

## Human Papillomavirus Vaccines

Current as of 07/20/2020.



- I will provide a discussion of the epidemiology of human papillomavirus, as well as the vaccine recommendations for prevention of HPV infection.
- The immunization content in this slide deck was last updated on 7/20/2020. To learn of immunization content updates that may have been made since this time, please visit the IRUN webpage.

## About This Presentation

This presentation was designed to help prelicensure nursing faculty incorporate appropriate elements of the [IRUN Curriculum Framework](#) into their existing curricula. This content is also available in a PowerPoint file located on the [IRUN web page](#).

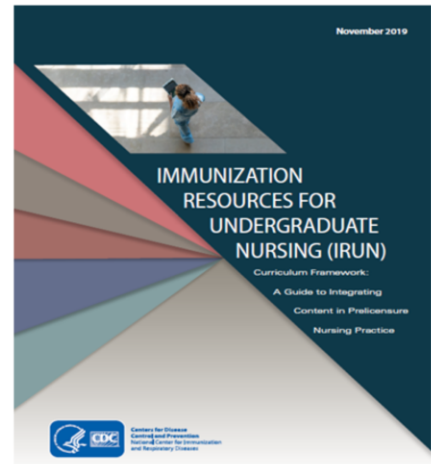
Please submit questions or comments about this presentation via the [IRUN web page](#).

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(READ SLIDE)

## Immunization Resources for Undergraduate Nursing (IRUN) Curriculum Framework Topics

- Public Health Perspective
- Immunization Strategies
- Immune System/Immunology
- Vaccine-Preventable Diseases
- Types of Vaccines
- Immunization Schedules
- Communications
- Legal/Ethical Issues
- Vaccine Storage and Handling
- Vaccine Administration
- Documentation
- Vaccine Safety



- The Immunization Resources for Undergraduate Nursing (IRUN) Curriculum Framework consists of 12 topic areas with corresponding learning objectives and suggested resources. In this slide deck, we will use these topical areas and framework to learn about Human Papillomavirus Vaccines.
- For more information about the IRUN Curriculum Framework Topics or resources, please visit the IRUN web page, which can be accessed by clicking on the graphic on this slide.

## Learning Objectives

- Describe the etiologic agent, pathogenesis, epidemiology, and clinical manifestations of human papillomavirus (HPV).
- Describe barriers to vaccination and strategies to increase HPV vaccine coverage.
- Describe the HPV vaccine, including immunogenicity, indications, contraindications, and precautions for vaccination.
- Discuss the importance of appropriate spacing and timing of HPV vaccine doses.
- Describe correct HPV vaccine storage and handling.
- Define the steps for proper HPV vaccine administration.
- Describe proper HPV vaccine documentation and adverse event reporting practices.
- Explain the nurse's role in preventing HPV infection through immunization.
- Locate resources relevant to current HPV vaccine recommendations.

- Following today's lecture, you will be able to meet these nine learning objectives. (READ SLIDE)

## PUBLIC HEALTH PERSPECTIVE

- HPV infection is causally associated with most anogenital cancers, as well as oropharyngeal and possible oral cavity and laryngeal cancers
- HPV infection contributes to an estimated 600,000 incident cancers worldwide and 250,000 premature deaths.

## Global Impact of HPV

- HPV infection is causally associated with most anogenital cancers, as well as oropharyngeal and possible oral cavity and laryngeal cancers
- HPV infection contributes to an estimated 600,000 incident cancers worldwide and 250,000 premature deaths.

Information from Saraiya M, Unger ER, Thompson TD, et al. US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. *J Natl Cancer Inst.* 2015;107(6):dju086. Published 2015 Apr 29. doi:10.1093/jnci/dju086

- HPV infection is causally associated with most anogenital cancers, as well as oropharyngeal and possible oral cavity and laryngeal cancers
- HPV infection contributes to an estimated 600,000 incident cancers worldwide and 250,000 premature deaths.

## HPV Disease Burden in the United States

- **Anogenital HPV infection believed to be the most common sexually-transmitted infection in the United States.**
  - ~79 million infected persons; ~14 million new infections annually.
  - First HPV infection occurs soon after onset of sexual activity.
- **Common among adolescents and young adults:**
  - 50% of new infections occur in persons 15–24 years of age.
  - 40% of college women were infected with HPV by 24 months after first sexual intercourse.

Information from Saraiya M, Unger ER, Thompson TD, et al. US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. *J Natl Cancer Inst.* 2015;107(6):djv086. Published 2015 Apr 29. doi:10.1093/jnci/djv086; Winer RL, Lee SK, Hughes JP, Adam DE, Kiviat NB, Koutsky LA. Genital human papillomavirus infection: incidence and risk factors in a cohort of female university students [published correction appears in *Am J Epidemiol.* 2003 May 1;157(9):858]. *Am J Epidemiol.* 2003;157(3):218–226. doi:10.1093/aje/kwf180.

- Anogenital HPV infection is believed to be the most common sexually transmitted infection in the United States.
- An estimated 79 million persons are infected, and an estimated 14 million new HPV infections occur annually. HPV infection occurs soon after the onset of sexual activity.
- HPV infection is common among adolescents and young adults; 50% of new infections occur in persons 15-24 years of age. In a prospective study of college women, the cumulative incidence of infection was 40% by 24 months after first sexual intercourse.

## HPV Vaccination Coverage – 2018

- **51% of adolescents have completed the vaccine series.**
- **Vaccine series initiation in adolescents is increasing.**
  - During 2014-2018, HPV vaccine coverage of one or more doses increased an average of 4.4 percentage points per year nationally.
- **Up-to-date vaccination coverage was found to be lower among:**
  - Adolescents living in non-metropolitan areas (40.7%) vs. metropolitan areas (56.1%).
  - Individuals living at or above the poverty level (49.6%) vs. below the poverty level (57.1%).

Information from Walker TY, Elam-Evans LD, Yankey D, et al. National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years—United States, 2018. *MMWR Morb Mortal Wkly Rep.* 2019;68:718–723.

- Approximately half of adolescents (51%) have completed the HPV vaccine series.
- During 2014 to 2018, HPV vaccination coverage of one dose or greater increased an average of 4.4 percentage points per year nationally
- HPV vaccination coverage was found to be lower among adolescents living in non-metropolitan areas (40.7%) than those living in metropolitan areas (56.1%).
- HPV vaccination coverage was found to be lower among individuals living at or above the poverty level (49.6%) than individuals living below the poverty level (57.1%).



## Barriers to Vaccination in the United States: Health Care Access

- **Barriers to health care access:**

- Language barriers
- Lack of trust in providers
- Transportation problems
- Inconvenient office hours
- Patient/parent misinformation
- Vaccine stigma
- Competing provider priorities
- Low awareness of vaccination benefits
- Receipt of care from multiple providers
- Complex vaccination schedule
- Vaccine cost
- Breaks in insurance coverage

Up-to-date vaccination coverage higher in adolescent patients with Medicaid (55.7%) compared with those with private health insurance (50.2%) and uninsured (35.5%).

Information from Hill HA, Elam-Evans LD, Yankey D, Singleton JA, Kang Y. Vaccination Coverage Among Children Aged 19–35 Months—United States, 2017. *MMWR Morb Mortal Wkly Rep.* 2018;67(40):1123–1128.; Walker TY, Elam-Evans LD, Yankey D, et al. National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years—United States, 2018. *MMWR Morb Mortal Wkly Rep.* 2019;68:718–723; Escoffery C, et al. Facilitators and Barriers to the Implementation of the HPV VACs (Vaccinate Adolescents Against Cancers) Program: A Consolidated Framework for Implementation Research Analysis. *Prev Chronic Dis.* 2019;16:E85.

- Barriers to health care access and use among the publicly insured include language barriers, lack of trust in providers, transportation problems, inconvenient office hours, patient/parent misinformation, vaccine stigma, competing provider priorities, low awareness of vaccination benefits, receipt of care from multiple providers, complex vaccination schedules and vaccine cost.
- Medicaid patients also tend to experience more breaks in insurance coverage than privately insured children do, and discontinuities in insurance coverage have been associated with lower vaccination coverage.
- Providers report difficulties recommending the HPV vaccine to patients when parents had either general antivaccine sentiments—they refused all optional vaccines—or they had negative opinions of the HPV vaccine specifically. Many parents believed the vaccine promoted sexual activity in their children or they thought children only needed the vaccine if they were sexually active.
- Up-to-date vaccination coverage was higher in adolescent patients with Medicaid (55.7%) compared with adolescents with private health insurance (50.2%) and adolescents who were uninsured (35.5%).

# IMMUNIZATION STRATEGIES

## Strategies for High Vaccination Coverage

- Reduce barriers to immunization.
- Provide recommendation for vaccination and reinforcement.
- Reduce missed opportunities.
- Schedule next immunization visit before patient leaves the office.
- Utilize reminder and recall for patients.

