomavirus (2;HPV: females only; 4;HPV, 9;HPV: males and females)</td>
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<tr>
<td>Meningococcal (5)</td>
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<td>3-dose series</td>
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<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
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</tbody>
</table>

This schedule includes recommendations in effect as of January 1, 2016. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at [http://www.cdc.gov/vaccines/hcp/acip-recs/index.html](http://www.cdc.gov/vaccines/hcp/acip-recs/index.html). Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online ([http://www.vaers.hhs.gov](http://www.vaers.hhs.gov)) or by telephone (800-822-7967). Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online ([http://www.cdc.gov/vaccines/recs/vac-admin/contraindications.htm](http://www.cdc.gov/vaccines/recs/vac-admin/contraindications.htm)) or by telephone (800-CDC-INFO [800-232-4636]).

This schedule is approved by the Advisory Committee on Immunization Practices ([http://www.cdc.gov/vaccines/acip](http://www.cdc.gov/vaccines/acip)), the American Academy of Pediatrics ([http://www.aap.org](http://www.aap.org)), the American Academy of Family Physicians ([http://www.aafp.org](http://www.aafp.org)), and the American College of Obstetricians and Gynecologists ([http://www.acog.org](http://www.acog.org)).

NOTE: The above recommendations must be read along with the footnotes of this schedule.
### Figure 1. Recommended immunization schedule for adults aged 19 years or older, by vaccine and age group

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>19-21 years</th>
<th>22-26 years</th>
<th>27-49 years</th>
<th>50-59 years</th>
<th>60-64 years</th>
<th>≥ 65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza*</td>
<td>1 dose annually</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)*</td>
<td></td>
<td></td>
<td></td>
<td>Substitute Tdap for Td once, then Td booster every 10 yrs</td>
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</tr>
<tr>
<td>Varicella*</td>
<td>2 doses</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female*</td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Human papillomavirus (HPV) Male*</td>
<td>3 doses</td>
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<td></td>
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<td></td>
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<tr>
<td>Zoster*</td>
<td>1 dose</td>
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<tr>
<td>Measles, mumps, rubella (MMR)*</td>
<td>1 or 2 doses depending on indication</td>
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<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)*</td>
<td>1 dose</td>
<td></td>
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<tr>
<td>Pneumococcal 23-valent polysaccharide (PPSV23)</td>
<td>1 dose</td>
<td></td>
<td></td>
<td>1 or 2 doses depending on indication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A*</td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
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<tr>
<td>Hepatitis B*</td>
<td>3 doses</td>
<td></td>
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</tr>
<tr>
<td>Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV)*</td>
<td>1 or more doses depending on indication</td>
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<tr>
<td>Meningococcal B (MenB)*</td>
<td>2 or 3 doses depending on vaccine</td>
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<tr>
<td>Haemophilus influenzae type b (Hib)*</td>
<td>1 or 3 doses depending on indication</td>
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</tr>
</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

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Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at [www.vaers.hhs.gov](http://www.vaers.hhs.gov) or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at [www.hrsa.gov/vaccinecompensation](http://www.hrsa.gov/vaccinecompensation) or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at [www.cdc.gov/vaccines](http://www.cdc.gov/vaccines) or from the CDC-INFo Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m. - 8:00 p.m. Eastern Time, Monday - Friday, excluding holidays.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the America College of Physicians (ACP), the American College of Obstetricians and Gynecologists (ACOG) and the American College of Nurse-Midwives (ACNM).
<table>
<thead>
<tr>
<th>VACCINE</th>
<th>INDICATION</th>
<th>Pregnancy</th>
<th>Immuno-compromising conditions (excluding HIV infection)</th>
<th>HIV infection CD4+ count (cells/μL)</th>
<th>Men who have sex with men (MSM)</th>
<th>Kidney failure, end-stage renal disease, on hemodialysis</th>
<th>Heart disease, chronic lung disease, chronic alcoholism</th>
<th>Asplenia and persistent complement component deficiencies</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Healthcare personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza*</td>
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</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)*</td>
<td>1 dose Tdap each pregnancy</td>
<td></td>
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<tr>
<td>Varicella*</td>
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<td>Contraindicated</td>
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<tr>
<td>Human papillomavirus (HPV) Female*</td>
<td></td>
<td></td>
<td>1 dose annually</td>
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<tr>
<td>Human papillomavirus (HPV) Male*</td>
<td></td>
<td></td>
<td>1 dose annually</td>
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<td>Zoster*</td>
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<tr>
<td>Measles, mumps, rubella (MMR)*</td>
<td></td>
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<td>Contraindicated</td>
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<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)*</td>
<td></td>
<td></td>
<td>1 dose annually</td>
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<tr>
<td>Pneumococcal polysaccharide (PPSV23)*</td>
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<td></td>
<td>1, 2, or 3 doses depending on indication</td>
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<tr>
<td>Hepatitis A*</td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Hepatitis B*</td>
<td></td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Meningococcal 4-valent conjugate (MenACWY) or polysaccharide (MPSV4)*</td>
<td></td>
<td></td>
<td>1 or more doses depending on indication</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Meningococcal B (MenB)*</td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b (Hib)*</td>
<td></td>
<td></td>
<td>3 doses post-HSCT recipients only</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*Covered by the Vaccine Injury Compensation Program

