

Teaching Immunization

for Medical Education (TIME)



MULTISTATION CLINICAL TEACHING SCENARIOS

Adult Vaccination: Facilitator's Answer Key

DEVELOPED AND REVISED BY

Richard K. Zimmerman, MD, MPH

Department of Family Medicine

University of Pittsburgh School of Medicine

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FOR MORE INFORMATION

Association for Prevention Teaching and Research (APTR) can be contacted at

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University of Pittsburgh
Department of Family Medicine

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Contents

Sources of Information on Adult Vaccination	Page 2
Answers to Questions for Learners	
Scenario One	Page 3
Scenario Two	Page 5
Scenario Three	Page 7
Scenario Four	Page 11
Scenario Five	Page 12
Scenario Six	Page 14
Adult Vaccination Sample Test	Page 15
Adult Vaccination Sample Test Answer Key	Page 19

SOURCES OF INFORMATION ON ADULT VACCINATION

1. Centers for Disease Control and Prevention. National Immunization Program. *Epidemiology and Prevention of Vaccine-Preventable Diseases*.. This book may be viewed at www.cdc.gov/vaccines/pubs/pinkbook/pink-chapters.htm and may be purchased from the Public Health Foundation purchased from the Public Health Foundation at:
<http://bookstore.phf.org/index.php?cPath=45&osCsid=kk54jd1mifts1477hjinqg20j3>
or by calling 1-877-252-1200.
2. Recommended Adult Immunization Schedule, United States.
www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm
3. Plotkin SA, Orenstein WA, Offit P eds. *Vaccines*. 5th ed. Philadelphia, PA: Elsevier Inc; 2008.
4. Zimmerman RK, Middleton DB, Kimmel SR, Stebbins S: *Shots*.
www.immunizationed.org

Please note that much of this information is available online. Immunization schedules and recommendations change periodically, and students should be encouraged to be familiar with immunization websites such as the National Center for Immunization and Respiratory Diseases: <http://www.cdc.gov/vaccines/> (where ACIP recommendations can be found) and to check them for the latest information.

Answers to Questions for Learners – Scenario One

1. What vaccinations are indicated?

Influenza, pneumococcal polysaccharide, hepatitis B, and Tdap vaccines are indicated.

2. What can Janys' physician do to encourage vaccination? Is physician advice effective?

Janys' physician can (a) explain the morbidity and mortality from these diseases in adults (e.g., 36,000 estimated annual influenza associated deaths), (b) discuss her status as a person at higher risk for complications from these diseases due to her medical conditions, and (c) inform her that the ACIP/CDC recommends vaccines to prevent these diseases for a person with her medical history. The three vaccine-preventable diseases that cause the highest number of annual deaths in adults in the United States are influenza, pneumococcal infection, and hepatitis B. Janys is at a higher risk than similarly aged healthy adults due to her diabetes, renal failure, and hemodialysis (Table 1).

Physician recommendation can influence patient vaccinations. As can be seen in Figure 1, physician recommendations for vaccination can increase patient willingness to be vaccinated, even if the patient has negative attitudes about vaccinations.

3. For hepatitis B, what vaccine dosages should be used? Does Janys need any postvaccination testing?

Larger doses of hepatitis B vaccine (2 to 4 times those for healthy adults) and, for one product (Engerix-B®), a fourth dose, are recommended for hemodialysis patients because of lower vaccine immunogenicity in such persons. Specifically, 40 µg/mL (Recombivax HB®) administered on a 3-dose schedule or 2 doses of

20 $\mu\text{g}/\text{mL}$ (Engerix-B®) administered simultaneously on a 4-dose schedule at 0, 1, 2 and 6 months.

In hemodialysis patients, protection lasts only as long as antibody levels to hepatitis B surface antigen (anti-HBs) remain greater than 10 mIU/mL; such patients should be tested for anti-HBs annually and revaccinated when anti-HBs declines below this level. About 60% of hemodialysis patients who receive hepatitis B vaccine as recommended will develop protective antibodies against HBV; nonrespondents should be revaccinated.

4. If Janys experiences an adverse event that is temporally associated with vaccination, does it need to be reported?

Providers are required to report certain adverse events for certain vaccines to the Vaccine Adverse Event Reporting System (VAERS) and can report other adverse events. Adverse events required to be reported follow:

- 1) Any event listed by the vaccine manufacturer as a contraindication to subsequent doses of the vaccine and
- 2) VAERS Table of Reportable Events Following Vaccination
(<http://vaers.hhs.gov/pdf/ReportableEventsTable.pdf>)

VAERS forms and instructions can be obtained by calling 1-800-822-7967 or at <http://vaers.hhs.gov/pubs.htm>

5. What vaccinations are indicated for staff at the hemodialysis center Janys attends?

Healthcare workers should be vaccinated (or have other evidence of immunity) against hepatitis B virus, influenza, measles, mumps, rubella, varicella, and pertussis.