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; Vaccination Coverage by Age 24 Months Among Children Born in 2015 and 2016—National Immunization Survey-Child, United States, *MMWR*/ October 18, 2019 / 68(41):913–918. ; <https://www.cdc.gov/vaccines/programs/iqip/index.html>

- Recognizing and reducing barriers, as described in the previous slides, is key to immunization is key to increasing vaccination coverage.
- Recommending the vaccine and reinforcing this recommendation has been shown to be one of the most effective strategies for increasing vaccination coverage.
- “Reducing missed opportunities” means establishing a policy to vaccinate at every visit if vaccinations are indicated. Providers need to use every patient encounter to screen for and offer vaccinations.
- Another strategy to increase vaccination coverage is scheduling the next immunization visit before the patient leaves the office.
- Reminder/recall systems are cost-effective methods to identify and notify families when children are due for vaccinations or are already behind. Reminders and recalls differ in content and can be delivered by telephone, text message, letter, postcard, or other methods. Most reminder and recall notices are tailored for individuals, and many include educational messages about the importance of vaccination.

## Strategies for High Vaccination Coverage

- Employ Immunization Quality Improvement For Providers (IQIP) Process and Strategies:
  - <https://www.cdc.gov/vaccines/programs/iqip/at-a-glance.html>
- Maintain thorough documentation in patient records.
- Utilize Immunization Information Systems (IISs)

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; <https://www.cdc.gov/vaccines/programs/iis/index.html>

- The Immunization Quality Improvement for Providers promotes and supports implementation of provider-level strategies designed to help increase on-time vaccination of children and adolescents.
- Other important strategies consist of good record-keeping through documentation in patient records and the use of immunization information systems.

## Immunization Information Systems (IISs)

- IISs are confidential, computerized databases that record all vaccine doses administered by providers to persons residing within a given geopolitical area.
- IISs provide consolidated immunization histories that help in determining appropriate vaccinations.
- All immunization providers are encouraged to document all administered vaccines in an IIS.

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; About Immunization Information Systems <https://www.cdc.gov/vaccines/programs/iis/about.html>; <https://www.cdc.gov/vaccinesafety/concerns/history/gardasil-recall-faq.html>.

- By 2 years of age, over 20% of children in the U.S. typically have seen more than one health care provider, resulting in scattered paper medical records. Immunization information systems (IISs) help providers and families by consolidating immunization information into one reliable source. IISs are confidential, population-based, computerized information systems that collect and consolidate vaccination data from multiple health care providers within a geographic area.
- IISs can be useful in identifying under- and over-immunized children, monitoring community immunization rates, identifying coverage gaps, and improving vaccination rates.
- Immunization providers are strongly encouraged to participate in an IIS. Laws governing use of IISs vary by state or region. Some states mandate use of an IIS to document vaccinations. Providers should be aware of state and/or regional requirements for reporting.

## 5 Ways to Boost HPV Vaccination Coverage

- Bundle your HPV vaccine recommendation with all other indicated adolescent vaccines
- Ensure a consistent message.
- Use every opportunity to vaccinate.
- Provide personal examples.
- Effectively answer questions.



[Imelda Reyes, NP, Describes How She Recommends HPV Vaccine](#)

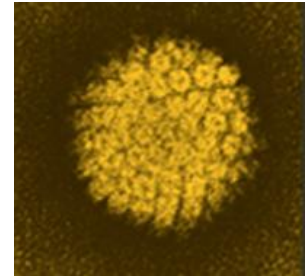
Information from <https://www.cdc.gov/hpv/hcp/boosting-vacc-rates.html>

- These five additional practical and proven strategies should also be implemented to increase HPV vaccination coverage.
- Bundle your recommendation such that all indicated adolescent vaccines, including HPV vaccine, can be administered in the same way on the same day.
- All office staff should receive training in how to successfully communicate with parents and patients about HPV vaccination. Starting with the front office, make sure that everyone is on the same page when it comes to proper vaccination practices, recommendations, and how to answer parents' questions.
- Establish a policy to check patients' immunization status at every visit and always recommend and administer vaccines your patients need. Call to remind families about getting vaccines if they fall behind or need follow-up doses to complete the series. Develop a process where all clinicians in your practice compare HPV vaccination coverage to meningococcal and Tdap vaccination coverage.
- Providing personal examples of how you support vaccinations for your family members shows you believe they are important. Share how you recommended or administered HPV vaccine for your own children, grandchildren, nieces, or nephews. Sharing your personal experience may make parents more comfortable in their decision to vaccinate their child.
- Learn how to answer some of parents' most common questions about HPV vaccine. Be prepared to answer parents' questions succinctly, accurately, and empathetically by using terms they understand. A parent will often accept your explanations if presented with their children's best interests in mind.
- In the video linked here, Imelda Reyes, a nurse practitioner, describes how she implements these techniques when she makes HPV vaccine recommendations. Additional videos demonstrating these strategies are available at the URL included on this slide.

# IMMUNE SYSTEM/IMMUNOLOGY

## Human Papillomavirus (HPV)

- **Small, double-stranded DNA virus**
- **More than 200 HPV types**
  - High-risk types associated with increased risk for cancer and precancer
    - Examples include HPV 16 and HPV 18.
  - Other types associated with benign disease (warts) or no disease
    - Examples include HPV 6 and HPV 11
- **First HPV vaccine was licensed in the United States in 2006**



Electron micrograph of HPV

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; image source: National Cancer Institute (1986), Image from <https://www.cdc.gov/hpv/hcp/photos.html>.

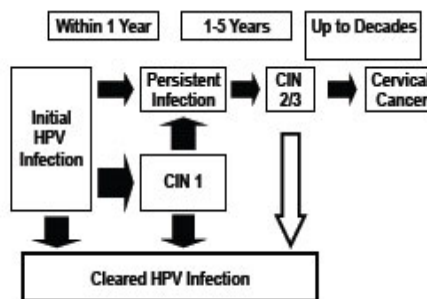
- Human papillomaviruses are small, double-stranded DNA viruses.
- More than 150 HPV types have been identified.
  - High-risk types associated with increased risk for cancer and precancer. Examples include HPV 16 and HPV 18.
  - Other types associated with benign disease (warts) or no disease. Examples include HPV 6 and HPV 11.
- The relationship between cervical cancer and sexual behavior was suspected for more than 100 years and was established by epidemiologic studies in the 1960s. In the early 1980s, cervical cancer cells were shown to contain HPV DNA. Epidemiologic studies showing a consistent association between HPV and cervical cancer were published in the 1990s. The first vaccine to prevent HPV infection was licensed in 2006.



# VACCINE-PREVENTABLE DISEASES

## Human Papillomavirus (HPV) Pathogenesis

- Infection occurs at basal epithelium.
- Most infections resolve spontaneously.
- Small proportion of infected persons become persistently infected
  - Can lead to cervical intraepithelial neoplasia (CIN) which is characterized by abnormal cell growth at the surface of the cervix
  - Low grade CIN may resolve spontaneously whereas high grade CIN are considered cancer precursors.



Natural History of HPV Infection

Information and image from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>.

- HPV infection occurs at the basal epithelium. Although the incidence of infection is high, most infections resolve spontaneously. A small proportion of infected persons become persistently infected; persistent infection is the most important risk factor for the development of cervical cancer. The most common clinically significant manifestation of persistent genital HPV infection is cervical intraepithelial neoplasia, or CIN, which is characterized by abnormal cell growth at the surface of the cervix.
- Low grade CIN may resolve spontaneously.
- Persistent HPV infection, however, may progress directly to high-grade CIN. High-grade CIN are considered cancer precursors. Some high-grade abnormalities spontaneously regress. If left undetected and untreated, years or decades later high grader CIN can progress to cervical cancer

## HPV Epidemiology

<b>Reservoir</b>	Human
<b>Transmission</b>	Direct skin-to-skin contact (usually sexual)
<b>Temporal pattern</b>	None
<b>Communicability</b>	During acute and persistent infection; Presumed to be high

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>.

- HPV infection occurs throughout the world. Humans are the only natural reservoir of HPV.
- HPV is transmitted by direct skin-to-skin contact, usually sexual, with an infected person—even when the infected person has no signs or symptoms.
- It is important to note sexual intercourse is not required to acquire HPV infection. It can be transmitted by vaginal, anal, or oral sex with someone who has the virus.
- There is no temporal pattern to HPV transmission.
- HPV is presumably communicable during the acute infection and during persistent infection. This issue is difficult to study because of the inability to culture the virus. Communicability can be presumed to be high because of the large number of new infections estimated to occur each year.

## HPV Clinical Manifestations

- **Most people with HPV do not develop symptoms and never know that they have been infected.**
  - 90% of infections become undetectable within 2 years due to the body's immune system.

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>.

