EpiVac Pink Book Web-on-Demand Series

HPV–2020

Immunization Services Division
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Atlanta, GA

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Learning Objectives

- For each vaccine-preventable disease, identify those for whom routine immunization is recommended.
- For each vaccine-preventable disease, describe characteristics of the vaccine used to prevent the disease.
- Describe an emerging immunization issue.
- Locate current immunization resources to increase knowledge of team’s role in program implementation for improved team performance.
- Implement disease detection and prevention health care services (e.g., smoking cessation, weight reduction, diabetes screening, blood pressure screening, immunization services) to prevent health problems and maintain health.
Today’s Agenda

EpiVac Pink Book Web-on-Demand Series: HPV–2020

Andrew Kroger, MD, MPH, Medical Officer, CDC/NCIRD
Continuing Education Information

- CE credit, go to: www.cdc.gov/GetCE
- Search course number: WD4344-092320
- CE credit expires: July 1, 2022
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Human Papillomavirus and Human Papillomavirus Vaccine

Pink Book Web-on-Demand Series 2020

Andrew Kroger, MD, MPH
Medical Officer/Medical Health Educator
Disease
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-grade cervical abnormalities
    - High-grade abnormalities
    - Cancer precursors
    - Anogenital cancers
  - “Low-Risk” Types (6, 11, others)
    - Low-grade cervical abnormalities
    - Genital warts
    - Respiratory papillomas

- Cutaneous (other types) “Common” Warts (hands/feet)
Natural History of HPV Infection

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

1-5 Years
- Persistent Infection
- CIN* 2/3

Up to Decades
- CIN* 2/3
- Cervical Cancer

*CIN = cervical intraepithelial neoplasia
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 1. Average annual number and rate of human papillomavirus (HPV)–associated cancers and estimated percentage and annual number of cancers attributable to HPV, by HPV type, cancer type, and sex — United States,* 2012–2016

<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Reported HPV-associated cancers†</th>
<th>Estimated no. (% of cancers attributable to HPV types†)</th>
<th>9vHPV-targeted</th>
<th>Other HPV</th>
<th>HPV-negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total no.**</td>
<td>Rate**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervix</td>
<td>12,015</td>
<td>7.2</td>
<td>9,700 (81)</td>
<td>1,200 (10)</td>
<td>1,100 (9)</td>
</tr>
<tr>
<td>Vagina</td>
<td>862</td>
<td>0.4</td>
<td>600 (73)</td>
<td>0 (2)</td>
<td>300 (25)</td>
</tr>
<tr>
<td>Vulva</td>
<td>4,009</td>
<td>2.1</td>
<td>2,500 (63)</td>
<td>300 (6)</td>
<td>1,200 (31)</td>
</tr>
<tr>
<td>Penis</td>
<td>1,303</td>
<td>0.8</td>
<td>700 (57)</td>
<td>100 (6)</td>
<td>500 (37)</td>
</tr>
<tr>
<td>Anus</td>
<td>6,810</td>
<td>1.8</td>
<td>6,000 (88)</td>
<td>200 (3)</td>
<td>600 (9)</td>
</tr>
<tr>
<td>Female</td>
<td>4,539</td>
<td>2.3</td>
<td>4,100 (90)</td>
<td>100 (2)</td>
<td>300 (8)</td>
</tr>
<tr>
<td>Male</td>
<td>2,270</td>
<td>1.3</td>
<td>1,900 (83)</td>
<td>100 (6)</td>
<td>300 (11)</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>19,000</td>
<td>4.9</td>
<td>12,600 (66)</td>
<td>900 (5)</td>
<td>5,500 (29)</td>
</tr>
<tr>
<td>Female</td>
<td>3,460</td>
<td>1.7</td>
<td>2,100 (60)</td>
<td>100 (3)</td>
<td>1,300 (37)</td>
</tr>
<tr>
<td>Male</td>
<td>15,540</td>
<td>8.5</td>
<td>10,500 (68)</td>
<td>800 (5)</td>
<td>4,200 (28)</td>
</tr>
<tr>
<td>Total</td>
<td>43,999</td>
<td>12.2</td>
<td>32,100 (73)</td>
<td>2,700 (6)</td>
<td>9,200 (21)</td>
</tr>
<tr>
<td>Female</td>
<td>24,886</td>
<td>13.7</td>
<td>19,000 (76)</td>
<td>1,700 (7)</td>
<td>4,200 (17)</td>
</tr>
<tr>
<td>Male</td>
<td>19,113</td>
<td>10.6</td>
<td>13,100 (69)</td>
<td>1,000 (5)</td>
<td>5,000 (26)</td>
</tr>
</tbody>
</table>

