

Teaching Immunization

for Medical Education (TIME)



MULTISTATION CLINICAL TEACHING SCENARIOS

Influenza Prevention: Facilitator's Answer Key

DEVELOPED AND REVISED BY

Richard K. Zimmerman, MD, MPH
Department of Family Medicine
University of Pittsburgh School of Medicine
2008

SPONSORED BY

Association for Prevention Teaching and Research
Centers for Disease Control and Prevention

FOR MORE INFORMATION

Association for Prevention Teaching and Research (APTR) can be contacted at
202-463-0550

Copyright 2008 by the Association for Prevention Teaching and Research.

This project was supported by funding from the Centers for Disease Control and Prevention (CDC), National Center for Immunization and Respiratory Diseases, through Cooperative Agreement 5U50CD300860 to the Association for Prevention Teaching and Research.



University of Pittsburgh
Department of Family Medicine

Influenza Prevention: Facilitator's Answer Key

Contents

Sources of Information on Influenza Vaccine	Page 2
Answers to Questions for Learners	
Scenario One	Page 3
Scenario Two	Page 5
Scenario Three	Page 7
Scenario Four	Page 9
Scenario Five	Page 12
Scenario Six	Page 14
Influenza Sample Test	Page 16
Influenza Sample Test Answer Key	Page 20

SOURCES OF INFORMATION ON INFLUENZA VACCINE

1. Centers for Disease Control and Prevention. Prevention and Control of Influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR*. – use latest edition (www.cdc.gov/vaccines/pubs/ACIP-list.htm)
2. Bridges CB, Katz JM, Levandowski RA, Cox NJ. Inactivated influenza vaccines. In: Plotkin SA, Orenstein WA, Offit P eds. *Vaccines*. 5th ed. Philadelphia, PA: Elsevier Inc; 2008: 259-290.
3. Belshe RB, Walker R, Stoddard JJ, Kemble G, Maassab HF, Mendelman PM: Influenza vaccine – live. In: Plotkin SA, Orenstein WA, Offit P eds. *Vaccines*. 5th ed. Philadelphia, PA: Elsevier Inc; 2008: 291-310.
4. Centers for Disease Control and Prevention. Influenza website. www.cdc.gov/flu/

Answers to Questions for Learners – Scenario One

1. What is the differential diagnosis for his chief complaint?

This case represents secondary bacterial pneumonia following influenza; the differential diagnosis includes primary bacterial pneumonia and spread of an initial bacterial infection of the upper respiratory tract to the lungs. Common organisms include *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Legionella*, and *Moraxella catarrhalis*. *Streptococcus* and *Staphylococcus* are gram-positive cocci; gram-positive cocci in clusters are shown in Gram stain, suggesting *Staphylococcus*.

2. What treatment is needed and where should it be administered?

This patient needs hospitalization and supplemental oxygen administration. He needs to be treated quickly, i.e., in the Emergency Department, with intravenous antibiotics. Antivirals are unlikely to be helpful given the amount of time that has passed since onset of influenza symptoms.

3. Was the diagnosis of influenza appropriate?

Influenza can be diagnosed appropriately upon clinical grounds as long as influenza is known to be occurring in the community. His physician could also have used rapid antigen detection methods or the more accurate PCR or viral culture to diagnose influenza A and B infections on his initial presentation.

4. Before becoming ill, did Mr. Smith have an indication for influenza vaccine? If so, which one and what time of year should it be administered?

Yes, diabetes mellitus is an important indication for inactivated influenza vaccine. Live attenuated influenza vaccine is not recommended for persons with underlying medical illnesses such as diabetes mellitus. The optimal time for influenza vaccination is typically October to November, before the peak of influenza season. Vaccine should be offered until and even after influenza activity is documented in a community, which peaks late December through early March in most seasons.

Take Home Points:

Influenza is severe and missed opportunities for influenza vaccination occur, particularly among those with a medical indication for vaccination.

Answers to Questions for Learners – Scenario Two

1. Are their diseases related?

Yes, these are all manifestations of influenza. Influenza has different clinical presentations, depending upon the age of the patient (see Table 1). The incubation period for influenza is 1 to 5 days, which is consistent with the scenario.