(READ SLIDE)

## HPV Clinical Manifestations

**However, when not cleared, HPV infections can cause disease:**

- High-risk HPV types can cause cancers of the vulva, vagina, cervix, penis, anus, and oropharynx.
- Low-risk HPV types can cause cervical cell changes and anogenital warts.
- Recurrent respiratory papillomatosis is caused mainly by low risk types.

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; image source: <https://www.cdc.gov/hpv/hcp/protecting-patients.html>.

(READ SLIDE)

**TYPE OF VACCINE**

## HPV Vaccine

- Subunit vaccine which include only parts of the virus, or subunits, instead of the entire germ
- Cannot replicate
- Cannot result in infection from the antigen in the vaccine, even in immunodeficient people
  - Immune response primarily humoral (antibodies) vs. cell-mediated

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; <https://www.vaccines.gov/basics/types/index.html>; <https://www.cdc.gov/vaccines/hcp/conversations/downloads/vacsafe-understand-color-office.pdf>.

- We will now discuss some key characteristics about the HPV Vaccine.
- The HPV vaccine is a subunit vaccine. That means that the vaccine includes only parts of the virus, subunits, instead of the entire germ. Because these vaccines contain only the essential antigens and not all the other molecules that make up the germ, side effects are less common.
- The virus subunit in the HPV vaccine cannot replicate or multiply. It is not possible for inactivated vaccines to result in infection from the antigen in the vaccine, even in immunodeficient people.
- Since there is no replication, multiple doses are required to induce a protective antibody level. The immune response is primarily humoral, meaning antibodies are produced. There is little, if any, cell-mediated immunity. The antibody titer or level will decline with time and periodic booster doses may be required.

## HPV Vaccine

- Only one HPV vaccine (9vHPV) is currently available in the United States.
- Licensed for females and males 9–45 years of age.

Vaccine product	Serotypes contained
<b>Gardasil®9</b> (9vHPV)	6, 11, 16, 18, 31, 33, 45, 52, 58
* <b>Gardasil®</b> (4vHPV)	6, 11, 16, 18
* <b>Cervarix®</b> (2vHPV)	16, 18

\*No longer available in U.S. as of 2016; available for use in select countries outside of the U.S (see WHO link below)

Over 98% of recipients develop an antibody response to HPV types included in respective vaccines 1 month after completing a full vaccination series.

Information from <https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html>; <https://www.who.int/news-room/detail/31-10-2019-major-milestone-reached-as-100-countries-have-introduced-hpv-vaccine-into-national-schedule>

- Nine-valent, or Gardasil®9, has been the only HPV vaccine available for use in the U.S. since 2017. It is licensed for females and males 9–45 years of age. Gardasil®9 protects against 9 HPV types: 6, 11, 16, 18, 31, 33, 45, 52, and 58. The other two HPV vaccines are no longer distributed or used in the U.S., although they may be relevant for patient record review.
- More than 98% of recipients develop an antibody response to HPV types included in respective vaccines 1 month after completing a full vaccination series.



## HPV Vaccine Immunogenicity and Effectiveness

- High efficacy among females without evidence of infection with vaccine HPV types (>95%).
- No evidence of vaccine effectiveness or any therapeutic effect on existing infection or disease
- Prior infection with one HPV type did not diminish efficacy of the vaccine against other vaccine HPV types.
- 9vHPV (Gardasil®9):
  - Similar protection to 4vHPV against 6-, 11-, 16-, 18-related disease
  - ~97% protection against 31-, 33-, 45-, 52-, 58-related disease

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed., Supplement. Washington D.C.: Public Health Foundation, 2017.

- HPV vaccines are intended to prevent cancer—primarily cervical cancers. But cancer can take decades to develop following HPV infection. Clinical trials using cancer as the end point would take many years to complete. Thus, a clinical trial using cancer as the outcome is not very practical. Instead, other end points were used to determine vaccine efficacy, such as persistent HPV infection and cancer precursors.
- Bivalent and quadrivalent HPV vaccines were studied in large efficacy and safety trials. Both vaccines were found to be highly effective and cervical cancer precursors were reduced by 95% among the vaccinated group compared with the unvaccinated group.
- Although high efficacy among persons without evidence of infection with HPV types included in the vaccines was demonstrated in clinical trials for both bivalent and quadrivalent HPV vaccines, there is no evidence of vaccine effectiveness or any therapeutic effect on existing infection or disease. Participants infected with one or more HPV types prior to vaccination were protected against disease caused by the other vaccine types. Prior infection with one HPV type did not diminish efficacy of the vaccine against other HPV vaccine types.
- 9vHPV has been shown to have non-inferior immunogenicity to 4vHPV for all serotypes and age groups and is approximately 97% effective against the 5 additional HPV types in the vaccine.

# IMMUNIZATION SCHEDULES

## Advisory Committee on Immunization Practices (ACIP)

- A group of medical and public health experts who develop recommendations on the use of vaccines in the civilian population of the United States
- Provides guidance on use of vaccines and other biologic products to U.S. Department of Health and Human Services, CDC, and the U.S. Public Health Service
- ACIP recommendations are standard of care in the United States.

Information from Advisory Committee on Immunization Practices <https://www.cdc.gov/vaccines/acip/committee/index.html>

- The Advisory Committee on Immunization Practices (ACIP) is a group of medical and public health experts that develops recommendations on the use of vaccines in the civilian population of the United States. ACIP provides guidance on the use of vaccines. ACIP recommendations are considered standard of care in the U.S.

# ACIP HPV Vaccine Recommendations: Pediatric

ACIP recommends HPV vaccine for boys and girls at 11–12 years of age (may start as early as 9 years of age).

Routine pediatric recommendations are found in the [Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger](#).

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19-23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13-15 yrs	16 yrs	17-18 yrs
Hepatitis B (HepB)	1 <sup>st</sup> dose	2 <sup>nd</sup> dose			← 3 <sup>rd</sup> dose →												
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)		1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose	See Notes												
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)		1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose					← 4 <sup>th</sup> dose →			5 <sup>th</sup> dose					
Haemophilus influenzae type b (Hib)		1 <sup>st</sup> dose	2 <sup>nd</sup> dose	See Notes			3 <sup>rd</sup> or 4 <sup>th</sup> dose See Notes										
Pneumococcal conjugate (PCV13)		1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose			← 4 <sup>th</sup> dose →										
Inactivated poliovirus (IPV <18 yrs)		1 <sup>st</sup> dose	2 <sup>nd</sup> dose		← 3 <sup>rd</sup> dose →							4 <sup>th</sup> dose					
Influenza (IV)					Annual vaccination 1 or 2 doses								Annual vaccination 1 dose only				
Influenza (LAIV)												Annual vaccination 1 or 2 doses	Annual vaccination 1 dose only				
Mumps, mumps, rubella (MMR)					See Notes		← 1 <sup>st</sup> dose →					2 <sup>nd</sup> dose					
Varicella (VAR)							← 1 <sup>st</sup> dose →					2 <sup>nd</sup> dose					
Hepatitis A (HepA)					See Notes				2-dose series, See Notes								
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)															Tdap		
<b>Human papillomavirus (HPV)</b>															See Notes		
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos)									See Notes						1 <sup>st</sup> dose	2 <sup>nd</sup> dose	
Meningococcal B																See Notes	
Pneumococcal polysaccharide (PPSV23)																See Notes	

Range of recommended ages for all children
Range of recommended ages for catch-up immunisation
Range of recommended ages for certain high-risk groups
Recommended based on shared clinical decision-making or \*can be used in this age group
No recommendation/ not applicable

Information from [www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html](http://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html)

- This is Table 1 from the 2020 Recommended Child and Adolescent Immunization Schedule for persons aged 18 years or younger.
- This table shows routine recommendations, with the HPV portion highlighted by the red text box.
- ACIP routinely recommends HPV vaccine for boys and girls at 11–12 years of age, as indicated by the yellow bar. Children as young as 9 years of age may begin the HPV vaccine series, as indicated by the purple and blue bar. For children who did not begin the series within the routinely recommended age range catch-up guidance is indicated by the green bar.

## ACIP HPV Vaccine Recommendations: Adult

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IV) or Influenza recombinant (RV) <b>or</b> Influenza live, attenuated (LAV)	1 dose annually			
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Tdap, then Td or Tdap booster every 10 years			
Measles, mumps, rubella (MMR)	1 or 2 doses depending on indication (if born in 1957 or later)			
Varicella (VAR)	2 doses (if born in 1980 or later)		2 doses	
Zoster recombinant (RZV) (preferred) <b>or</b> Zoster live (ZVL)			2 doses	1 dose
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		
Pneumococcal conjugate (PCV13)	1 dose			65 years and older
Pneumococcal polysaccharide (PPSV23)	1 or 2 doses depending on indication			1 dose
Hepatitis A (HepA)	2 or 3 doses depending on vaccine			
Hepatitis B (HepB)	2 or 3 doses depending on vaccine			
Meningococcal A, C, W, Y (MenACWY)	1 or 2 doses depending on indication, see notes for booster recommendations			
Meningococcal B (MenB)	19 through 23 years	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations		
Haemophilus influenzae type b (Hib)	1 or 3 doses depending on indication			

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

ACIP recommends HPV catch-up vaccine for adults 19–26 years of age and shared clinical decision making to determine vaccination for adults 27–45 years of age.

