

Teaching Immunization

for Medical Education (TIME)



MULTISTATION CLINICAL TEACHING SCENARIOS

Childhood Vaccination: Facilitator's Answer Key

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SOURCES OF INFORMATION ON CHILDHOOD VACCINATION

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2. Plotkin SA, Orenstein WA, eds. *Vaccines*. 5th ed. Philadelphia, PA: W.B. Saunders Company; 2008.
3. Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. Atkinson W, Wolfe S, Hamborsky J, McIntyre L, eds. 12th ed. Washington DC: Public Health Foundation, 2011. This book may be viewed at <http://www.cdc.gov/vaccines/pubs/pinkbook/default.htm> and may be purchased from the Public Health Foundation by calling 1-877-252-1200.
4. Feigin R, Cherry J, Demmler-Harrison G, Kaplan S. *Feigin and Cherry's Textbook of Pediatric Infectious Diseases*. 6th ed. Saunders. 2009.
5. Shots smartphone app software. Available free at www.immunizationed.org.

Answers to Questions for Learners – Scenario One

1. What vaccination(s) are indicated?

DTaP #1, Hib #1, IPV #1, PCV13 #1, RV #1, and hepatitis B #2. Combination vaccines can be used to lessen the number of needle sticks.

Combination Vaccines

1. Pentacel® = DTap + IPV/Hib
2. Pediarix® = DTap + IPV + Hepatitis B
3. Comvax® = Hepatitis B + Hib

2. By what route and site should the vaccines be given?

DTaP, Hib, PCV13 and hepatitis B are given IM in the anterolateral thigh. RV is oral. IPV is SQ.

3. How would you answer the parents' question, "Are so many shots really needed?"

Historically, larger numbers of cases of vaccine-preventable diseases were greatly reduced by vaccination. Deaths, hospitalizations, and brain damage decreased as well. Since these diseases are contagious, they can return if immunization rates drop, as has happened in other developed countries when immunization rates dropped (see Table 2). The immune system is capable of responding to 100,000 vaccines at one time, according to the abstract by Dr. Offit, et al.

4. What information about vaccines should be given prior to vaccination?

Vaccine Information Statements are currently available for all vaccines that Joan should received today. They should be given to the legal parent or guardian of any child receiving these vaccinations.

Take Home Points

- Since these diseases are contagious, they can return if immunization rates drop, as has happened in other developed countries when immunization rates dropped.
- Each infant has the theoretical capacity to respond to about 100,000 vaccines at any one time.

Answers to Questions for Learners – Scenario Two

1. Which vaccinations are due today?

Rose is due for the second dose of DTaP, Hib, IPV PCV13, inactivated influenza vaccine, and hepatitis B vaccine. Combination vaccines can be used to reduce the number of injections. RV is not recommended since the final dose should be administered by age 8 months 0 days; Rose is now 10 months old.

2. Are any of these vaccines contraindicated today? If so, why and which ones? If not, why not?

None of these vaccines are contraindicated today. A mild upper respiratory tract infection is not a valid contraindication to vaccination. She could have been vaccinated at 5 months of age when she had a cold and should be vaccinated today. The presence of a pregnant household contact is not a valid contraindication to any routine childhood vaccination. A family history of allergies is not a contraindication.

3. Rose had a 10-month lapse since her first hepatitis B vaccination. How many doses does she need now? Does Rose need to restart this or any of the vaccination series?

Rose needs two more doses of hepatitis B vaccine. The routine childhood hepatitis B vaccination schedule should be continued from where it lapsed, it should not be started over again.

4. When should her next (second) appointment be scheduled? What vaccines should be administered at that visit? What is the minimal interval between doses of these vaccines?

Rose's next (second) appointment should be scheduled in 1 month when she is 11 months of age. At that time, she should receive the third dose of DTaP, Hib, PCV13,

and the second dose of inactivated influenza vaccine. One month is the minimum interval between doses for all of these vaccines. The recommended age for the third dose of IPV is 6 – 18 months so the clinician can elect to give IPV #3 at this visit as well. The third dose of hepatitis B vaccine should be administered at least 4 months after the first dose and at least 2 months after the second dose. Two doses of inactivated influenza vaccine are recommended in the first year that a child less than nine years of age receives influenza vaccine; one dose is recommended in subsequent years.

