



Pediatric Immunizations

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Disclosures

Deena Garner, DNP, APRN, CPNP-PC

- Has no financial relationship with commercial interests
- This presentation contains no reference to unlabeled/unapproved uses of drugs or products

Learning Objectives

- Identify vaccine classifications and characteristics.
- Describe general recommendations of vaccine administration
- Compare contraindications with invalid contraindications for immunizations.
- Identify immunizations required or recommended for infants, children, and adolescents.
- Educate patients and families regarding immunizations.
- Explain common side effects and adverse reactions to immunizations.

Overview of Vaccine Administration

- **ALL VACCINES CAN BE ADMINISTERED AT THE SAME VISIT**
 - Ex: MMR, Varicella, Nasal Influenza
 - if not given on same day, the live vaccines must be separated by 28 days (4 weeks).
- Antibody containing products can interfere with live vaccines
 - Give vaccines and antibodies on the same day or:
 - Vaccine first then wait 2 weeks before antibody
 - Antibody first then wait 3 months before vaccine
 - Give MMR/ Varicella at the same time as Synagis or the above rules apply
 - Give MMR and TB test on same day (+/- 1-2 days) or wait 4 weeks in between.

Overview of Vaccine Administration

- **Intervals between doses of same vaccines...**
 - **MUST FOLLOW MINIMUM INTERVALS**
 - **THERE IS NO MAXIMUM INTERVAL**
 - **NEVER RESTART A SERIES**

CONTRAINDICATIONS

Invalid Contraindications

- Mild illness
- Antimicrobial therapy
- Disease exposure or healing
- Pregnant or immunocompromised person in household*
- Breastfeeding
- Preterm birth
- Allergy to products not present in the vaccines or allergy that is NOT anaphylactic
- Family history of adverse reaction
- Tuberculin skin test being placed*
- Multiple vaccines

Valid Contraindications

- Severe allergic reaction to any component
- Encephalopathy not due to other cause
- SCIDS
- History of intussusception (rotavirus)
- Immunosuppression

Vaccine Classification:

- **Inactivated vaccines**

- Hepatitis B
- Hepatitis A
- IPV

- **All live vaccines**

- MMR
- Rota
- Nasal Influenza

Question

Which of the following children should NOT receive a live vaccine?

1. A one-year-old who has not been exposed to eggs because his grandmother seems to be allergic to eggs.
2. An otherwise healthy child with otitis media and a temperature of 100.6°F.
3. A child who develop injection site pain, was fretful, would not eat, and had a temperature of 101°F for 24 hours following the last dosage of the vaccine he/she is to receive today.
4. A child with cancer in remission whose last chemotherapy treatment was 35 days ago.

Question

Which of the following children should NOT receive a live vaccine?

Answer: A child with cancer in remission whose last chemotherapy treatment was 35 days ago.

Hepatitis B Vaccine Routine Infant Schedule

Dose	Usual Age	Minimal Interval
Dose 1 (Monovalent must be used)	Birth	-----
Dose 2	1-2 months	4 weeks
Dose 3	6-18 months	8 weeks

****The third dose is given a minimum of 8 weeks after second dose and at least 16 weeks after the first dose.**

- Babies of mothers who are HBsAg+ or status is unknown should have third dose by 6 months of age.
- All children not previous vaccinated with hepatitis B vaccine should be vaccinated ASAP

Diphtheria, Tetanus, and Acellular Pertussis Vaccine Vaccination Schedule

Dose	Usual Age	Minimal Interval
Dose 1 (DTaP)	2 months	-----
Dose 2(DTaP)	4 months	4 weeks
Dose 3(DTaP)	6 months	4 weeks
Dose4 (DTaP)	15-18 months	6 months
Dose 5(DTaP)	4-6 years	6 months
Dose 1 (Tdap given)	11-12 years	

The number of doses of DT needed to complete the series depends on the child's age at the first dose:

- if first dose given at younger than 12 months of age, 4 doses are recommended
- if first dose given at 12 months or older, 3 doses complete the primary series

The **Tdap** note in 2019 was updated to indicate those who receive a dose of Tdap or diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP) at age 7-10 years inadvertently or as part of the catch-up series should still receive the routine dose of Tdap at age 11-12 years.