Information from <https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html>

- HPV immunization recommendations span both the childhood and adult immunization schedules.
- This slide shows the adult immunization schedule age-related figure. Again, HPV vaccine is highlighted by the red box.
- ACIP recommends HPV vaccine for men and women 19–26 years of age who have not previously completed the vaccine series, as indicated by the yellow bar. The blue bar indicates where shared clinical decision-making may be used to determine if the vaccine should be administered to people 27 through 45 years of age.

## ACIP HPV Immunization Recommendations: Schedule Considerations

- HPV vaccine can be administered during the same clinical visit as other vaccines.
  
- Number of recommended doses is based on:
  - Age at administration of the first dose
  - Health status: altered immunocompetence
  
- Series does not need to be restarted if interrupted.

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>.

(READ SLIDE)

## ACIP HPV Recommendations: Ages 9–14

- **Administer 2 doses of HPV vaccine to adolescents starting the series at 9 through 14 years of age.**
- **Routine 2-dose schedule (0, 6-12 months):**
  - 2nd dose 6–12 months after dose 1
- **If a 2nd dose is inadvertently administered prior to 5 months, default to a 3-dose series.**

Information from Meites E, Kempe A, Markowitz LE. Use of a 2-Dose Schedule for Human Papillomavirus Vaccination—Updated Recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2016;65:1405–1408; <https://www.cdc.gov/hpv/hcp/schedules-recommendations.html>.

- Adolescents starting the vaccine series between 9 and 14 years of age should follow the 2-dose schedule. T
- Administer the second dose 6 to 12 months after the first dose.
- If a second dose is inadvertently administered prior to 6 months after the first dose, default to a 3-dose series.
- The references noted on the bottom of this slide further explain the HPV vaccine schedule and dosing.

## ACIP HPV Recommendations: Ages 15–26

- 3 doses of HPV vaccine to adolescents starting the series at or after 15 years of age.
- Routine 3-dose schedule (0, 1-2, 6 months):
  - 2nd dose: 1 to 2 months after dose 1
  - 3rd dose: 6 months after dose 1
- Guidance on minimum intervals between doses:
  - 1<sup>st</sup> and 2<sup>nd</sup> dose: 4 weeks
  - 2<sup>nd</sup> and 3<sup>rd</sup> dose: 12 weeks
  - 1<sup>st</sup> and 3<sup>rd</sup> dose: 24 weeks



Information from Meites E, Kempe A, Markowitz LE. Use of a 2-Dose Schedule for Human Papillomavirus Vaccination—Updated Recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2016;65:1405–1408.; Image source: <https://www.cdc.gov/hpv/hcp/schedules-recommendations.html>.

- Administer 3 doses to previously unvaccinated persons starting the series at/after 15 years of age.
  - The second dose should be administered 1–2 months after the first dose and the third dose 6 months after the first dose.
  - The minimum interval between the first and second doses of HPV vaccine is 4 weeks.
  - The minimum interval between the second and third doses of vaccine is 12 weeks.
  - The minimum interval between the first and third dose is 24 weeks.
- Following an accelerated schedule using minimum intervals is not recommended. ACIP recommends following the recommended schedule of 0, 1–2, and 6 months.
- Selecting the linked image will take you to a web page that further explains the HPV vaccine schedule and dosing.



## ACIP HPV Recommendations: Special Populations

ACIP recommends HPV vaccination for immunocompromised persons 9 through 26 years of age with 3 doses of HPV vaccine. The recommended three-dose schedule is 0, 1–2 and 6 months.

### Examples of immunocompromising conditions:

- B lymphocyte antibody deficiencies
- T lymphocyte complete or partial defects
- HIV infection
- Malignant neoplasm
- Transplantation
- Autoimmune disease
- Receipt of immunosuppressive therapy

Information from Meites E, Kempe A, Markowitz LE. Use of a 2-Dose Schedule for Human Papillomavirus Vaccination—Updated Recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2016;65:1405–1408; <https://www.cdc.gov/vaccines/vpd/hpv/hcp/recommendations.html#schedules>.

- Immunocompromised persons should be vaccinated following the 3-dose schedule at 0, 1–2, and 6 months.
- Examples of immunocompromised persons include those with primary or secondary immunocompromising conditions that might reduce cell-mediated or humoral immunity, such as:
  - B lymphocyte antibody deficiencies
  - T lymphocyte complete or partial defects
  - HIV infection
  - Malignant neoplasm
  - Transplantation
  - Autoimmune disease
  - Receipt of immunosuppressive therapy

## ACIP HPV Recommendations: Special Situations

- **HPV vaccine can be administered to females who:**
  - Have equivocal or abnormal Pap test
  - Have positive HPV DNA test
  - Are breastfeeding
  
- **HPV vaccine can be administered to persons who:**
  - Have genital warts
  - Have altered immunocompetence

Information from Markowitz LE, Dunne EF, Saraiya M, et al. Human papillomavirus vaccination: recommendations of the Advisory Committee on Immunization Practices (ACIP) [published correction appears in *MMWR Recomm Rep.* 2014 Dec 12;63(49):1182]. *MMWR Recomm Rep.* 2014;63(RR-05):1–30.

- There are a variety of “special situations” for HPV vaccination.
  
- Vaccine can be administered to females 26 years of age or younger or those 27–45 years of age (based on shared clinical decision-making) who:
  - Have an equivocal or abnormal Pap test,
  - Have a positive HPV DNA test, meaning they are currently infected, or
  - Are breastfeeding
  
- HPV vaccination can be administered to persons who have:
  - Genital warts, or
  - Altered immunocompetence
  
- HPV is an inactivated vaccine, so it may be administered to immunocompromised persons for whom vaccination is recommended. This includes persons with HIV.
  
- Remember, as noted earlier, the vaccine will have no effect on existing disease or infection.

## ACIP HPV Recommendations: Special Situations

- **Pregnancy**
  - 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 manufacturer:  
Merck: <http://www.merckpregnancyregistries.com/gardasil9.html>

Information from Markowitz LE, Dunne EF, Saraiya M, et al. Human papillomavirus vaccination: recommendations of the Advisory Committee on Immunization Practices (ACIP) [published correction appears in *MMWR Recomm Rep.* 2014 Dec 12;63(49):1182]. *MMWR Recomm Rep.* 2014;63(RR-05):1–30.

- The HPV vaccine has not been causally associated with adverse pregnancy outcomes or with adverse effects on the developing fetus, but data on vaccination during pregnancy are limited.
- HPV vaccine is not recommended for use during pregnancy. If a woman is found to be pregnant after initiating the vaccination series, completion of the series should be delayed until after the pregnancy.
- If a vaccine dose has been inadvertently administered during pregnancy, there is no indication for medical intervention.
- A pregnancy registry has been established for 9vHPV and should be notified if the vaccine is inadvertently administered to a pregnant woman.
- Contact information for the registry is noted in the 9vHPV package insert.
- The bivalent and quadrivalent vaccine pregnancy registries have been closed with concurrence from FDA since those products are no longer used in the U.S.
- HPV vaccination during pregnancy can be reported to the vaccine manufacturer and to the Vaccine Adverse Event Reporting System (VAERS).

## ACIP HPV Immunization Recommendations: Additional Considerations

- No therapeutic effect on existing HPV infection, genital warts, or cervical lesions.
- Prevacination testing (HPV, Pap, pregnancy, etc.) is not recommended.
- The use of HPV vaccine does not eliminate the need for continued Pap test screening, since other cervical cancers are caused by HPV types not included in the vaccine.

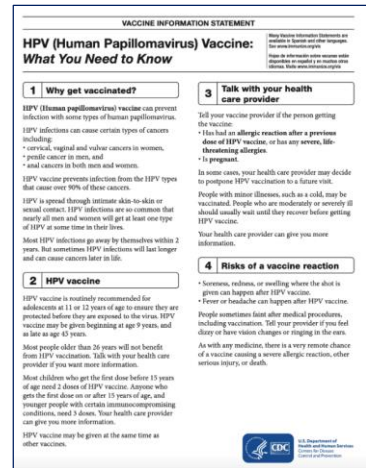
Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>.

- Patients should be advised the vaccine will not have a therapeutic effect on existing HPV infection, genital warts, or cervical lesions.
- Prevacination testing such as Pap tests, screening for high-risk HPV DNA, type-specific HPV tests, or HPV antibody or pregnancy testing is not needed nor recommended to determine if HPV vaccine can be administered.
- The use of HPV vaccine does not eliminate the need for continued Pap test screening, since other cervical cancers are caused by HPV types not included in the vaccine.