5. If she comes for the second visit at the recommended time and is appropriately vaccinated, when should she next return, and for which vaccines?

Rose's third visit to the office should be scheduled at 12 months of age. At that time she should receive the third dose of hepatitis B vaccine, MMR, varicella vaccine, and hepatitis A vaccine #1. The minimum recommended interval between the third and fourth doses of DTaP is 6 months; hence, it should not be given until she is 17 months of age. The booster dose of Hib vaccine should be given at least 2 months after the previous dose, so it should be given at 13 to 15 months of age.

Take Home Points

- Missed opportunities occur when children are seen for acute visits for minor illnesses and needed vaccines are not given.
- The catch-up schedule is complex and care is needed to provide accelerated catch-up without violating minimal interval rules.

Answers to Questions for Learners – Scenario Three

1. What vaccinations does Rhonda need?

Rhonda needs DTaP #4, Hib #3, PCV13 #4, IPV #3, varicella vaccine, two doses of inactivated influenza vaccine (1 month apart), hepatitis A vaccine, and, 2 months after PCV13, pneumococcal polysaccharide vaccine (PPSV23). Inactivated influenza vaccine is indicated due to her chronic lung disease.

2. Rhonda's mother refuses to let her have more than three injections at one time. Which vaccination(s) would you defer until the next visit? When should she return for that visit and for which vaccines? Are additional visits needed?

Hepatitis A is usually not severe in preschoolers so it is a logical choice to delay. At this visit, give a combination vaccine containing DTaP and Hib, PCV13 #4, and the first dose of influenza vaccine. Rhonda should return at 26 months of age for the second dose of influenza vaccine, hepatitis A vaccine, and varicella vaccine. PPSV23 is also recommended 2 months after the last dose of PCV13 (which covers more serotypes than does PCV13) and so would be given at 27 months of age. The reason for administering pneumococcal polysaccharide vaccine is that her chronic lung disease is an indicator for this vaccine. Pneumococcal polysaccharide vaccine should not be given prior to 24 months of age because children <24 months old do not respond to polysaccharide vaccines.

3. Are any vaccines contraindicated? What is the impact of the history of oral steroids?

Neither reactive airways disease, the convalescent stage following otitis media, nor antibiotic therapy is a valid contraindication to routine childhood vaccinations. Due to the immunosuppressive effects of corticosteroids when given in high doses, providers should wait at least 1 month after completion of corticosteroid therapy before administering live-virus vaccines to persons who have received high systemic doses of corticosteroids for >2 weeks. Since Rhonda last had corticosteroids 5

months ago, she can receive MMR and varicella, which are live-virus vaccines. (However, live, attenuated influenza is not recommended for her because of her reactive airway disease). A household contact with HIV is not a contraindication to any routine childhood vaccine.

4. What dosage and type of influenza vaccine should be given?

The dosage of inactivated influenza vaccine for children <3 years of age is 0.25mL IM. (Live, attenuated influenza vaccine is not recommended for her because of her reactive airway disease).

Take Home Point

- Children with chronic lung disease are at increased risk for complications of certain infectious diseases and should receive influenza, pneumococcal, and acellular pertussis vaccines.

Answers to Questions for Learners – Scenario Four

1. What are possible causes for low vaccination rates?

Vaccination rates may be low for one or more of the following reasons:

- a. Lack of simultaneous vaccine administration
 - b. Failure to note and address vaccination status at acute-care visits, hospital discharge, and chronic-care visit
 - c. Incorrect interpretation of vaccine contraindications
 - d. Economic issues, such as lack of insurance or transportation difficulties. These are less likely to occur now because of the Vaccines for Children program and the Children's Health Insurance Program.
 - e. Parental concerns about vaccine safety
 - f. Parental lack of awareness of the vaccine schedule
 - g. Provider apathy
2. What can be done to raise the vaccination rates, i.e., what can be done to encourage parents to bring their children to the office according to schedule, and once children are at the office, what can be done to ensure that they receive the needed vaccinations?
- a. Ways to improve parental compliance with vaccination include the following:
 - 1) Mailed reminders or auto dialing telephone messages to patients. The office computer can be used to assess vaccination status and the results used for generating letters or phone calls to those who are not up-to-date with vaccinations.