Polio Vaccination Schedule

Dose	Usual Age	Minimal Interval
Dose 1	2 months	-----
Dose 2	4 months	4 weeks
Dose 3	6-18 months	4 weeks
Dose 4	4-6 years	6 months

- The first dose may be given as early as 6 weeks of age but is usually given at 2 months of age.
- If accelerated protection is needed, the minimum interval between each of the first 3 doses of IPV is 4 weeks.
- A polio vaccination schedule begun with OPV should be completed with IPV
- If an IPV dose is appropriately given after 4 years of age (regardless of the number of previous doses) no further doses are needed.



Rotarix (RV1) 2 dose series

RotaTeq (RV5) 3 dose series

Dose	Age	Minimal Interval	Dose	Age	Minimal Interval
Dose 1	2 months	-----	Dose 1	2 months	-----
Dose 2	4 months	4 weeks	Dose 2	4 months	4 weeks
			Dose 3	6 months	4 weeks

- Minimum age to begin is 6 weeks of age.
- If any dose in the series is either RotaTeq or unknown, default to 3-dose series.
- Do not start the series on or after age 15 weeks, 0 days.
- The maximum age for the final dose is 8 months, 0 days.
- Infants documented to have had rotavirus gastroenteritis before receiving the full course of rotavirus vaccinations should still begin or complete the 2- or 3-dose schedule following the age recommendations.
- Do not repeat a dose if it is spit out or regurgitates the vaccine.

Pneumococcal (PCV 13) Vaccination Schedule

Dose	Usual Age	Minimal Interval
Dose 1	2 months	-----
Dose 2	4 months	4 weeks
Dose 3	6 months	4 weeks
Dose 4	12-15 months	8 weeks

- First dose as early as 6 weeks
- Unvaccinated children 7 months of age or older require fewer doses
- PCV13 should be administered at the same time as other routine childhood immunizations, using a separate syringe and injection site.
- For children vaccinated at younger than 12 months of age, the minimum interval between doses is 4 weeks. Doses given at 12 months of age and older should be separated by at least 8 weeks.



Haemophilus influenzae type b Vaccination Schedule

Dose	Usual Age	Minimal Interval
Dose 1	2 months	-----
Dose 2	4 months	4 weeks
Dose 3	6 months	4 weeks
Dose 4	12-15 months	8 weeks

- Minimum age is 6 weeks.
- Recommended interval 8 weeks for primary series doses.
- Unvaccinated children 7 months of age and older may not require a full series of three or four doses. The number of doses a child needs to complete the series depends on the child's current age.
- No dosage is recommended for children at 5 years of age or later



Influenza Vaccine (Inactivated) Dosages

Age	Dose	Number of Doses
6-35 months	0.25 ml	1 or 2
3-8 years	0.5 ml	1 or 2
>9 years	0.5 ml	1

- ACIP recommends routine vaccination for all persons 6 months of age or older.

Live Nasal Flu Vaccine

- Live attenuated influenza vaccine (LAIV4)
- Contains four flu viruses
- Appropriate for children at least 2 years of age.
- Some health conditions are contraindications

MMR Vaccine

- All children 12 months of age and older should get MMR vaccine.
 - The second dose is usually given at age 4-6 years
 - Can be given anytime after 4 weeks of the first dose
- **Repeat MMR is NOT a booster, it is a revaccination**
 - 2-5% of vaccinees do not respond with first vaccine.
- Measles and Mumps viruses grow in chick embryo fibroblast culture. Studies have shown safety of MMR in egg allergic children. Vaccinate without testing.