# COMMUNICATIONS

# CDC Vaccine Information Statement (VIS)

- Federal law requires that a VIS be provided to a patient, parent, or legal representative before each dose of HPV vaccines.
- VISs explain both the benefits and risks of the vaccine the patient is receiving.



Information from vaccine information statements [www.cdc.gov/vaccines/hcp/vis/](http://www.cdc.gov/vaccines/hcp/vis/); foreign language versions <https://www.immunize.org/vis/>

- All public and private vaccine providers are required by the National Childhood Vaccine Injury Act to give the appropriate Vaccine Information Statement or VIS to the patient (or parent or legal representative) prior to every dose of HPV vaccine.
- VISs explain both the benefits and risks of the vaccine the patient is receiving.
- VISs have been translated into about 40 languages. These can be found on the website of CDC's partner, the Immunization Action Coalition.
- The HPV Vaccine Information Statement can be found by clicking on the image on the right of the slide.
- Additional resources on the use of VISs are listed in the resources and references slides at the end of this presentation.

## CDC Vaccine Information Statement (VIS)

### How to provide a VIS prior to vaccination:

- Printed and given to patients
- Permanent, laminated office copies given to patients to read
- Viewed on a computer monitor or other video display
- Viewed on phone or other digital device
- Printed and given during a prior visit or told how to access it through the internet in advance

**Always offer the patient an opportunity to ask questions about the vaccine you are administering to them.**

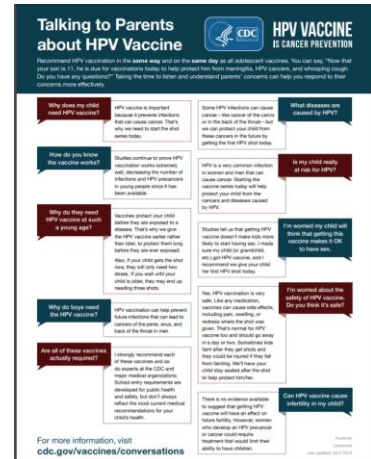
**The patient must be offered a copy of the VIS to take away following the vaccination. The patient may decline.**

Information from <https://www.cdc.gov/vaccines/hcp/vis/about/facts-vis.html>

- There are several ways that a VIS can be provided prior to vaccination.
  - Paper copies of the VIS can be printed and given to patients.
  - Permanent, laminated office copies may be given to patients to read.
  - Patients may view VISs on a computer monitor or other video display.
  - Patients may read the VIS on their phone or other digital device by downloading the pdf file from CDC's website.
  - Patients may be given a copy of a VIS during a prior visit or told how to access it through the internet so they can read it in advance. These patients must still be offered a copy to read during the immunization visit as a reminder.
- Always offer the patient an opportunity to ask questions about the vaccine you are giving them.
- The patient must still be offered a copy of the VIS to take away following the vaccination. The patient may decline.

# HPV Vaccine Communication

- Communication during the health care encounter is critical to vaccine acceptance.
- Often misrepresented as optional, whereas other adolescent vaccines are recommended.



[Tip sheet for health care providers](#)

Information from <https://www.cdc.gov/hpv/hcp/answering-questions.html>; Hughes CC, Jones AL, Feemster KA, Fiks AG. HPV vaccine decision making in pediatric primary care: a semi-structured interview study. *BMC Pediatr.* 2011;11:74. Published 2011 Aug 30. doi:10.1186/1471-2431-11-74; Goff SL, Mazor KM, Gagne SJ, Corey KC, Blake DR. Vaccine counseling: a content analysis of patient-physician discussions regarding human papillomavirus vaccine. *Vaccine.* 2011;29(43):7343–7349.

- One should recommend HPV vaccine when discussing other adolescent vaccines, making it part of your standard procedures. All indicated vaccines should be recommended in the same way and on the same day.
- The image on this slide depicts talking points that can be used to prepare responses to common questions about HPV. The link below the image includes the web address at which you will be able to review the tip sheet in greater detail.



## HPV Vaccine Communication

- Parents may have mixed or negative opinions with concerns about:
  - HPV vaccine being relatively new compared to some other vaccines
  - Vaccine safety and efficacy
  - Sending a message to adolescent it is OK to have sex



[Lacey Eden, NP, Describes How She Recommends HPV Vaccine](#)

Information from <https://www.cdc.gov/hpv/hcp/answering-questions.html>; Hughes CC, Jones AL, Feemster KA, Fiks AG. HPV vaccine decision making in pediatric primary care: a semi-structured interview study. *BMC Pediatr.* 2011;11:74. Published 2011 Aug 30. doi:10.1186/1471-2431-11-74; Goff SL, Mazor KM, Gagne SJ, Corey KC, Blake DR. Vaccine counseling: a content analysis of patient-physician discussions regarding human papillomavirus vaccine. *Vaccine.* 2011;29(43):7343–7349.

- A strong recommendation for HPV vaccination is very important. Parents may have mixed or negative opinions and concerns about the HPV vaccine. In the video on the right, Lacey Eden, NP, describes how she uses a bundled recommendation to normalize the HPV vaccine.

## LEGAL/ETHICAL ISSUES

## Legal and Ethical Considerations

### State vaccination requirements

- As of July 2020, at least five jurisdictions require HPV vaccination for school attendance:
  - Rhode Island
  - Virginia
  - Hawaii
  - Washington, D.C.
  - Puerto Rico

Information from <https://www.cdc.gov/vaccines/imz-managers/laws/index.html>.

(READ SLIDE)

## Legal and Ethical Considerations

### Vaccine exemptions

- All states provide medical exemptions.
- Some states offer religious and/or philosophical exemptions.
- Some states require these exemptions be sworn or affirmed through signed, notarized affidavits.
- Notwithstanding religious objections, children with vaccine exemptions may be excluded from child care facilities or school during an epidemic of any disease.

Information from <https://www.cdc.gov/vaccines/imz-managers/laws/index.html>.

(READ SLIDE)

## Legal and Ethical Considerations

### National Childhood Vaccine Injury Act (NCVIA)

- Passed by Congress in 1986
- Established Vaccine Adverse Event Reporting System (VAERS) to collect reports of vaccine adverse events
- Initiated the National Vaccine Injury Compensation Program (VICP) to compensate individuals who experience certain health events following receipt of a VICP-covered vaccine

Information from <https://www.cdc.gov/vaccines/imz-managers/laws/index.html>.

- Unsubstantiated vaccine injury claims caused a risk to the vaccine supply in the past because fear of lawsuits drove many manufacturers out of the vaccine business. In response, Congress passed the National Childhood Vaccine Injury Act in 1986. This law established the Vaccine Adverse Event Reporting System, which collects reports of vaccine adverse events and includes a reporting table for the National Vaccine Injury Compensation Program. This program was also initiated by the law to compensate individuals who experience certain health events following vaccination. The VAERS reporting table complements the Health Resources and Services Administration Injury Table, outlining distinct outcomes that are compensable, along with the time period when the outcome occurred following vaccination.

## Legal and Ethical Considerations

### Consent for vaccines

- There is no federal requirement for informed consent relating to immunization.
- Individual states may have laws outlining consent requirements.
- Health care systems/facilities also may have consent policies.

Information from <https://www.cdc.gov/vaccines/imz-managers/laws/index.html>.

(READ SLIDE)

# VACCINE STORAGE AND HANDLING

## Vaccine Storage and Handling

### Storage

- Store HPV vaccine in:
  - A refrigerator between 2°C–8°C (36°F–46°F)
  - Original packaging with the lids closed
  - Clearly labeled bin and/or area of the storage unit
- Do not freeze the vaccine.
- Protect the vaccine from light.

### Handling

- Administer as soon as possible after being removed from refrigeration.

Information from <https://www.fda.gov/media/90064/download>.

- HPV vaccine should be stored in the refrigerator between 2 degrees–8 degrees C (36 degrees–46 degrees F).
- Store vaccine in the original packaging in a clearly labeled bin in the storage unit. Use a label to identify the vaccine.
- Do not freeze the vaccine and protect the vaccine from light.
- Administer the vaccine as soon as possible after it is removed from refrigeration.



## Vaccine Storage and Handling

### Keys to vaccine storage

- Reliable storage and temperature monitoring equipment
- Accurate vaccine inventory management
- Well-trained staff



"Keys to Storing and Handling Your Vaccine Supply" Video

Information from [https://www2.cdc.gov/vaccines/ed/pinkbook/2019/downloads/PB5/SHVA\\_webinar\\_7-17-19.pdf](https://www2.cdc.gov/vaccines/ed/pinkbook/2019/downloads/PB5/SHVA_webinar_7-17-19.pdf).