Abbreviations: 9vHPV = 9-valent HPV vaccine; ICD-O-3 = International Classification of Diseases for Oncology, Third Edition.
* Compiled from population-based cancer registries that participate in the CDC National Program of Cancer Registries, and/or the National Cancer Institute’s Surveillance, Epidemiology, and End Results Program and meet the criteria for high data quality for all years during 2012–2016, covering 100% of the U.S. population.
† HPV-associated cancers were defined as invasive cancers at anatomic sites with cell types in which HPV DNA frequently is found. All cancers were histologically confirmed. Cervical cancers (ICD-O-3 codes C53.0–C53.9) are limited to carcinomas (ICD-O-3 histology codes 8010–8071, 8990–8991). Vaginal (ICD-O-3 site code C52.9), vulvar (ICD-O-3 site code C53.9), penile (ICD-O-3 site codes C60.0–60.9), anal (ICD-O-3 site codes C20.9, C21.0–C21.9) and oropharyngeal (ICD-O-3 site codes C01.9, C02.4, C02.8, C05.1, C05.2, C09.0, C09.1, C09.8, C09.9, C10.0, C10.1, C10.2, C10.3, C10.4, C10.5, C10.9, C14.0, C14.2, and C14.8) cancer sites are limited to squamous cell carcinomas (ICD-O-3 histology codes 8050–8084, 8120–8131).
‡ HPV-attributable cancers are cancers that are probably caused by HPV (https://academic.oup.com/jnci/article/107/6/sjv086/872092 [3]). Estimates for attributable fraction were based on studies used population-based data from cancer tissue studies to estimate the percentage of those cancers probably caused by HPV. The

https://www.cdc.gov/mmwr/volumes/68/wr/mm6833a3.htm?s_cid=mm6833a3_w
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

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**
Revised in 2018

Screening should begin at age 21 years.

Screen women 21 to 29 years of age with a Pap test every 3 years.

Screen women 30 to 65 years of age with a Pap test every 3 years, an HPV test every 5 years, or co-testing (Pap and HPV testing) every 5 years.

https://www.cdc.gov/cancer/cervical/basic_info/screening.htm
Vaccine
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).
- VLPs are noninfectious and nononcogenic.
### Human Papillomavirus Vaccine

<table>
<thead>
<tr>
<th>HPV Vaccines</th>
<th>9-valent 9vHPV (Gardasil 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 VLP types</td>
<td>6, 11, 16, 18, 31, 33, 45, 52, 58</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Merck</td>
</tr>
<tr>
<td>Contraindications</td>
<td>Hypersensitivity to yeast</td>
</tr>
<tr>
<td>FDA indications</td>
<td>Females (9 through 45 yrs): Anal, cervical, vaginal, and vulvar precancer and cancer; genital warts</td>
</tr>
<tr>
<td></td>
<td>Males (9 through 45 yrs): Anal precancer and cancer; genital warts</td>
</tr>
</tbody>
</table>

Only 9vHPV vaccine is available in the U.S.
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 the efficacy of the vaccine against other vaccine HPV types.
9vHPV (Gardasil 9)

- Licensed by the FDA for males and females 9 through 45 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

- **Noninferior immunogenicity to 4vHPV**

- **5 additional types account for 11% of invasive cancers.**
  - Differences by gender: 14% for females, 4% for males

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

- **Safety profile similar to 4vHPV across age, gender, race, ethnic groups**
9vHPV (Gardasil 9)
Efficacy and Safety: 27 through 45 years

- Immunogenicity: 94 to 100%
- Safety—few serious adverse events and no vaccine-related deaths

https://www.cdc.gov/mmwr/volumes/68/wr/pdfs/mm6832a3-H.pdf
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.
3

Clinical Considerations
Recommended Child and Adolescent Immunization Schedule for ages 18 years and younger, 2020.