- 2) Provision of personal vaccination cards for patients that list both the schedule and the date for the child's next vaccination.
- b. Ways to improve office vaccination rates include the following:
- 1) Conducting problem solving and goal setting activities, following an evaluation of the practice's current vaccination rates. Subsequently, vaccination rates should be monitored with ongoing feedback to providers about vaccination rates.
 - 2) Having office staff assess vaccination status at patient registration or during vital signs. The office computer can generate "tickler" reminders about vaccinations.
 - 3) Administering vaccines simultaneously if more than one is indicated.
 - 4) Having a dedicated spot in the medical record for vaccination information.
 - 5) Training providers to distinguish between valid and invalid contraindications.
 - 6) Writing standing orders to allow the nurse to administer routine vaccinations.
 - 7) Marking updated copies of schedules and contraindication checklists available.
 - 8) Monitoring rates, providing feedback, encouraging competition, and offering prizes.

Take Home Point

- Practical ways to increase vaccination rates are available and include evaluation of rates, problem solving, goal setting, monitoring, and feedback.

Answers to Questions for Learners – Scenario Five

1. Which vaccine is most likely to have been responsible for the adverse events?

The vaccine most likely to have been responsible for the hypotonic-hyporesponsive episode (HHE) and fever is DTaP. HHE has been reported following DTaP, but appears to occur less frequently than after whole-cell DTP vaccination.

2. Should Shasta receive another dose of this vaccine?

No; HHE is considered a precaution to further DTaP vaccination. Providers may elect to administer additional doses of pertussis vaccine if they believe that the benefits outweigh the risks for this particular patient. Alternatively, the provider may choose to withhold further pertussis vaccination and complete the series with DT.

3. Do these adverse events need to be reported?

HHE should be reported to the Vaccine Adverse Event Reporting System (VAERS). Forms are available from VAERS at 1-800-822-7967 and online at <http://vaers.hhs.gov/>

4. If Shasta's parents allege that vaccination caused a permanent injury, what could be done?

If Shasta's parents allege that vaccination caused a permanent injury, they can apply for compensation from the Vaccine Injury Compensation Program (VICP). The VICP is a system under which no-fault compensation can be awarded for specified injuries that are temporally related to administration of recommended childhood vaccines. The VICP has reduced the risk of litigation for both providers and vaccine manufacturers. The VICP can be reached at 1-800-338-2382.

Take Home Point

- Although rare, moderate adverse events after vaccination can occur and should be reported to VAERS.

Answers to Questions for Learners – Scenario Six

1. How could Dr. Davis respond to the parents concerns?
 - a. The Institute of Medicine, an organization of leading scientists who do not have any conflicts of interest, reviewed the data and found the evidence favors **rejection** of a causal relationship between thimerosal containing vaccines and autism and between MMR and autism. (A discussion about MMR may not be necessary at this time since the child is only 2 months old and too young to receive MMR vaccine.)
 - b. Controlled studies show no association between thimerosal containing vaccines and autism.
 - c. The studies suggesting a link were poorly done and had serious flaws.
 - d. Although thimerosal is no longer used as a preservative in infant vaccines, autism rates continue to increase.
 - e. Vaccine-preventable diseases resurge when vaccination rates drop
2. The parents read a report about a scientific article written by Drs. Geier and Geier that linked vaccines with autism, how would you respond?
 - a. The Institute of Medicine found the articles on autism written by Drs. Geier and Geier have serious methodological flaws.
 - b. See answers to #1

Take Home Point

- Good science backs the safety of vaccines and resurgences of vaccine-preventable diseases occur when vaccination rates drop.

CHILDHOOD VACCINATION SAMPLE TEST

This test was developed using expert knowledge and psychometric methods for the construction of criterion-referenced tests. It may be used as a sample examination.