- Proper vaccine storage and handling are important factors in ensuring vaccine potency, thereby preventing and eradicating many common vaccine-preventable diseases. Yet, each year, storage and handling errors result in revaccination of many patients and significant financial loss due to wasted vaccines. Failure to store and handle vaccines properly can reduce vaccine potency, resulting in inadequate immune responses in patients and poor protection against disease. Patients can lose confidence in vaccines and providers if they require revaccination because the vaccines they received may have been compromised.
- The following are necessary to protect a vaccine inventory:
  - Reliable storage and temperature monitoring equipment
  - Accurate vaccine inventory management
  - Well-trained staff
- The video depicted on the slide describes vaccine storage and handling. Additional resources on storage and handling are listed in the resources and references slides at the end of this presentation.

# VACCINE ADMINISTRATION

## Before Vaccine Administration

- Assess for needed vaccines by reviewing the immunization history.
  - Accept only written, dated records for HPV vaccine.
  - Compare to recommended vaccination schedule.
- Screen for contraindications and precautions.
- Discuss vaccine benefits, risks, and vaccine-preventable diseases using VISs and other reliable resources.
- Provide after-care instructions indicating how to respond to vaccine reactions.

Information from Centers for Disease. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Fund Control and Prevention Action; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; Kroger AT, Duchin J, Vázquez M. General Best Practice Guidelines for Immunization. Best Practices Guidance of the Advisory Committee on Immunization Practices (ACIP), April 20, 2017.

- The patient's immunization status should be reviewed at every health care visit. Using the patient's immunization history, health care personnel should assess for all routinely recommended vaccines, as well as any vaccines indicated based on health status, occupation, or other risk factors such as travel. Use the current immunization schedule based on the age of the patient to determine all vaccines that are needed.
- The immunization history may be obtained by using information from immunization information systems, current and previous medical records, and personal record cards. Providers should only accept written, dated records as evidence of vaccination for HPV vaccine.
- Before administering any vaccine, patients should be screened for contraindications and precautions, even if the patient has previously received that vaccine. The patient's health status may change from one visit to the next or recommendations regarding contraindications and precautions may have changed. Using a standardized, comprehensive screening tool helps staff assess patients correctly and consistently. Staff should be knowledgeable of contraindications and precautions to vaccination and only valid contraindications should be followed.
- Health care personnel should assess the level and type of information each patient or parent needs—for example, not everyone wants the same level of medical or scientific information about vaccines. Health care personnel need to be ready to answer questions. Fortunately, there are many resources available to help providers stay up to date on vaccine-related information, including vaccine information statements.
- Parent/patient education should also include a discussion of comfort and care strategies after vaccination. After-care instructions should include information for dealing with common side effects such as injection site pain, and fever. After-care instructions should also include information on when to seek medical attention and when to notify the health care provider about any concerns that arise following vaccination. A section on supportive care is detailed later in this slide deck.

## Contraindications and Precautions

### Screen for contraindications and precautions before administering vaccines:

- Severe allergic reaction (anaphylaxis) to vaccine component or following a prior dose
- Not recommended during pregnancy
- Gardasil®9 is contraindicated for persons with a history of severe allergy to yeast.
- Moderate or severe acute illness (defer until symptoms improve)

**Note: Minor illnesses (e.g., mild upper respiratory infection) are not contraindications to vaccination.**

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; <https://www.cdc.gov/std/hpv/stdfact-hpv-vaccine-young-women.htm>

- Patients and their family members count on health care personnel to administer vaccines safely. Screening helps prevent adverse reactions such as anaphylaxis.
- HPV vaccine should not be administered to persons with a history of a severe allergic reaction to a vaccine component or following a prior dose.
- HPV vaccine is also not recommended for pregnant women. Studies show that the HPV vaccine does not cause problems for babies born to women who were vaccinated while pregnant, but more research is still needed. A pregnant woman should not get any doses of the HPV vaccine until her pregnancy is completed.
- Gardasil®9 is contraindicated for persons with a history of severe allergy to yeast.
- A moderate or severe acute illness is a precaution to vaccination, and vaccination should be deferred until symptoms of the acute illness improve.
- Persons with a mild or minor acute illness (e.g., diarrhea or mild upper respiratory tract infection, with or without fever) can be vaccinated.
- Additional resources for screening for vaccine contraindications and precautions are listed in the resources and references slides at the end of this presentation.

## Vaccine Supplies and Preparation

- Follow aseptic medication preparation practices
- Perform hand hygiene before preparing vaccines.
- Use designated, clean preparation area.
- Prepare your own vaccines.
- Prepare vaccine only when ready to administer.
- Always follow the vaccine manufacturers' directions, located in the package insert.
- Check expiration date.



Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; <https://www2.cdc.gov/vaccines/ed/vaxadmin/va/index.html>. Videos from: <https://www.youtube.com/watch?v=SsCxncrsKM>; <https://www.youtube.com/watch?v=odQTVg7s3HA>

- Preparing vaccine properly is critical to maintaining the integrity of the vaccine during transfer from the manufacturer's vial to the syringe and, ultimately, to the patient. CDC recommends preparing and drawing up vaccines just before administration. When preparing vaccines:
  - Follow strict aseptic medication preparation practices.
  - Perform hand hygiene BEFORE preparing vaccines.
  - Use a designated, clean medication area that is not adjacent to any area where potentially contaminated items are placed.
  - Prepare your own vaccines.
  - Prepare vaccine only when ready to administer.
  - Always follow the vaccine manufacturer's directions, located in the package insert.
  - Check expiration date.
- Clicking on the linked videos, you can learn about the supplies and preparation required for providing intramuscular injections to children, in the first video, and to adults, in the second video.
- Additional resources on vaccine preparation are listed in the resources and references slides at the end of this presentation.

# Vaccine Administration

## Route

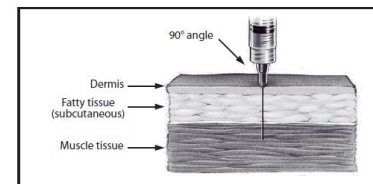
- IM injection

## Site

- Deltoid muscle in upper arm

## Needle Size

- 22- to 25-gauge
- 1–1.5 inches



**Patient should be seated or lying down during vaccination and remain in that position for 15 minutes after vaccination to mitigate or avoid potential syncope.**

Information from <https://www.cdc.gov/vaccines/vpd/hpv/hcp/recommendations.html>; <https://www2.cdc.gov/vaccines/ed/vaxadmin/va/ce.asp>; <https://www.cdc.gov/vaccines/ed/youcalltheshots.html>. Image source: Adapted from California Immunization Branch. Video from: <https://www.youtube.com/watch?v=PqSuCPnPeYE>

- Administer HPV vaccine via intramuscular injection using a 1- to 1-½ inch, 22- to 25-gauge needle.
  - The preferred site is the deltoid muscle in the upper arm.
  - A new needle and syringe should be used for each injection.
  - A single-dose vial is for one patient only.
  - An adhesive bandage may be applied to the site if bleeding occurs.
- Clicking on the linked video to the right, you can learn more about choosing site for IM injection administration.
- As discussed, HPV vaccines can be administered during the same clinical visit as other indicated vaccines.
- Patients should be seated or lying down during vaccination and remain in that position for 15 minutes after vaccination. This is to prevent any injuries that could occur from a fall because of syncope.
- Additional information about appropriate vaccine administration can be accessed through a e-learning module called *You Call the Shots*. The link can be found at the bottom of this slide as well as listed in the Vaccine Resources and References section at the end of this slide deck.

# DOCUMENTATION

# Documenting Vaccinations

All vaccinations should be documented in the patient's permanent medical record. Federal law requires documentation of:

- Vaccine manufacturer
- Vaccine lot number
- Date of administration
- Name and title of the person who administered the vaccine and the address of the facility where the permanent record will reside
- Edition date of the VIS and the date it was provided to the patient, parent, or legal guardian



Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; media clip from: <https://www.youtube.com/watch?v=xlyqUgKGFpk>

- Accurate and timely documentation can help prevent administration errors and curtail the number and cost of excess vaccine doses administered. In addition, preventing excess doses of vaccines may decrease the number of adverse reactions. All vaccines administered should be fully documented in the patient's permanent medical record. Health care providers who administer vaccines covered by the National Vaccine Injury Compensation Program are required to document the following information in the patient's permanent record:
  - Vaccine manufacturer
  - Vaccine lot number
  - Date of administration
  - Name and title of the person who administered the vaccine and the address of the facility where the permanent record will reside
  - Edition date of the VIS distributed, and the date provided
- This federal law applies to all routinely recommended childhood vaccines, even if many or most doses of the vaccine are administered to adults. The law applies to the on-point provider, who is not liable for previous lack of documentation. A provider is allowed to document self-reported doses. They are not liable if the report is wrong.
- The video linked to the right walks us through proper documentation of vaccines after administration.
- Additional resources for documenting vaccinations after administration are listed in the resources and references slides at the end of this presentation.