Recommended for all persons who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection; zoster vaccine is recommended regardless of past episode of zoster

Recommended for persons with a risk factor (medical, occupational, lifestyle, or other indication)

No recommendation

Contraindicated

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly recommended for adults aged ≥ 19 years, as of February 2016. For all vaccines being recommended on the Adult Immunization Schedule, a vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine’s other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers’ package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/hcp/acip-recs/index.html). Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.
Human Papillomavirus Vaccine
ACIP Recommendations

- Vaccinate males and females at 11-12 years*
- Catch up those previously unvaccinated or missing doses:
  - Females age 13 through 26 years
  - Males age 13 through 21 years
  - High-risk males age 21 through 26 years
    - Men who have sex with men and immunocompromised men (including HIV-infected persons)

- Use:
  - 2vHPV, 4vHPV, or 9vHPV for females
  - 4vHPV or 9vHPV for males

*Vaccination series can be started at 9 years of age
Human Papillomavirus Vaccine
ACIP Recommendations

- Routine 3-dose schedule*: 0, 1-2, 6 months
  - Dose #2: Administer at least 1 to 2 months after dose 1
  - Dose #3: Administer at least:
    - 12 weeks after dose 2 AND
    - 6 months (24 weeks) after dose 1

- An accelerated schedule using minimum intervals is not recommended

*ACIP off-label recommendation  MMWR 2015;64(29):300-4
Human Papillomavirus Vaccine
ACIP Recommendations

- There is NO maximum interval between HPV vaccine doses
- Series does not need to be restarted if the schedule is interrupted
- Prevaccination assessments not recommended
- No therapeutic effect on HPV infection, genital warts, cervical lesions
No data on schedules that include 2vHPV and 4vHPV and/or 9vHPV

Response to types 16 and 18 likely to be similar when 2vHPV, 4vHPV, or 9vHPV used in the same series

Protection against types other than 16 and 18 is probably reduced if fewer than 3 doses of 4vHPV or 9vHPV received

Use same vaccine for all 3 doses whenever possible
ACIP Recommendations and HPV Vaccine Product Interchangeability*

- If immunization providers do not know or do not have available the HPV vaccine product previously administered or are in settings transitioning to 9vHPV for protection against HPV 16 and 18:
  - **Females:** Any HPV vaccine product may be used to continue or complete the series
  - **Males:** 4vHPV or 9vHPV* may be used to continue or complete the series

*ACIP off-label recommendation MMWR 2015;64(29):300-4
What is the cost effectiveness of 3 additional doses of 9-valent HPV vaccine for persons who already have received a complete 3-dose HPV vaccination series?

- The estimated cost per quality-adjusted life years for females aged 13-18 years who have received 3 doses of 9-valent HPV vaccine.
- The potential benefit of HPV vaccination would be greater for males of any age.
- In contrast, models have shown that there may be limited additional benefit of the 9-valent HPV vaccine for persons who had previously completed a 3-dose series.

Information for persons who previously received the 9-valent HPV vaccine

- If a series was started with quadrivalent HPV vaccine or bivalent HPV vaccine and will be completed with 9-valent HPV vaccine, what are the intervals for the remaining doses in the 3-dose series?
- If a series was started with quadrivalent HPV vaccine or bivalent HPV vaccine, the current recommended HPV vaccination schedule involves completing the series with 9-valent HPV vaccine within 2 months after the third dose.
- If a series was started with 4-valent HPV vaccine or 2-valent HPV vaccine, the current recommended HPV vaccination schedule involves completing the series with 9-valent HPV vaccine within 2 months after the third dose.