Recommended Child and Adolescent Immunization Schedule for ages 18 years and younger, 2020.

### Table 2

**Recommended Catch-up Immunization Schedule for Children and Adolescents Who Start Late or Who are More than 1 month Behind, United States, 2020**

The table below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. Always use this table in conjunction with Table 1 and the notes that follow.

#### Children age 4 months through 6 years

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Minimum Age for Dose 1</th>
<th>Dose 1 to Dose 2</th>
<th>Minimum Interval Between Doses</th>
<th>Dose 2 to Dose 3</th>
<th>Minimum Age for the final dose is 18 months or older.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td>Birth</td>
<td>4 weeks</td>
<td>8 weeks and at least 16 weeks after first dose. Minimum age for the final dose is 24 weeks.</td>
<td>4 weeks</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
<tr>
<td>Diphtheria, tetanus, and pertussis&amp; Haemophilus influenzae type b</td>
<td>6 weeks</td>
<td>4 weeks</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>6 months</td>
<td>6 months</td>
</tr>
<tr>
<td>Pneumococcal conjugate</td>
<td>6 weeks</td>
<td>4 weeks</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>6 months</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
<tr>
<td>Inactivated poliovirus</td>
<td>6 weeks</td>
<td>4 weeks</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>6 months</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
<tr>
<td>Measles, mumps, rubella</td>
<td>12 months</td>
<td>4 weeks</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>6 months</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
<tr>
<td>Varicella</td>
<td>12 months</td>
<td>4 weeks</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>6 months</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
<tr>
<td>Meningococcal ACW</td>
<td>2 months</td>
<td>See Notes</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>See Notes</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
<tr>
<td>Meningococcal ACYW D</td>
<td>9 months</td>
<td>See Notes</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
<td>See Notes</td>
<td>Maximum age for final dose is 8 months, 0 days.</td>
</tr>
</tbody>
</table>

#### Children and adolescents age 7 through 18 years

- **Human papillomavirus** 9 years: Routine dosing intervals are recommended.
Recommended Child and Adolescent Immunization Schedule for ages 18 years and younger, 2020.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Recommended Child and Adolescent Immunization Schedule by Medical Indication, United States, 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>VACCINE</td>
<td>INDICATION</td>
</tr>
<tr>
<td></td>
<td>Pregnancy</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td></td>
</tr>
<tr>
<td>Rotavirus</td>
<td></td>
</tr>
<tr>
<td>Diphteria, tetanus &amp; acellular pertussis (DTaP)</td>
<td></td>
</tr>
<tr>
<td>Mumps, mumps, rubella</td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate</td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus</td>
<td></td>
</tr>
<tr>
<td>Polio (IV)</td>
<td></td>
</tr>
<tr>
<td>Polio (IPV)</td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella</td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
</tr>
<tr>
<td>Influenza A</td>
<td></td>
</tr>
<tr>
<td>Influenza B</td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus</td>
<td></td>
</tr>
<tr>
<td>Meningococcal ACWY</td>
<td></td>
</tr>
<tr>
<td>Meningococcal B</td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate</td>
<td></td>
</tr>
</tbody>
</table>

Vaccination according to the routine schedule is recommended. Vaccination is recommended, and additional doses may be necessary based on medical condition. For additional information regarding HIV, see the General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunization-schedule.html and Table 6-1 (footnote D) at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.