Take Home Points:

Infectious diseases are more serious in those with underlying medical conditions and these persons should be vaccinated. Certain adverse events should be reported.

Answers to Questions for Learners – Scenario Two

1. What are some of the reasons for low vaccination rates?

Possible reasons for low vaccination rates follow:

Provider-oriented Reasons

- a. Vaccination indications based on environment, lifestyle and chronic medical conditions are often overlooked.
- b. Missed opportunities occur when vaccination is not addressed although the patient is seen by a provider. Missed opportunities can occur at acute-care visits, chronic-care visits, and hospital discharge.
- c. Providers may not vaccinate due to use of invalid vaccine contraindications, such as mild acute illnesses.
- d. Lack of systems to identify persons needing vaccination.

Patient-oriented Reasons

- a. Patients may not realize their need for vaccination.
- b. Some patients are fearful of adverse events.
- c. Patients may not make routine appointments with clinicians who provide vaccines, particularly during influenza vaccination season.

System Reasons

- a. Vaccine shortages
- b. Limited use of interoperable vaccination tracking systems (i.e., vaccine immunization information systems [registries]).
- c. Vaccine reimbursement issues, especially for those < 65 years old.

2. Why do the vaccination rates vary by physician?

Possible reasons for variability in vaccination rates by physician follow:

- a. Some physicians do not consider vaccinations part of their practice even though their patients may not see another healthcare provider on a routine basis.
- b. Some providers underestimate vaccine safety, vaccine efficacy, and disease severity.

- c. The frequency of missed opportunities varies (some providers may not vaccinate at acute-care visits, chronic-care visits, and hospital discharge).
 - d. Providers may not vaccinate due to use of invalid vaccine contraindications, such as mild acute illnesses.
 - e. Some providers do not know the indications for vaccines used in adults.
3. What can Dr. Powell and the other physicians do to increase vaccination rates, given that many adults do not make appointments for vaccinations? How might ICD codes be used?

Vaccination rates can be improved by the following:

- a. Develop a system to screen patients for needed vaccinations coupled with standing orders for the nurse to administer the needed vaccines according to a protocol, without the need for an individual physician order for each patient.
- b. Using the office computer, identify patients needing vaccinations based on age and high-risk conditions by ICD codes or problem lists. Send reminders to inform patients of needed vaccinations, and place reminders or prompts on patient charts about needed vaccinations.
- c. Have the nursing staff ask about vaccination status during measurement of vital signs.
- d. Have a standard vaccination record in the front of the patient charts or in the EMR and give patients a vaccination record to keep.
- e. Each fall, graph and display progress in administering influenza vaccine to patients aged 50 years and older, and patients at high risk for complications of influenza.

Note: The Task Force on Community Preventative Services has reviewed the evidence on interventions at www.thecommunityguide.org/vaccine/default.htm.

Take Home Points:

Interventions including standing orders, reminders, incorporation of vaccination as a routine procedure, and good documentation can increase vaccination rates.

Answers to Questions for Learners – Scenario Three

1. What vaccination(s) should Margaret receive? What is the indication for each?

Margaret should receive the vaccines listed in the following table:

Vaccine	Indication	Number of doses indicated	Route
Tetanus and diphtheria toxoids, adult type, and acellular pertussis vaccine (Tdap)	Interval since previous dose is greater than 10 years	A 1-time dose of Tdap to replace the next Td. Boosters of Td to be given every 10 years	IM
Measles, mumps, and rubella (for measles and mumps only)	The ACIP recommends that students entering college have received 2 doses of MMR vaccine on or after their first birthday or other acceptable evidence of measles, rubella, and mumps immunity. Acceptable evidence of immunity to measles, mumps, and rubella is receipt of the appropriate number of vaccine doses, birth before 1957, laboratory evidence (e.g., serology), or documentation of physician-diagnoses disease. For measles, the number of recommended vaccine doses is two; for mumps and rubella, one dose of vaccine is recommended. Acceptable evidence of immunity to rubella is laboratory evidence or one dose of rubella-containing vaccine, or birth before 1957.	1 additional dose of MMR	SQ
Inactivated influenza	Asthma is a high-risk indication (Live attenuated influenza vaccine is not recommended for persons with asthma)	1 annually	IM
Hepatitis B	Recent history of sexually-transmitted disease	3	IM
Meningococcal conjugate vaccine	College freshman in dormitory	1	IM if conjugate vaccine
Human papillomavirus vaccine (HPV)	Catch-up for age-base recommendation	3	IM