2. What tests are available commonly and when should they be used?

Rapid antigen detection tests, reverse-transcriptase polymerase chain reaction (RT-PCR), and viral culture are commonly available tests for influenza. Diagnostic testing should be considered when an institutional outbreak of influenza is suspected. Testing should be considered when test results would influence clinical decision making and is recommended for inpatients. For individual patients seen in ambulatory care settings, tests are most useful when they are likely to help with diagnostic and treatment decisions, such as the use of influenza antiviral agents.

3. Were these cases preventable?

Persons with chronic respiratory disease, such as asthma, should be vaccinated against influenza. The ACIP recommends vaccinating persons who could transmit influenza to high-risk persons, such as household members in families with an asthma patient. All persons age 50 or older should receive influenza vaccine; as should 6 month olds – 18 year olds. Hence, influenza was potentially preventable in all three persons. Chronic-care visits (e.g., hypertension visit for Jonathan's grandmother) and hospital discharge (e.g., following cholecystectomy) are important but often overlooked opportunities to administer vaccinations.

4. Where was influenza most likely to have been contracted initially?

Jonathan most likely contracted influenza in kindergarten. School-aged children have the highest age-specific attack rate and are the primary transmission route for influenza. Because most are healthy, they suffer relatively few serious complications. However, they can transmit it to elderly adults who have a higher complication rate. Vaccination of school-aged children protects others in a community and can prevent an outbreak.

5. Jonathan's grandmother is being seen by her primary care physician one day after her cough started. Should any treatment be given?

Zanamivir or oseltamivir can be given therapeutically to persons who contract influenza type A, provided that either drug is started within 48 hours of the onset of symptoms. Zanamivir and oseltamivir are effective against both influenza types A and B; they shorten the duration of symptoms by about 1 day and can be given within 48 hours of the onset of illness. Because surveillance has detected high levels of resistance to the adamantanes (amantadine and rimantadine) among influenza viruses, these agents should not be used at present. People who are at high risk of serious complications from influenza may benefit most from antiviral medications. Therefore, in general, people who are in these high-risk groups should be given priority for use of influenza antiviral medications:

- Any person experiencing a potentially life-threatening influenza-related illness should be treated with antiviral medications.
- Any person at high risk for serious complications of influenza and who is within the first 2 days of illness onset should be treated with antiviral medications. (Pregnancy category C)

Take Home Points:

The signs of influenza vary by age group; missed vaccination opportunities occur for age, risk-based and contact indications; antiviral treatment is indicated for certain groups, including persons at risk for complications.

Answers to Questions for Learners – Scenario Three

1. Was the record review important? How good are the influenza vaccination rates in the practice?

Assessment, i.e., the medical record review, is very important because the problem must be quantified before meaningful, well-informed action will occur. Many clinicians do not know the actual vaccination rates in their practices according to record review and overestimate these rates. The vaccination rates in the scenario are modest; the values given are typical for many practices. Such data may provide motivation for action and a baseline upon which to measure change.

2. Why are the vaccination rates suboptimal?

Possible reasons for low vaccination rates follow:

- a. Some physicians and staff underestimate disease severity and infectiousness.
- b. Some clinicians may not realize that Medicare reimburses for influenza vaccination.
- c. Some physicians have not done quality assurance studies about vaccine rates in their practice; hence, they do not realize that vaccination rates are low.
- d. Missed opportunities occur when physicians forget to address influenza vaccination when there is an opportunity, e.g., acute and chronic-care visits and hospital discharge.
- e. Clinicians use invalid vaccine contraindications, such as mild acute illnesses.
- f. Vaccination indications based on occupation and chronic medical conditions are often overlooked.
- g. Patients may not realize their need for vaccination.
- h. Some patients are fearful of adverse events following vaccination.
- i. Some patients do not access health care institutions during the vaccination season.

3. What can be done to improve influenza vaccination rates, given that this is a busy practice with several different providers?