1 For additional information regarding HIV, see the General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunization-schedule.html and Table 6-1 (footnote D) at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.
2 Severe Combined Immunodeficiency
3 LAM contraindicated for children 2-4 years of age with asthma or wheezing during the preceding 12 months.
Recommended Adult Immunization Schedule for ages 19 years or older, 2020.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19-26 years</th>
<th>27-45 years</th>
<th>50-64 years</th>
<th>≥65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza inactivated (IIV) or influenza recombinant (RIIV)</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
</tr>
<tr>
<td>Influenza live, attenuated (LAIV)</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td, Tdap)</td>
<td>1 dose Tdap, then Td or Tdap booster every 10 years</td>
<td>1 dose Tdap, then Td or Tdap booster every 10 years</td>
<td>1 dose Tdap, then Td or Tdap booster every 10 years</td>
<td>1 dose Tdap, then Td or Tdap booster every 10 years</td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
<td>1 dose annually</td>
</tr>
<tr>
<td>Varicella (VZV)</td>
<td>2 doses if born in 1980 or later</td>
<td>2 doses if born in 1980 or later</td>
<td>2 doses if born in 1980 or later</td>
<td>2 doses if born in 1980 or later</td>
</tr>
<tr>
<td>Zoster recombinant (RZV) preferred</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
</tr>
<tr>
<td>Zoster live</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td>2 or 3 doses depending on age at initial vaccination or condition</td>
<td>2 or 3 doses depending on age at initial vaccination or condition</td>
<td>2 or 3 doses depending on age at initial vaccination or condition</td>
<td>2 or 3 doses depending on age at initial vaccination or condition</td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td>1 or 2 doses depending on indication</td>
<td>1 or 2 doses depending on indication</td>
<td>1 or 2 doses depending on indication</td>
<td>1 or 2 doses depending on indication</td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
</tr>
<tr>
<td>Hepatitis B (HepB)</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
</tr>
<tr>
<td>Meningococcal A, C, W, Y (MenACWY)</td>
<td>1 or 2 doses depending on indication, see notes for booster recommendations</td>
<td>1 or 2 doses depending on indication, see notes for booster recommendations</td>
<td>1 or 2 doses depending on indication, see notes for booster recommendations</td>
<td>1 or 2 doses depending on indication, see notes for booster recommendations</td>
</tr>
<tr>
<td>Meningococcal B (MenB)</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
<td>2 doses</td>
</tr>
<tr>
<td>Haemophilus influenza type b (HiB)</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
</tr>
</tbody>
</table>

Table 1: Recommended Adult Immunization Schedule by Age Group, United States, 2020

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
Recommended vaccination for adults with an additional risk factor or another indication
Recommended vaccination based on shared clinical decision making
No recommendation/Not applicable
Table 2: Recommended Adult Immunization Schedule by Medical Condition and Other Indications, United States, 2020

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Pregnancy</th>
<th>Immune-compromised (excluding HIV infection)</th>
<th>HIV infection CD4 count</th>
<th>Hepatitis B</th>
<th>Arthritis, complement deficiencies</th>
<th>End-stage renal disease or on hemodialysis</th>
<th>Heart or lung disease, atherosclerotic</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Health care personnel*</th>
<th>Men who have sex with men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tdap or Td</td>
<td>NOT RECOMMENDED</td>
<td>1 dose annually</td>
<td>PRECAUTION</td>
<td>1 dose annually</td>
<td>1 dose Tdap, then Td or Tdap booster every 10 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMR</td>
<td>NOT RECOMMENDED</td>
<td></td>
<td></td>
<td></td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAR</td>
<td>NOT RECOMMENDED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RZV (preferred)</td>
<td>DELAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV</td>
<td>DELAY</td>
<td>3 doses through age 26 years</td>
<td>2 or 3 doses through age 26 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FCV13

PPSV23

HepA

HepB

MenACWY

MenB

HiB

Legend:

- Recommended vaccination for adults who meet age requirements, lack documentation of vaccination, or lack evidence of past infection
- Recommended vaccination for adults with an additional risk factor or another indication
- Precaution—vaccination might be indicated if benefit of protection outweighs risk of adverse reaction
- Delay vaccination until after pregnancy if vaccine is indicated
- Not recommended (contraindicated)—vaccine should not be administered
- No recommendation/Not applicable