Supplemental information and guidance for vaccination providers regarding use of 9-valent HPV vaccine

A 9-valent human papillomavirus (HPV) vaccine (Gardasil 9, Merck & Co., Inc) is licensed for use in females and males in the United States in December 2014, 2015. 9-valent HPV vaccine is the third HPV vaccine licensed by the Food and Drug Administration (FDA); the other vaccines are bivalent HPV vaccine, licensed for use in females, and quadrivalent HPV vaccine, licensed for use in females and males. In February 2015, the Advisory Committee on Immunization Practices (ACIP) recommended 9-valent HPV vaccine as one of 3 HPV vaccines that can be used for routine vaccination of females and males. A Policy Note was published in the MMWR in March 2015. The information below summarizes some of the recommendations included in the Policy Note and provides additional guidance for issues that were not addressed in the Policy Note but are likely to arise during the transition from quadrivalent HPV vaccine to 9-valent HPV vaccine.

Information about the vaccines

- What are some of the similarities and differences in the characteristics of the three licensed HPV vaccines?
- Each of the three currently licensed HPV vaccines is a noninfectious, virus-like particle (VLP) vaccine.
- Bivalent, quadrivalent and 9-valent HPV vaccines each target HPV 16 and 18, types that cause about 66% of cervical cancers and the majority of other HPV-associated cancers in both women and men in the United States.
- 9-valent HPV vaccine also targets five additional cancer causing types (HPV 31, 33, 45, 52, 58) which account for about 15% of cervical cancers. Quadrivalent and 9-valent HPV vaccines also protect against HPV 6 and 11, types that cause anogenital warts.
- Quadrivalent and 9-valent HPV vaccines are licensed for use in females and males; bivalent HPV vaccine is licensed for use in females.
- What percent of HPV-associated cancers in females and males are caused by the 5 additional types in the 9-valent HPV vaccine?
- About 14% of HPV-associated cancers in females (approximately 2800 cases annually) and 4% of HPV-associated cancers in males (approximately 550 cases annually) are caused by the 5 additional types in the 9-valent HPV vaccine.

Information for persons who started an HPV vaccination series with quadrivalent or bivalent HPV vaccine

If a series was started with quadrivalent HPV vaccine or bivalent HPV vaccine, can it be completed with 9-valent HPV vaccine?
- Yes, ACIP recommendations state that 9-valent HPV vaccine may be used to continue or complete a series started with a different HPV vaccine product.

Are additional 9-valent HPV vaccine doses recommended for a person who started a series with quadrivalent or bivalent HPV vaccine and completed the series with one or two doses of 9-valent HPV vaccine?
- Yes, these individuals should be vaccinated with a single additional dose of quadrivalent or bivalent HPV vaccine.
- There is no ACIP recommendation for additional 9-valent HPV vaccine doses for persons who started the series with quadrivalent or bivalent HPV vaccine and completed the series with 9-valent HPV vaccine.

Human Papillomavirus Vaccine
Special Situations

- Administer vaccine to:
  - Females who:
    - Have equivocal or abnormal Pap test
    - Have positive HPV DNA test
    - Are breastfeeding
  - Males and females who
    - Have genital warts
    - Are immunosuppressed

MMWR 2014;63(No. 5):1-30
MMWR 2015;64(29):300-4
Initiation of the vaccine series should be delayed until after completion of pregnancy.

If a woman is found to be pregnant after initiating the vaccination series, remaining doses should be delayed until after the pregnancy.

If a vaccine dose has been administered during pregnancy, there is no indication for intervention.

Women vaccinated during pregnancy should be reported to the respective manufacturer.
- Active pregnancy registry for 9vHPV established; others closed.
- Telephone numbers are in the package inserts.

MMWR 2014;63(No. 5):1-30 and MMWR 2015;64(29):300-4
Human Papillomavirus Vaccine
Contraindications and Precautions

- **Contraindication**
  - Severe allergic reaction to a vaccine component or following a prior dose
    - 2vHPV (Cervarix) prefilled syringe contains latex

- **Precaution**
  - Moderate or severe acute illnesses (defer until symptoms improve)
## Adverse Events Following Any Dose of HPV Vaccine Among Females*

<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>2vHPV</th>
<th>4vHPV</th>
<th>9vHPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>92%</td>
<td>84%</td>
<td>89%</td>
</tr>
<tr>
<td>Swelling</td>
<td>44%</td>
<td>29%</td>
<td>40%</td>
</tr>
<tr>
<td>Erythema</td>
<td>48%</td>
<td>25%</td>
<td>34%</td>
</tr>
<tr>
<td>Fever</td>
<td>13%</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>Nausea</td>
<td>7%</td>
<td>GI 28%**</td>
<td>4%</td>
</tr>
<tr>
<td>Headache</td>
<td>12%</td>
<td>55%</td>
<td>11%</td>
</tr>
</tbody>
</table>