1. Which administration route is incorrect?
 - a. DTaP intramuscularly in the anterolateral thigh of an infant.
 - b. Varicella vaccine subcutaneously in the deltoid region of a child.
 - c. Hib intramuscularly in the anterolateral thigh of an infant.
 - d. Hepatitis B intramuscularly in the upper outer quadrant of the buttock of a child.
 - e. IPV administered subcutaneously.

2. Which statement about the routine schedule is false?
 - a. The first dose of hepatitis B vaccine is recommended from birth to 2 months of age.
 - b. The first dose of MMR is ideally given from 15 to 19 months of age.
 - c. The first dose of varicella vaccine is ideally given from 12 to 15 months of age.
 - d. The second dose of Hib vaccine is ideally given at 4 months of age.
 - e. The fourth dose of DTaP is ideally given at 15 to 18 months of age.

3. Which of the following is incorrect?
 - a. MMR is an attenuated, live viral vaccine.
 - b. Pertussis vaccine is an inactivated bacterial vaccine.
 - c. IPV is an inactivated, viral vaccine.
 - d. Hepatitis B is an attenuated, live viral vaccine.
 - e. Pneumococcal vaccine is an inactivated, bacterial vaccine.

4. Which is not a valid contraindication?
 - a. For varicella vaccine, pregnancy in the vaccine recipient.
 - b. For DTP/DTaP, encephalopathy within 7 days of a previous DTP/DTaP dose.
 - c. For MMR, current, prolonged use of high-dose systemic steroids.
 - d. For MMR, allergy to eggs.
 - e. All are valid contraindications.

5. Which of the following is false?
- Missed vaccination opportunities occur when the first dose of MMR is needed but only the fourth dose of DTP/DTaP is given.
 - Missed vaccination opportunities occur when vaccinations are not administered during visits for mild acute illnesses.
 - Missed vaccination opportunities occur when providers limit the number of injections.
 - Missed vaccination opportunities could occur when the last dose of Hib vaccine is needed but only varicella vaccine is given.
 - Missed vaccination opportunities are a minor contributor to low vaccination rates in many practices.
6. Which of the following is false?
- The Vaccine Injury Compensation Program provides compensation for permanent and non-permanent injuries temporally associated with any recommended vaccination.
 - The Vaccine Injury Compensation Program differs from civil litigation in that negligence does not need to be proven if an injury is on the injury table.
 - Professionals who administer vaccines are required to keep a permanent record of information including vaccine manufacturer, lot number, and date of administration.
 - Systemic adverse events following Hib vaccination are infrequent.
 - Possible adverse events (reactions) to vaccines which are severe enough for the recipient to seek medical attention should be reported to the Vaccine Adverse Event Reporting System.
7. Which of the following procedures is least likely to improve vaccination rates over several years?
- Evaluation of the practice's vaccination rates and causes of low rates in the practice.
 - Setting numerical goals for raising vaccination rates.
 - Providing posters in the waiting room about vaccinations in general.

- d. Telephone reminders about needed vaccinations.
 - e. Evaluation by nursing staff of vaccination status when vitals are taken, and then addressing missing vaccines.
8. Which of the following DTaP immunization records, although late at times, is otherwise entirely within the recommended guidelines?
- a. 4, 6, 8, and 11 months.
 - b. 3, 4, 6, and 15 months.
 - c. 1, 2, 4, 7, and 17 months.
 - d. 2 weeks, 3 months, 7 months, and 15 months.
 - e. None of the above.
9. Which of the following is a contraindication to further doses of DTaP vaccine?
- a. Hypotonic-hyporesponsive episode within 48 hours of DTaP.
 - b. Seizures within 3 days of DTaP.
 - c. Persistent, inconsolable crying lasting ≥ 3 hours within 48 hours of DTaP.
 - d. Temperature of $\geq 40.5^{\circ}\text{C}$ (105°F) within 48 hours of DTaP.
 - e. Anaphylaxis after DTaP.

CHILDHOOD VACCINATION TEST ANSWER KEY

1. D
2. B
3. D
4. D
5. E
6. A
7. C
8. B
9. E