1. Precaution for LAIV does not apply to alcoholics. 2. See notes for influenza, hepatitis B, measles, mumps, and rubella, and varicella vaccinations. 3. Hematopoietic stem cell transplant.
Human Papillomavirus Vaccine Routine Recommendations

- Routinely vaccinate boys and girls at 11 through 12 years of age.*

- Catch up those who are unvaccinated or who are missing doses, including:
  - Females and males age 13 through 26 years

*Vaccination series can be started at 9 years of age.
HPV Vaccination Schedules

- FDA has approved a 2-dose schedule for 9vHPV (Gardasil 9).
- ACIP reviewed data on 2-dose schedules, including studies of immune response, vaccine effectiveness, and duration of protection. Specifically:
HPV Vaccination Schedules

• Data from clinical trials showed 2 doses of HPV vaccine given in younger adolescents (9 through 14 years) produced an immune response similar or higher than the response in young adults (16 through 26 years) who received 3 doses.
• Data available to date show that a 3-dose schedule in older adolescents and young adults provides long-lasting protection.
• Study data suggest that a 2-dose schedule given to younger adolescents will also provide long-lasting protection.
ACIP HPV Immunization Recommendations
Previously Unvaccinated Adolescents

- Administer 2 doses of HPV vaccine to adolescents starting the series at 9 through 14 years of age.

- Follow the routine 2-dose schedule:
  - Administer the second dose 6-12 months after the first dose.

- If a second dose is inadvertently administered prior to 5 months, default to a 3-dose series.

https://www.cdc.gov/vaccines/pubs/pinkbook/supplement.html
ACIP HPV Immunization Recommendations
Previously Unvaccinated Adolescents

- Administer 3 doses to adolescents starting the series on or after the 15th birthday, or to immunosuppressed or autoimmune persons of any age.

- Routine 3-dose schedule*: 0, 1 through 2, 6 months
  - Dose #2 should be administered at least 1 through 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.

MMWR 2016;65(49):1405–08
Adolescents who initiated vaccination with 9vHPV, 4vHPV, or 2vHPV

- Before their 15th birthday, are fully vaccinated if they received:
  - 2 doses at the recommended dosing schedule (0, 6 through 12 months) OR
  - 3 doses at the recommended dosing schedule (0, 1 through 2, 6 months)
- On or after the 15th birthday are fully vaccinated if they received:
  - 3 doses at the recommended dosing schedule (0, 1 through 2, 6 months)

All of the doses do not have to be 9vHPV.

No additional doses are recommended, regardless of the current age of the vaccine recipient.
ACIP HPV Immunization Recommendations
Medical Condition Considerations

- ACIP recommends HPV vaccination with 3 doses (0, 1 through 2, 6 months) for immunocompromised females and males aged 9 through 26 years.
Shared clinical decision-making is recommended for adults 27 through 45 years of age.

Shared clinical decision-making includes adults who may have received doses prior to the 27th birthday.

Criteria for making the shared clinical decision-making available in box at https://www.cdc.gov/mmwr/volumes/68/wr/pdfs/mm6832a3-H.pdf
HPV is a very common sexually transmitted infection. Most HPV infections are transient and asymptomatic and cause no clinical problems.

Although new HPV infections are most commonly acquired in adolescence and young adulthood, some adults are at risk for acquiring new HPV infections. At any age, having a new sex partner is a risk factor for acquiring a new HPV infection.

Persons who are in a long-term, mutually monogamous sexual partnership are not likely to acquire a new HPV infection.

Most sexually active adults have been exposed to some HPV types, although not necessarily all of the HPV types targeted by vaccination.
No clinical antibody test can determine whether a person is already immune or still susceptible to any given HPV type.

HPV vaccine efficacy is high among persons who have not been exposed to vaccine-type HPV before vaccination.

Vaccine effectiveness might be low among persons with risk factors for HPV infection or disease (e.g., adults with multiple lifetime sex partners and likely previous infection with vaccine-type HPV), as well as among persons with certain immunocompromising conditions.