MMR Vaccine

- **Contraindications and Precautions**

- Severe allergic reaction to vaccine component or previous vaccine
- Moderate or severe acute illness
- Pregnancy
- Immunosuppression
- Recent blood product
- Personal or family history of seizures of any etiology (MMRV only)

- **Adverse Reactions:** Fever, Rash, Joint symptoms, Thrombocytopenia, Parotitis, Deafness, Encephalopathy

• Varicella Vaccine Recommendations for Children

- First dose given at 12-15 months of age
- Second dose given at 4-6 years of age
 - Minimal interval between doses of varicella vaccine for children younger than 13 years of age is 3 months.
 - If varicella and MMR vaccines are not administered at the same visit, they should be separated by at least 28 days.
- MMR and MMRV (ProQuad) can be used for both the 12 month and 4-6 yo vaccines
 - The CDC recommends that the MMR and Varicella be separate vaccines at 12 months and the MMRV can be used for the 4-6 yo vaccine

Varicella Vaccine

Contraindications and precautions

- Severe allergic reaction to vaccine or vaccine component
- Immunosuppression
- Pregnancy
- Moderate to severe acute illness
- Recent blood product
- Personal or family history of seizures of any etiology

Adverse Reactions

- Injection site pain and erythema
- Generalized rash; may be maculopapular rather than vesicular; average of 5 lesions
- Systemic reactions rare

Shingles following Vaccination

- Most cases in children and not all cases caused by vaccine virus. Usually a mild illness

Hepatitis A Vaccine

- ACIP recommends routine Hepatitis A vaccination of **all** children.
- Pediatric formulations approved for persons 12 months thru 18 years
- **Hepatitis A Vaccine Recommendations for Children:**
 - First dose after 1 year old
 - Second dose at least 6 months later
- **Contraindications and Precautions**
 - Severe allergic reaction to vaccine component or previous vaccine
 - Moderate or severe acute illness
- **Adverse Reactions**
 - Pain at injection site
 - Systemic reactions not common; no serious adverse events reported

HPV Vaccination Series

Recommended
number of HPV
vaccine doses

Recommended
interval between
doses

Persons initiating HPV vaccination at ages 9 through 14 years*, except immunocompromised persons†

2

0, 6-12 months‡

Persons initiating HPV vaccination at ages 15 through 26 years§ and immunocompromised persons† initiating HPV vaccination at ages 9 through 26 years

3

0, 1-2, 6 months||

- *ACIP recommends routine HPV vaccination for adolescents at age 11 or 12 years; vaccination may be given starting at age 9 years. † Persons with primary or secondary immunocompromising conditions that might reduce cell-mediated or humoral immunity (see also: Medical conditions). ‡ In a 2-dose schedule of HPV vaccine, the minimum interval between the first and second doses is 5 months. § For persons who were not adequately vaccinated previously, ACIP recommends vaccination for females through age 26 years and for males through age 21 years; males ages 22 through 26 years may be vaccinated. Vaccination is recommended for some persons aged 22 through 26 years; see Medical Conditions and Special Populations. || In a 3-dose schedule of HPV vaccine, the minimum intervals are 4 weeks between the first and second doses, 12 weeks between the second and third doses, and 5 months between the first and third doses.

- Meites E, et al. *MMWR*. 2016;65:1405-1408.

Adverse Events

- Adverse events from the HPV vaccine are usually mild and transient, and include:
 - Pain, redness, or swelling at the injection site
 - Fever
 - Headache or feeling tired
 - Nausea
 - Muscle or joint pain
- Fainting may occur after vaccination – patients should sit or lie down during vaccination and be observed for 15 minutes afterwards

Meningococcal Vaccine

- Serogroup A, C, Y, W meningococcal vaccines

- **Menactra or Menveo (MCV4):**
 - Quadrivalent meningococcal **conjugate** vaccine
 - **Minimum age:**
 - 2 months [Menveo]
 - 9 months [Menactra]

- **Routine Schedule:**

- 2-dose series: 11-12 years and 16 years.