## Documentation: Best Practice Guidelines

- **Best practice guidelines also include documenting:**
  - Vaccine type
  - Route
  - Dosage (amount)
  - Anatomic site
- **Provide personal immunization record that includes the vaccinations and administration dates.**
- **Update medical records to include:**
  - Adverse events after vaccination

Information from Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C.: Public Health Foundation; 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; <https://www2.cdc.gov/vaccines/ed/vaxadmin/va/index.html>.

- Medication administration best practices also include documenting the vaccine type, route, dosage (amount), and site. The patient or parent/guardian should be provided with a personal immunization record that includes the vaccinations and date administered. Providers should update patients' permanent medical records to reflect any documented episodes of adverse events after vaccination.

## Reporting Vaccine Adverse Events

**Vaccine Adverse Event Reporting System (VAERS):** A passive surveillance system to monitor adverse events following vaccination

### **Health care providers are required by law to report:**

- Any adverse event listed by the vaccine manufacturer as a contraindication to further doses of the vaccine
- Any adverse event listed in the VAERS Table of Reportable Events Following Vaccination that occurs within the specified time period after vaccination

### **Health care providers are encouraged to report:**

- Any adverse event after the administration of a vaccine
- Vaccine administration errors

Information from <https://vaers.hhs.gov/reportevent.html>

- Severe, life-threatening anaphylactic reactions following vaccination are rare.
- Report significant adverse events that occur after vaccination of adults and children, even if you are not sure whether the vaccine caused the adverse event.
- VAERS accepts all reports, including reports of vaccine administration errors.
- Health care providers are required to report:
  - Any adverse event listed by the vaccine manufacturer as a contraindication to further doses of the vaccine
  - Any adverse event listed in the VAERS Table of Reportable Events Following Vaccination within the specified time period
- Health care providers are encouraged to report:
  - Any adverse event after the administration of a vaccine
  - Vaccine administration errors

## Reporting Adverse Events

### VAERS Table of Reportable Events Following Vaccination

Vaccine/Toxoid	Event and Interval from Vaccination
Human papillomavirus (quadrivalent, bivalent, or 9-valent) – 9vHPV, 4vHPV, 2vHPV	A. Anaphylaxis or anaphylactic shock (7 days) B. Shoulder injury related to vaccine administration (7 days) C. Vasovagal syncope (7 days) D. Any acute complication or sequelae (including death) of above events (interval not applicable) E. Events described in manufacturer’s package insert as contraindications to additional doses of vaccine (interval – see package insert)

Information from [https://vaers.hhs.gov/docs/VAERS\\_Table\\_of\\_Reportable\\_Events\\_Following\\_Vaccination.pdf](https://vaers.hhs.gov/docs/VAERS_Table_of_Reportable_Events_Following_Vaccination.pdf), accessed 7/14/2020

- Providers should report all adverse events after vaccination to VAERS. This table reflects conditions reportable by law, but providers should report any adverse event that concerns them.

# VACCINE SAFETY

## Adverse Reactions Following Gardasil®9

Adverse Events	Females 9-15 years	Females 16-26 years	Males 9-15 years	Males 16-26 years
Injection-site pain	89.3%	89.9%	71.5%	63.4%
Injection-site erythema	34.1%	34.0%	24.9%	20.7%
Injection-site swelling	47.8%	40.0%	26.9%	20.2%
Headache	11.4%	14.6%	9.4%	7.3%
Fever ≥ 100°F	6.7%	6.0%	10.4%	4.4%

- Serious adverse events in prelicensure trials: pyrexia, allergy, asthma, headache
- No new safety concerns in post-licensure studies

Information from Gardasil 9 Package Insert: <https://www.fda.gov/media/90064/download>, accessed 7/21/2020; <https://pediatrics.aappublications.org/content/144/6/e20191808>; <https://pediatrics.aappublications.org/content/144/6/e20191791>

- A variety of systemic adverse reactions have been reported following Gardasil administration, including pain, injection-site erythema, injection-site swelling, headache, and fever of 100 degrees F or greater. Serious adverse events in prelicensure trials included pyrexia, allergy, asthma, and headache. No new safety concerns have been identified in post-licensure studies.

## Syncope Following Vaccination

- The Institute of Medicine found that evidence convincingly supports a causal relationship between any injectable vaccine and syncope.
- 70% of syncopal episodes occurred within 15 minute of vaccination.
- Serious injuries have resulted.
- Patients should be seated or lying down during vaccine administration.
- ACIP recommends providers strongly consider observing patients for 15 minutes after vaccination. Patients should be seated or lying down during observation.

Information from Kroger AT, Atkinson WL, Marcuse EK, Pickering LK. Advisory Committee on Immunization Practices (ACIP) Centers for Disease Control and Prevention (CDC). General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP) [published correction appears in *MMWR Morb Mortal Wkly Rep.* 2006 Dec 8;55(48):1303] [published correction appears in *MMWR Morb Mortal Wkly Rep.* 2007 Mar 23;56(11):256] [published correction appears in *Pediatrics.* 2007 May;119(5):1008]. *MMWR Recomm Rep.* 2006;55(RR-15):1–48; <http://www.iom.edu/Reports/2011/Adverse-Effects-of-Vaccines-Evidence-and-Causality.aspx>.

- Syncope has been reported among adolescents who received HPV and other vaccines recommended for this age group (tetanus, diphtheria, and acellular pertussis vaccine [Tdap], meningococcal conjugate vaccines [MCV4]).
- 70% of syncopal episodes occurred within 15 minutes of vaccination and serious injuries have resulted.
- Recipients should be seated or lying down during vaccine administration.
- ACIP recommends clinicians should consider observing vaccine recipients for 15 minutes after vaccination. Vaccine recipients should be seated or lying down during observation.

# NURSING CONSIDERATIONS

# Nursing Considerations

## Supportive treatment

	Mild to moderate reaction	Severe reaction (anaphylaxis)
Reactions	Soreness, redness, itching, swelling	Flushing, facial edema, urticaria, itching, swelling of the mouth/throat, wheezing, difficulty breathing.
Treatment	Cool, damp cloth to help reduce redness, soreness, and/or swelling at the injection site; antipyretics can be used for fever and local discomfort following vaccination	Call 911, administer CPR, provide epinephrine or equivalent (e.g., EpiPen), immediate transfer to hospital

Information from Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C. Public Health Foundation, 2015; <https://www.cdc.gov/vaccines/pubs/pinkbook/index.html>; <https://www.cdc.gov/vaccines/parents/by-age/months-1-2.html>.

## Supportive treatment

- Mild to moderate reaction
  - Reactions: Soreness, redness, itching, swelling
  - Treatment: Cool, damp cloth to help reduce redness, soreness, and/or swelling at the injection site. Evidence does not support use of antipyretics before or at the time of vaccination. However, they can be used for the treatment of fever and local discomfort that might occur following vaccination.
- Severe reaction (anaphylaxis)
  - Severe, life-threatening anaphylactic reactions following vaccination are rare. Staff must have in place and be familiar with procedures for managing a severe reaction. Staff should be familiar with the signs and symptoms of anaphylaxis, which usually begin within minutes of vaccination.
  - These signs and symptoms can include, but are not limited to, flushing, facial edema, urticaria, itching, swelling of the mouth or throat, wheezing, and difficulty breathing. Each staff member should know their role in the event of an emergency and all vaccination providers should be certified in cardiopulmonary resuscitation (CPR).
- Epinephrine and equipment for maintaining an airway should be available for immediate use. After the patient is stabilized, arrangements should be made for immediate transfer to an emergency facility for additional evaluation and treatment.



# Nursing Considerations

## Vaccinate with Confidence

- CDC's strategic framework to strengthen vaccine confidence and prevent outbreaks of vaccine-preventable diseases in the United States
- Key priorities:
  - Protect communities.
  - Empower families.
  - Stop myths.



Child vaccination coverage remains high nationally, and most parents are confident in the safety and effectiveness of vaccines. However, the spread of myths and misinformation has put some communities at risk. When misleading information circulates, vaccination coverage can fall and increase the risk for outbreaks of vaccine-preventable diseases.

### A New Approach

Vaccinate with Confidence is CDC's strategic framework to strengthen vaccine confidence and prevent outbreaks of vaccine-preventable diseases in the United States.

Vaccinate with Confidence will strengthen public trust in vaccines by advancing three key priorities:

#### Protect Communities

Vaccination rates remain strong nationally, but pockets of under-vaccination persist in some locations, putting communities at risk for outbreaks. CDC will support states, cities, and counties to find these communities and take steps to protect them.

#### Empower Families

Trust in vaccines is not built through a top-down approach, but through millions of conversations between parents, doctors, nurses, pharmacists, and community members. CDC will expand resources for health care professionals to support effective vaccine conversations.

#### Stop Myths

To stop misinformation from eroding public trust in vaccines, CDC will work with local partners and trusted messengers to improve confidence in vaccines among at-risk groups, establish partnerships to contain the spread of misinformation, and reach critical stakeholders to provide clear information about vaccination and the critical role it plays in protecting the public.