HPV vaccines are prophylactic (i.e., they prevent new HPV infections). They do not prevent progression of HPV infection to disease, decrease time to clearance of HPV infection, or treat HPV-related disease.
Human Papillomavirus Vaccine Administration

- Administer HPV vaccine via intramuscular (IM) injection:
  - Needle size: 1- through 1½-inch, 22- 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 HPV vaccine at the same medical visit as other vaccines.
ACIP HPV Immunization Recommendations

Additional Considerations

- No therapeutic effect on HPV infection, genital warts, cervical lesions

- Prevaccination assessments not recommended
  - HPV
  - Pregnancy
Human Papillomavirus Vaccine
Special Situations

- Administer vaccine to:
  - Females who:
    - Have equivocal or abnormal Pap test
    - Have positive HPV DNA test
    - Are breast-feeding
  - 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 vaccine 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 are closed
- Contact information is in the package insert.
Human Papillomavirus Vaccine
Contraindications and Precautions

- **Contraindication**
  - Severe allergic reaction to a vaccine component or following a prior dose

- **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
Adverse Events Following any Dose of HPV Vaccine Among Females*

- Postural orthostatic tachycardia syndrome (POTS)
- Guillain-Barré syndrome (GBS)
- Complex regional pain syndrome (CRPS)

https://www.cdc.gov/vaccinesafety/vaccines/hpv/hpv-safety-faqs.html#A10
Syncope Following Vaccination

- 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 to 18 years

- Serious injuries have resulted.

- ACIP recommends providers strongly consider observing patients for 15 minutes after they are vaccinated.
A 30-year-old woman received a first dose of HPV vaccine at 25 years of age. Is shared clinical decision-making necessary to continue the series?

A) Yes

B) No
A 30-year-old woman received a first dose of HPV vaccine at 25 years of age. Is shared clinical decision-making necessary to continue the series?

YES
Vaccine Storage and Handling

- Store HPV vaccine in a refrigerator between 2°C and 8°C (36°F and 46°F)
- Store HPV vaccines:
  - In the original packaging with the lids closed
  - In a clearly labeled bin of the storage unit
- Do not freeze the vaccine
- Protect the vaccine from light

Vaccine storage label example
Available at [www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf](http://www.cdc.gov/vaccines/hcp/admin/storage/guide/vaccine-storage-labels.pdf)
HPV Vaccination Coverage  
Females 13 through 17 Years of Age, 2018

<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>69.9%</td>
</tr>
<tr>
<td>HPV UTD**</td>
<td>53.7%</td>
</tr>
</tbody>
</table>

Percentages ≥1 human papillomavirus vaccine, either 4vHPV or 2vHPV
**HPV UTD includes those with ≥3 doses and those with 2 doses when the first HPV vaccine dose was initiated before age 15 years and time between the first and second dose was at least 5 months minus 4 days.
HPV Vaccine Communications during the Health Care Encounter

- HPV vaccine is often presented as optional, whereas other adolescent vaccines are recommended.
- Some providers 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 a teen is not at risk for HPV and vaccination can be delayed until the teen is older.

Strategies for Increasing HPV Vaccination Coverage 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.
  - Vaccinate at every opportunity.
  - Use standing orders.

- Reminder and recall

- Tools for improving uptake of HPV vaccine at www.cdc.gov/vaccines/teens
Resources
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
CE credit, go to: www.cdc.gov/GetCE

Search course number: WD4344-092320

CE credit expires: July 1, 2022

CE instructions are available on the EpiVac Pink Book Web-on-Demand Series web page

Questions and additional help with the online CE system, e-mail CE@cdc.gov
E-mail Your Immunization Questions to Us

Write “Web-on-Demand–HPV” in the subject line

NIPINFO@cdc.gov
EpiVac Pink Book Web-on-Demand Resources

- Comprehensive list of resources for ALL sessions
- Located on the web page for this web-on-demand session at www.cdc.gov/vaccines/ed/webinar-epv/index.html
- Additional materials located on this webpage include:
  - HPV slide set
  - Web-on-demand questions and answers
  - Transcript of this session
  - Continuing education instructions
Thank You From Atlanta!