2. Vaccine Information Statements should be given to her for which vaccines?

Federal law requires that Vaccine Information Statements (VISs)

<http://www.cdc.gov/vaccines/pubs/vis/default.htm> be given for vaccines covered by the Vaccine Injury Compensation Program

<http://www.hrsa.gov/Vaccinecompensation/table.htm>. For other vaccinations, CDC has developed VISs that should be given prior to vaccination, although their use is not required by law. She should receive the VISs for MMR, Tdap, influenza, meningococcal, HPV, and hepatitis B vaccines.

3. What are the contraindications for these vaccines? Does she need a pregnancy test prior to vaccination?

Contraindications for these vaccines are given below:

Vaccine	Question	Specifics
All vaccines	Is this person acutely ill?	Delay if moderate-to-severe illness with or without fever
	Did this person have a severe allergic reaction to a previous dose of this vaccine or any of its components?	A severe (anaphylactic) allergic reaction after vaccination will virtually always contraindicate a subsequent dose of that vaccine. Thimerosal is in meningococcal polysaccharide vaccine. MMR contains tiny amounts of gelatin and rarely someone is allergic to gelatin. Influenza vaccines are contraindicated if severe egg allergy exists.
Td	Did this person have encephalopathy within 7 days of a previous dose of DTP?	If so, Tdap is contraindicated.
	Did this person have Guillain-Barré syndrome ≤ 6 weeks after previous dose of tetanus toxoid-containing vaccine?	GBS within 6 weeks of a previous dose of tetanus-containing vaccine is a precaution to further doses.
MMR	Is this person pregnant or planning to become pregnant within the next 4 weeks?	If so, delay until postpartum. Routine pregnancy testing before MMR administration is not indicated since the risk is theoretical and data suggest little risk to the fetus.
	Does this person have cancer or an immune disorder?	Can give when MMR otherwise indicated to asymptomatic persons infected with HIV but not to persons with most other immunocompromising conditions.

Vaccine	Question	Specifics
MMR	Is this person on oral, intravenous, or intramuscular steroid drugs?	If large doses (e.g., prednisone at 2 mg/kg of body weight or a total of 20/mg per day), then delay. The following are <u>not</u> large doses: steroids for less than 2 weeks; steroids administered by the topical, nasal, inhaled, and intra-articular, tendon sheath or bursal route; or long-term alternate-day treatment with moderate doses of short-acting systemic steroids.
	Has this person recently received blood products such as packed red blood cells, plasma products, or immune globulin?	Recent administration of blood products can interfere with development of an immune response to a live-virus, but not an inactivated-virus vaccine. For instance, MMR may not be effective if given within 6 months after receipt of whole blood and within 8-10 months of receipt of large doses of intravenous immunoglobulin. Tables have been published that describe when various vaccines may be administered in such cases—see CDC information at www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/appdx-full-a.pdf .
	Does this person have a history of thrombocytopenia	A history of thrombocytopenia is a precaution to MMR vaccine in which case the risks and benefits need to be weighted.

Routine pregnancy testing before MMR administration is not indicated since the risk is theoretical and data suggest little risk to the fetus.

4. If Margaret were pregnant, how would that change your vaccination recommendations?

MMR, a live-virus vaccine, is contraindicated during pregnancy, due to theoretical concerns about the risk to the fetus. Women should avoid becoming pregnant within 28 days of MMR or varicella vaccinations. Inadvertent MMR administration during pregnancy is not an indication for pregnancy termination because data do not link this live-virus vaccination to an increased risk of fetal malformation (i.e., the risk is theoretical).

Inactivated influenza, meningococcal conjugate, and hepatitis B vaccines can be given during pregnancy. CDC recommends that due to the currently limited data in pregnant women, HPV vaccine should be deferred until after pregnancy. Generally, CDC recommends that Tdap be deferred until the immediate postpartum period before discharge; alternatively, Td may be given during pregnancy if interval >10 years since the last dose; see ACIP recommendations for details

<http://www.cdc.gov/mmwr/PDF/rr/rr5704.pdf>. Tdap is not contraindicated during

pregnancy although data are limited; in special situations, healthcare providers might weigh the theoretical risks and benefits before choosing to administer Tdap vaccine to a pregnant woman (e.g, theoretical risk of partial suppression of the infant immune response to DTaP).

Take Home Points:

College entry is an important time to address vaccine needs. Prior to vaccination, the history should be reviewed for true contraindications to vaccination.