*FDA product approval data

**GI = Gastrointestinal symptoms, including nausea, vomiting, diarrhea, and/or abdominal pain
# HPV Immunization Rates

**Females 13-17 Years of Age, 2015**

*Percentages ≥1 human papillomavirus vaccine, either HPV4 or HPV2

**≥3 doses of HPV vaccine, including 9vHPV, 4vHPV or 2vHPV. Some adolescents might have received more than the 3 recommended HPV vaccine doses*

*MMWR 2016; 65 (No. 33): 850-58*

<table>
<thead>
<tr>
<th>HPV Vaccine</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Females</td>
</tr>
<tr>
<td>1 or more doses*</td>
<td>62.8%</td>
</tr>
<tr>
<td>3 or more doses**</td>
<td>41.9%</td>
</tr>
</tbody>
</table>

*Percentages ≥1 human papillomavirus vaccine, either HPV4 or HPV2

**≥3 doses of HPV vaccine, including 9vHPV, 4vHPV or 2vHPV. Some adolescents might have received more than the 3 recommended HPV vaccine doses*
Impact of Eliminating Missed Opportunities by Age 13 Years in Girls Born in 2000

Missed opportunity: Healthcare encounter when some, but not all ACIP-recommended vaccines are given. HPV-1: Receipt of at least one dose of HPV. MMWR. 63(29);620-624.
HPV Vaccine Communications During the Healthcare Encounter

- HPV vaccine is often presented as optional, whereas other adolescent vaccines are recommended.

- Some expressed mixed or negative opinions about relatively new vaccines and concerns over safety and efficacy.

- When parents express reluctance, providers are hesitant to engage in discussion.

- Some providers share parents’ views that teen is not at risk for HPV and vaccination can be delayed until older.

Reasons Parents Won’t Initiate HPV Vaccination for Children

- Not sexually active
- Not recommended
- Safety concern/Side effects
- Not needed or necessary
- Lack of knowledge

*MWRR 2014; 63(29);625-633*
Strategies for Increasing HPV Vaccination Rates in Clinical Practices

- **Recommend HPV vaccine!**
  - Include HPV vaccine when discussing other recommended vaccines

- **Integrate standard procedures supporting vaccination**
  - Assess for needed vaccines at every clinical encounter.
  - Immunize at every opportunity
  - Use standing orders

- **Reminder and recall**

- **Tools for improving uptake of HPV at**
  [www.cdc.gov/vaccines/teens](http://www.cdc.gov/vaccines/teens)
HPV Vaccination Resources for HCP

Preteen and Teen Vaccines

HPV Vaccine Resources for Healthcare Professionals

HPV Vaccine is Cancer Prevention

Overview

- HPV is so common that almost everyone will be infected with HPV at some point in their lives, however most people will never know they have been infected.
- HPV can occur with any type of intimate sexual contact.
- In the U.S., HPV causes about 17,000 cancers in women, and about 9,000 cancers in men each year.

Low HPV vaccination rates are leaving another generation of individuals susceptible to HPV-related cancers.

Tips and Time-savers for Talking with Parents about HPV Vaccine

- The HPV vaccine is a cancer prevention message that resonates strongly with parents. In addition, studies show that a strong recommendation from you is the single best predictor of vaccination.
- Parents may be interested in vaccinating, yet still have questions. Taking the time to listen to parents' questions helps you save time and give an effective response. CDC research shows that straightforward messages work with parents when discussing HPV vaccine—and are easy for you or staff to deliver.

www.cdc.gov/vaccines/YouAreTheKey
Human Papillomavirus Vaccine

Storage and Handling

- Store between 2° – 8° C (36°F – 46°F) in the refrigerator
- Protect from light

2vHPV
4vHPV
9vHPV
Human Papillomavirus Vaccine Administration

- Administer HPV vaccines via intramuscular (IM) injection
  - Needle size: 1 - 1½ inch, 23- to 25 gauge
  - Site: Deltoid muscle in the upper arm
- Follow proper injection practices
  - Use aseptic technique
  - Use a new needle and syringe for each injection
- Administer at the same medical visit as other vaccines
An increase in the number of reports of syncope has been detected by the Vaccine Adverse Event Reporting System (VAERS)

- Most of the increase among females 11-18 years

Serious injuries have resulted

ACIP recommends providers strongly consider observing patients for 15 minutes after they are vaccinated
Human Papillomavirus Vaccine Resources


- Includes information for
  - Health care providers on
    - Disease and treatment
    - Vaccine administration, storage and handling
  - Parents and patients on
    - Disease
    - Vaccine safety
  - Partners and programs
    - Print, matte articles, online, video and audio resources