- Serogroup B meningococcal vaccines

- Bexsero or Trumenba
 - **Minimum age: 10 years**
- **Not a Routine Vaccination**

Meningococcal Vaccine

Contraindications and Precautions:

- Severe allergic reaction to vaccine component or previous vaccine
- Moderate or severe acute illness

Adverse Reactions

- Local reaction for 1-2 days
- Fever >100
- Systemic reactions: headache, malaise, and fatigue

Combination Vaccinations

Vaccine(b)	Trade name (year licensed)	Age range	Routinely recommended ages
HepA-HepB	Twinrix (2001)	≥18 years	Three doses on a schedule of 0, 1, and 6 months
DTaP-HepB-IPV	Pediarix (2002)	6 weeks-6 years	Three-dose series at 2, 4, and 6 months of age
MMRV	ProQuad (2005)	12 months-12 years	Two doses, the first at 12-15 months, the second at 4-6 years
DTaP-IPV	Kinrix (2008)	4-6 years	Fifth dose of DTaP and fourth dose of IPV
DTaP-IPV/Hib	Pentacel (2008)	6 weeks-4 years	Four-dose schedule at 2, 4, 6, and 15-18 months of age
Hib-MenCY	MenHibrix (2012)	6 weeks-18 months	Four-dose schedule at 2, 4, 6, and 12-15 months of age(c)
DTaP-IPV	Quadracel (2015)	4-6 years	Fifth dose of DTaP and fourth or fifth dose of IPV



Question 1

A 15-year-old female received the first dose of HPV-9 at 11 years of age and has not received any other vaccinations since that time. She is asking how many more HPV shots she will have to receive to complete the series. The correct response is:

1. One
2. Two
3. Three
4. Since the minimal time frame has lapsed, she does not need another.

Question 1

A 15-year-old female received the first dose of HPV-9 at 11 years of age and has not received any other vaccinations since that time. She is asking how many more HPV shots she will have to receive to complete the series. The correct response is:

Answer: One

Question 2

A 4-year-old received her third inactivated poliovirus (IPV) on July 18th, a week after her fourth birthday. When can she receive her fourth IPV to complete the series?

1. Anytime after August 18th
2. 6 months after the 3rd dose
3. 4 days before August 18th
4. A fourth dose is not necessary

Question 2

A 4-year-old received her third inactivated poliovirus (IPV) on July 18th, a week after her fourth birthday. When can she receive her fourth IPV to complete the series?

Answer: A fourth dose is not necessary

Question 3

A 4-year-old has been using a low dose prescribed topical steroid BID for one week due to a flare up of his eczema. He is in remission from Acute Lymphoblastic Leukemia. His last chemotherapy was 6 months ago. When may he receive the MMR and Varicella vaccines?

1. Both today
2. MMR today and Varicella in 4 weeks
3. In 28 days
4. As soon as the steroid has been discontinued for 2 weeks

Question 3

A 4 year old has been using a low dose prescribed topical steroid BID for one week due to a flare up of his eczema. He is in remission from Acute Lymphoblastic Leukemia. His last chemotherapy was 6 months ago. When may he receive the MMR and Varicella vaccines?

Answer: Both today

Question 4

A 15 month old has received the following immunizations:

- Birth: Hep B
- 6 Weeks: Hep B
- 2 months: Rotavirus, DTaP, Hib, PCV, IPV
- 4 months: same as 2 months
- 6 months: Hep B, Rotavirus, DTaP, Hib, PCV
- 12 months: Hib, PCV, IPV, MMR, Varicella

Which, if any, vaccinations should be given during the 15-month check-up?

1. DTaP, Hep A, and Influenza (if in season)
2. DTaP, Hep A, MMR and Influenza (if in season)
3. DTaP and Hep A
4. DTaP, Hep A, Hep B, and Influenza (if in season).

Question 4

A 15 month old has received the following immunizations:

- Birth: Hep B
- 6 Weeks: Hep B
- 2 months: Rotavirus, DTaP, Hib, PCV, IPV
- 4 months: same as 2 months
- 6 months: Hep B, Rotavirus, DTaP, Hib, PCV
- 12 months: Hib, PCV, IPV, MMR, Varicella

Which, if any, vaccinations should be given during the 15-month check-up?

Answer: DTaP, Hep A, and Influenza (if in season)