Answers to Questions for Learners – Scenario Four

1. What is the cause of the pain? How long can it last? Who is most at risk?

The pain is caused by herpes zoster, which is unilateral reactivation of the varicella-zoster virus in one to three dermatomes. Post-herpetic neuralgia is persistence of the pain after the zoster lesions have healed and can last a year or longer. The risk is higher with advancing age (see Figure 4).

2. How could this have been prevented? How well does prevention work?

Herpes zoster vaccine is recommended routinely for persons aged 60 years and older. For persons 60-69 years of age, the efficacy was 64% against herpes zoster and 65.7 % against post-herpetic neuralgia. In the Shingles Prevention Study, both the control and the intervention groups received both opioids and valacyclovir,

3. Who should not receive the vaccine against this disease?

Contraindications to zoster vaccine include the following:

- a. History of severe (e.g, anaphylactic reaction to gelatin, neomycin or other component of the vaccine).
- b. History of primary or acquired immune deficiency states including leukemia, lymphomas or malignant neoplasms effecting the bone marrow or lymphatic system and AIDS or HIV disease
- c. Active, untreated tuberculosis (PPD skin testing is not required).
- d. Immunosuppressive therapy including high-dose corticosteroids, chemotherapy or radiation therapy. Persons may be vaccinated after immunosuppressive therapy has been discontinued for 1 month for steroids and 3 months for chemotherapy.
- e. Pregnancy

Take Home Points:

The risk for zoster and for post-herpetic neuralgia increases with age and can be prevented by single-dose herpes zoster vaccination.

Answers to Questions for Learners – Scenario Five

The president of the medical staff has identified priorities for Dr. Hall. Dr. Hall asks you to assist him in these tasks. Please describe how you would advise Dr. Hall regarding each of these priorities:

1. Decide which vaccines and number of doses are recommended for healthcare workers. Can these vaccines be administered simultaneously?

The recommended vaccines can be given simultaneously and are listed in the table below:

Vaccine	Number of Recommended Doses
Varicella	2 doses or a reliable history of varicella
Measles	2 doses of live measles vaccine on or after first birthday for employees born in the U.S. in or after 1957*
Rubella	1 dose of vaccine on or after first birthday or laboratory evidence of immunity for employees born the U.S. in or after 1957*
Mumps	1 dose of live mumps vaccine on or after first birthday for employees born in the U.S. in or after 1957*
Influenza	1 dose annually
Hepatitis B	3 doses
Tdap	Td is currently recommended every 10 years with Tdap to replace one dose of Td

*Such persons can be considered immune only if they have documentation of vaccination, a record of physician diagnosed measles or mumps, or laboratory evidence of immunity. Adults born in the U.S. before 1957 can be considered immune to measles, mumps, and (except for women of childbearing potential) rubella, since these infections were common before the availability of vaccines. However, because serologic studies of hospital workers indicate that up to 9.3% of those born in the U.S. before 1957 are not immune to measles, recommending at least one dose of MMR should be considered for older employees at risk of occupational exposure who lack laboratory evidence of immunity.

2. Formulate a plan to vaccinate staff, including physicians, nurses, trainees, and other workers, against influenza prior to the influenza season.

Components of a plan to vaccinate healthcare personnel include (a) free vaccine, (b) publicity, (c) convenience (e.g., using a mobile cart to take vaccine to work sites), (d) availability during work hours including the night shift, (e) competition between units or work groups, and (f) communication of importance of employee vaccination to protect patients (particularly for employees caring for high-risk groups), the employee, and the employee's household members. A follow-up campaign early in the course of a community outbreak may enhance compliance. Many workable plans could be designed. Declination statements are recommended for healthcare personnel who refuse influenza vaccination.

3. Develop a policy on postvaccination testing of healthcare personnel who received hepatitis B vaccine.

Postvaccination testing should be performed at 1 to 2 months after the third dose of hepatitis B vaccine for healthcare workers at risk of needlestick or other exposures. An adequate antibody response to vaccination is ≥ 10 mIU/mL. Nonresponders should receive a repeat series using an accelerated schedule.

Take Home Points:

Infectious diseases such as influenza occur nosocomially, threatening the lives of patients. Healthcare worker vaccination against influenza, pertussis, measles, varicella, and hepatitis B is a priority.

Answers to Questions for Learners – Scenario Six

1. Given Stan's age and occupation, which vaccinations should he receive?

Stan should receive inactivated influenza, pneumococcal polysaccharide, Td (three doses), zoster and rabies (three doses) vaccinations. The use of combined diphtheria and tetanus toxoids is preferred over tetanus toxoid alone because the combined product offers protection against diphtheria as well as tetanus. (Note: pre-prophylaxis rabies vaccine supplies not available in January 2009. The rabies vaccine shortage can be monitored at: <http://www.cdc.gov/vaccines/vac-gen/shortages/default.htm>.)