Vaccination rates can be improved by the following:

- a. Setting a target vaccination rate for the practice and monitoring progress; **this is one of the most powerful interventions.**
- b. Comparing vaccination rates of different practices in a competitive spirit and awarding prizes for the highest rates.
- c. Sending postcard reminders to patients or using an autodialing machine to deliver telephone messages about needed vaccinations.
- d. Having office staff inquire about vaccination status at registration or during measurement of vital signs. Colored stickers, checklists, EMR notes, or inked rubber stamps help to communicate the information.
- e. Computer-generated "tickler" reminders in the EMR or placed in a patient's chart. Displaying vaccination posters and pamphlets in the office waiting room.
- f. Issuing standing orders for the nurse to administer influenza vaccine according to a protocol, without the need for an individual physician order for each patient. An office nurse can deliver vaccination services during influenza vaccine season, allowing a patient to receive vaccinations without seeing a physician.
- g. Writing standing orders to vaccinate all patients.
- h. During the late fall, opening an influenza vaccination clinic or express vaccination service that is staffed by nurses.
- i. Participating in mass media campaigns or public service announcements (as a benefit to the practice, these may provide free publicity).

Take Home Points

Assessment of vaccination rates points to areas for improvement; setting a goal, reminders, and standing orders are powerful interventions to raise rates.

Answers to Questions for Learners – Scenario Four

1. What treatment should Mrs. Gaither receive?

Mrs. Gaither should receive an influenza antiviral agent (oseltamivir or zanamavir) and TIV. The influenza antiviral agent should be administered for 2 weeks, until antibodies develop from influenza vaccine. Mrs. Gaither has chronic renal failure, which is an indication for vaccination. Vaccination is also indicated because of her age (>50 years).

Because influenza is in the community, she is at risk for influenza and should be vaccinated even though antiviral agents may protect her from her husband's infection. Because she has chronic renal failure, oseltamivir should be reduced to 75mg every other day if the creatinine clearance is 10-30mL/min; it is not recommended if the creatinine clearance is <10mL/min. There is no dose adjustment for zanamavir. Zanamivir and oseltamivir are effective for influenza type A and B infections; oseltamivir is licensed for persons aged 1 year and older. Zanamivir is FDA approved for prophylaxis for persons 5 years old and older and treatment in persons 7 years of age and older.

People who are at high risk of serious complications from influenza may benefit most from antiviral medications. Therefore, in general, people who fall into these high-risk groups should be given priority for use of influenza antiviral medications:

- Any person experiencing a potentially life-threatening influenza-related illness should be treated with antiviral medications.
- Any person at high-risk for serious complications of influenza and who is within the first 2 days of illness onset should be treated with antiviral medications. (Pregnant women should consult their primary provider regarding use of influenza antiviral medications.)

All persons at high risk of serious influenza complications should be given antiviral medications if they are likely to be exposed to others infected with influenza. For example, when a high-risk person is part of a family or household in which someone else has been diagnosed with influenza, the exposed high-risk person should be given chemoprophylaxis.

2. Can TIV cause “flu”?

Inactivated influenza vaccine cannot cause influenza or "flu" because the viruses have been killed. In adults, systemic symptoms following inactivated influenza vaccination are similar to those of placebo injection (Table 2).

There is a small risk that intranasally administered live attenuated influenza virus (LAIV) vaccine may cause disease in immunosuppressed persons. LAIV vaccine contains a live virus with three traits that distinguish it from wild-type virus and strictly limit the ability of LAIV to cause influenza in healthy persons. First, LAIV is attenuated, such that it produces mild or no signs and symptoms related to influenza virus infection. Second, LAIV is cold-adapted so that it replicates efficiently at the temperature in the human upper airways in order to produce immunity. Finally, LAIV is temperature-sensitive and cannot replicate efficiently at the temperature in the human lower airways. Therefore, it is unable to cause influenza or "flu" in most people. Since LAIV vaccine contains live viruses, there is a small chance for transmission of these viruses from vaccinees to other persons. If vaccine virus is inadvertently administered to or transmitted to immunosuppressed persons, there is a theoretical risk that LAIV could cause disease.

3. Given that she has an allergy to duck feathers, should she receive TIV?

Allergy to duck feathers, allergic rhinitis, and a family history of convulsions are not valid contraindications to influenza vaccination. However, anaphylaxis to influenza

vaccine and severe egg allergies are valid contraindications. An acute moderate or severe febrile illness is a valid reason to postpone vaccination temporarily.