Image courtesy of the American Academy of Pediatrics and AAP Images



Information from <https://www.cdc.gov/vaccines/partners/vaccinate-with-confidence.html>.

## Vaccinate with Confidence

- *Vaccinate with Confidence* is CDC's strategic framework to strengthen vaccine confidence and prevent outbreaks of vaccine-preventable diseases in the United States. This slide contains links to the *Vaccinate with Confidence* web page and fact sheet.
- *Vaccinate with Confidence* will strengthen public trust in vaccines by advancing three key priorities:
  - Protect communities.
  - Empower families.
  - Stop myths.
- *Protect communities*: Vaccination coverage remains strong nationally, but pockets of undervaccination persist in some locations, putting communities at risk for outbreaks. CDC will support states, cities, and counties in finding these communities and taking steps to protect them.
- *Empower families*: Trust in vaccines is not built through a top-down approach, but through millions of conversations between parents, doctors, nurses, pharmacists, and community members. CDC will expand resources for health care professionals to support effective vaccine conversations.
- *Stop myths*: To stop misinformation from eroding public trust in vaccines, CDC will work with local partners and trusted messengers to improve confidence in vaccines among at-risk groups, establish partnerships to contain the spread of misinformation, and reach critical stakeholders to provide clear information about vaccination and the critical role it plays in protecting the public.

# VACCINE RESOURCES AND REFERENCES

## Vaccine Resources and References

### ACIP recommendations

- Current ACIP human papillomavirus vaccine recommendations  
<https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/hpv.html>
- ACIP General Best Practice Guidelines for Immunization  
<https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html>

### Disease

- HPV For Healthcare Professionals  
<https://www.cdc.gov/hpv/hcp/index.html>
- CDC Human Papillomavirus Pink Book Webinar Series  
<https://www2.cdc.gov/vaccines/ed/pinkbook/2019/pb13.asp>

## Vaccine Resources and References

### Immunization Strategies

- Immunization Information Systems  
<https://www.cdc.gov/hpv/hcp/index.html>
- Immunization Quality Improvement for Providers  
<https://www.cdc.gov/vaccines/programs/iqip/at-a-glance.html>
- Comprehensive Clinic Assessment Software Application  
<https://www.cdc.gov/vaccines/programs/cocasa/index.html>

## Vaccine Resources and References

### Manufacturer's vaccine package inserts (PIs)

- Gardasil<sup>®</sup>, Merck & Co., Inc (No longer available in U.S. as of 2017).  
<https://www.fda.gov/vaccines-blood-biologics/vaccines/gardasil>
- Cervarix<sup>®</sup>, GlaxoSmithKline (No longer available in U.S. as of 2016).  
<https://www.fda.gov/vaccines-blood-biologics/vaccines/cervarix>
- Gardasil<sup>®</sup>9, Merck & Co., Inc  
<https://www.fda.gov/vaccines-blood-biologics/vaccines/gardasil-9>

## Vaccine Resources and References

### Immunization schedules

- [Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger](#)
- [Recommended Adult Immunization Schedule for ages 19 years or older](#)
- [Catch-Up Immunization Schedule](#)

## Vaccine Resources and References

### Communications

- #HowIRecommend Vaccination Video Series  
<https://www.youtube.com/playlist?list=PLvvp9iOILTQYCC6DnrG4FuRT8SpdUnMbZ>
- Current Vaccine Information Statements (VISs)  
<https://www.cdc.gov/vaccines/hcp/vis/current-vis.html>
- HPV Boosting Vaccination Rates  
<https://www.cdc.gov/hpv/hcp/boosting-vacc-rates.html>
- HPV Answering Parents' Questions  
<https://www.cdc.gov/hpv/hcp/answering-questions.html>
- American Academy of Pediatrics: Documenting Parental Refusal to Have Their Children Vaccinated  
[https://www.aap.org/en-us/Documents/immunization\\_refusaltovaccinate.pdf](https://www.aap.org/en-us/Documents/immunization_refusaltovaccinate.pdf)

## Vaccine Resources and References

### Communications

- Immunization Action Coalition: Decision to Not Vaccinate My Child  
<https://www.immunize.org/catg.d/p4059.pdf>
- Instructions for Using VISs  
<https://www.cdc.gov/vaccines/hcp/vis/about/required-use-instructions.html>
- Translated VISs  
<https://www.immunize.org/vis/?f=9>

### Vaccine storage and handling

- *Vaccine Storage and Handling Toolkit*  
<https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/index.html>



## Vaccine Resources and References

### Vaccine storage and handling

- “Keys to Storing and Handling Your Vaccine Supply”  
<https://www.youtube.com/watch?v=VCzO8Zod8DI>

### Vaccine administration

- Immunization Action Coalition Clinic Tools Screening for Vaccine Contraindications and Precautions  
<https://www.immunize.org/clinic/screening-contraindications.asp>
- CDC Vaccine Administration Resource Library  
<https://www.cdc.gov/vaccines/hcp/admin/resource-library.html>

## Vaccine Resources and References

### Vaccine administration

- You Call the Shots Module- Vaccine Administration  
<https://www2.cdc.gov/vaccines/ed/vaxadmin/va/ce.asp>
- Intramuscular (IM) Injection: Supplies (Children Birth Through 18 Years of Age): <https://www.youtube.com/watch?v=SsCxncrsKM>
- Intramuscular Injection: Supplies (Adults 19 Years of Age and Older)  
<https://www.youtube.com/watch?v=odQTVg7s3HA>
- Intramuscular (IM) Injection: Sites  
<https://www.youtube.com/watch?v=PqSuCPnPeYE>

## Vaccine Resources and References

### Documentation

- Documentation of Vaccinations After Administration  
<https://www.youtube.com/watch?v=xlyqUgKGFPk>

### Safety

- <https://www.cdc.gov/vaccinesafety/vaccines/hpv/hpv-safety-faqs.html#A10>
- <https://www.cdc.gov/vaccinesafety/vaccines/hpv-vaccine.html>

# GLOSSARY

## Glossary

- **Anaphylaxis:** A severe and sometimes fatal allergic reaction characterized by hives, itching, respiratory difficulty, and shock; this condition requires immediate medical attention.
- **Accelerated schedule:** A schedule that allows vaccines to be administered at sooner than routinely recommended intervals.
- **Communicability:** Ability to spread disease; also known as infectious.
- **Contraindication:** A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition. If the vaccine is administered in the presence of that condition, the resulting adverse reaction could seriously harm the recipient.
- **Diluent:** A diluting agent (e.g., a liquid) added to reconstitute lyophilized vaccine before administration (manufacturers of freeze-dried vaccine also supply the matching diluents).
- **Direct contact:** The transmission of an infectious agent through skin-to-skin contact, kissing, and sexual intercourse.
- **DNA virus:** Virus that has DNA as its genetic material and is replicated by either host or virally encoded DNA polymerases; most viruses have either RNA or DNA as their genetic material.

## Glossary (continued)

- **Immunocompromised:** A condition in which the immune system is unable to protect the body from disease. This condition can be caused by disease (like HIV infection or cancer) or by certain drugs (like those used in chemotherapy). Individuals whose immune systems are compromised should not receive live, attenuated vaccines.
- **Incidence:** The number of new disease cases reported in a population over a certain period of time.
- **Informed consent:** Process by which a patient or parent makes a voluntary decision about a procedure or intervention after being fully informed by a health care provider about the risks and benefits of the procedure or intervention; some states have informed consent laws for vaccination.
- **Informed refusal:** Refusal of a recommended medical treatment, such as vaccination, based on an understanding of the facts and implications of not following the recommended treatment.
- **Metropolitan area:** Geographical region with a relatively high population density.
- **Papanicolaou (pap) testing:** Process in which a sample of cells is gently scraped from the surface of the cervix to screen for cell changes and cervical cancer.

## Glossary (continued)

- **Precaution:** A condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity.
- **Reservoir:** Habitat in which an infectious agent normally lives, grows, and multiplies; reservoirs include humans, animals, and the environment.
- **Sequelae:** The after effects of a disease or injury.
- **Subunit vaccines:** vaccine that includes only parts of the virus or bacteria, subunits, instead of the entire germ. Because these vaccines contain only the essential antigens and not all the other molecules that make up the germ, side effects are less common.
- **Supportive treatment:** Treatment provided to keep a person comfortable.

## Glossary (continued)

- **Syncope:** Fainting or a temporary loss of consciousness caused by decreased blood flow to the brain. Although fainting has a variety of possible causes, it is usually triggered by pain or anxiety. Sometimes people faint after vaccination. People who faint might fall and injure themselves if they are not sitting or lying down at the time that they lose consciousness. Sometimes when people faint, their muscles twitch and their bodies make jerking movements. This can sometimes be confused with a seizure but is not actually a seizure.
- **Temporal pattern:** Occurrence of health-related events by time.
- **Up to date:** An individual has received all doses of a vaccine series for a given age in accordance with ACIP recommendations.