2. What is the significance of not serving in the military in terms of vaccination?

Persons who served in the military can be considered to have been vaccinated against diphtheria and tetanus.

3. Does Stan need tetanus prophylaxis?

Yes. Due to the contaminated wound and lack of previous tetanus vaccination, Stan should receive 250 units IM of tetanus immune globulin in addition to the 3-dose Td series.

Take Home Points:

Occupation is an indication for several vaccines. Tetanus immune globulin is indicated for persons with a high-risk exposure who have not had a primary series of tetanus toxoids.

ADULT VACCINATION SAMPLE TEST

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

1. Which person does not have a specific indication for influenza vaccine?
 - a. Healthy 13-year-old.
 - b. Healthy 40-year-old who works in a restaurant.
 - c. 58-year-old with emphysema.
 - d. Homeless 50-year-old who smokes tobacco.
 - e. Healthy 45-year-old physician.

2. Which of the following is false?
 - a. The Vaccine Injury Compensation Program provides compensation for permanent and non-permanent injuries temporally associated with any recommended vaccination.
 - b. The Vaccine Injury Compensation Program differs from civil litigation in that negligence does not need to be proven.
 - c. Professionals who administer vaccines are required to keep a permanent record of information including vaccine manufacturer, lot number, and date of administration.
 - d. Vaccines administered to adults are generally safe and, for the population at large, the benefits clearly outweigh the risks.
 - e. 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.

3. Which is the most powerful way to increase influenza vaccination rates for a practice?
 - a. Postcard about vaccine-preventable diseases and vaccine schedules sent to patients.
 - b. Public service announcements.
 - c. A system-oriented approach which includes standing orders to nurses to administer vaccines according to protocol.
 - d. Prompts to the physician placed on the chart about needed vaccines.
 - e. Poster in the waiting room about influenza.

4. All of the following are recommended except:
 - a. Varicella vaccine for medical personnel who have not had chickenpox.
 - b. Two doses of MMR for medical personnel born in the U.S. in 1957 or later.
 - c. Pregnancy test prior to MMR administration in women who are sexually active and need MMR.
 - d. Influenza vaccine for ward clerks who gather insurance information from patients.
 - e. Hepatitis B vaccine for nursing students.

5. Which of the following is incorrect?
 - a. The three vaccine-preventable diseases with the highest annual number of deaths in adults in the United States are varicella, zoster, and pneumococcal infection.
 - b. Medical conditions which place patients at a high risk for complications from pneumococcal disease include diabetes and renal failure.
 - c. Serious sequelae of hepatitis B include hepatocellular carcinoma, cirrhosis, and chronic active hepatitis.
 - d. Medical conditions which place patients at high risk for complications of influenza include chronic pulmonary disease and rheumatic heart disease.
 - e. School-aged children are a primary source for contracting influenza.

6. Vaccine administration, when needed, is appropriate in which of the following situations?
 - a. Office visit for an acute, febrile illness requiring antibiotics.
 - b. Hospital discharge for mothers who have recently delivered a newborn.
 - c. Office visit for follow-up of hypertension.
 - d. Both a and b.
 - e. Both b and c.

7. A 49-year-old woman is being treated with chemotherapy for breast cancer. Which immunization is indicated?
 - a. Inactivated poliovirus vaccine.
 - b. Inactivated influenza vaccine.
 - c. MMR.
 - d. Varicella vaccine.
 - e. Oral poliovirus vaccine.

8. Which of the following is not indicated?
 - a. Inactivated influenza vaccine for a person with hypertensive cardiomyopathy (heart disease).
 - b. Pneumococcal polysaccharide vaccine for a person with congestive heart failure.
 - c. Inactivated influenza vaccine for persons with nephrotic syndrome.
 - d. Pneumococcal polysaccharide vaccine for a nurse in an institution for the developmentally disabled.
 - e. Hepatitis B vaccine for an injection drug user.

9. For MMR,Td, hepatitis B, varicella, and poliovirus vaccines, providers are required to
- a. Keep a permanent record of immunizations.
 - b. Report certain adverse events to the Vaccine Adverse Event Reporting System, such as reactions listed in the manufacturer's package insert as contraindications to subsequent doses.
 - c. Use the appropriate Vaccine Information Statements.
 - d. Both a and b.
 - e. Answers a, b, and c are all correct.

ADULT VACCINATION TEST ANSWER KEY

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