4. What are the side effects of antiviral drugs that are used for influenza?

The side effects of zanamivir are reduced FEV1, bronchospasm, respiratory function deterioration, and oropharyngeal or facial edema. The side effects of oseltamivir are nausea and vomiting.

5. Which groups of patients have the highest influenza hospitalization rates?

Persons 65 years of age or older with two or more high-risk medical conditions (e.g., diabetes mellitus, chronic lung disease, hemodynamically significant cardiac disease, chronic renal disease) have the highest fatality rates from influenza (Table 3).

Take Home Points

Influenza is most severe in those with two or more high-risk conditions and such persons should receive antiviral agents when infected with influenza (when seen within an appropriate time frame). Inactivated influenza vaccine cannot cause influenza disease.

Answers to Questions for Learners – Scenario Five

1. What can be done for Mr. Cook? When can he return to work?

Being a healthy 35-year-old, Mr. Cook is not at high risk for influenza complications and therefore is not a priority but could be considered for therapy if local supplies are sufficient. Mr. Cook can receive oseltamivir or zanamivir for 5 days. He can return to work when he is no longer contagious and is off antiviral therapy. For adults, the period of communicability is usually from the day before symptoms begin through approximately 5 days after illness onset.

People who are at high risk of serious complications from influenza may benefit most from antiviral medications. Therefore, in general, people who fall into these high-risk groups should be given priority for use of influenza antiviral medications:

- Any person experiencing a potentially life-threatening influenza-related illness should be treated with antiviral medications.
- Any person at high risk for serious complications of influenza and who is within the first 2 days of illness onset should be treated with antiviral medications.

Pregnant women should consult their primary provider regarding use of influenza antiviral medications.

Antiviral medications can be considered in other situations when the available supply of such medications is locally adequate.

2. What should be done for the nursing home residents and other employees with whom Mr. Cook was working?

All persons who live or work in institutions caring for people at high risk of serious complications of influenza infection should be given antiviral medications for chemoprophylaxis in the event of an institutional outbreak. This includes nursing homes, hospitals, and other facilities caring for persons with immunosuppressive conditions, such as HIV/AIDS. When vaccine is available, vaccinated staff require

chemoprophylaxis only for the 2-week period following vaccination. Vaccinated and unvaccinated residents should receive chemoprophylaxis for the duration of institutional outbreak activity. Unvaccinated staff and residents should be offered vaccination.

Rapid tests or other influenza tests should be used to confirm influenza as the cause of outbreaks as soon as possible. However, treatment and chemoprophylaxis should be initiated if influenza is strongly suspected and test results are not yet available. Other outbreak control efforts such as cohorting of infected persons and practicing good respiratory and hand hygiene should be implemented.

3. Could this episode have been prevented?

The entire episode could have been prevented or limited in the following ways:

- Medical personnel and others in contact with high-risk persons should receive influenza vaccine on a yearly basis as part of standard protocol.
- The nursing home should implement a standard protocol wherein all residents are vaccinated each year unless they have a valid contraindication. For instance, part of standard admission orders could include influenza vaccine administration in the fall.
- The nursing home should have a contingency plan for prompt administration of an influenza antiviral agent in the event of an outbreak.

Take Home Points

Health care workers should be vaccinated against influenza annually. In institutional outbreaks, staff and residents should receive antiviral chemoprophylaxis and unvaccinated persons vaccinated.

Answers to Questions for Learners – Scenario Six

1. Does Scott need influenza vaccination?

Scott needs inactivated influenza vaccination. High-risk children are often overlooked regarding influenza vaccination. (He also needs hepatitis A vaccine; this can be given simultaneously with influenza vaccine).

2. Given that Scott has never received influenza vaccine, if he were to be vaccinated, how many doses would he need? What type of vaccine should he receive?

Influenza vaccine is recommended for all children and adolescents 6 months to 18 years of age. Scott, having a high-risk condition, should receive 2 doses of inactivated influenza vaccine 4 weeks apart. Children aged 6 months to 1 year should receive TIV and healthy children aged 2-18 can receive either TIV or LAIV. Children younger than 9 years old should receive two doses of influenza vaccine in the first year that they are vaccinated against influenza; 4 weeks should separate the doses. If last year was their first influenza vaccination season and they only received one dose, they should receive two doses in this (the second) vaccination year. In subsequent years, they should receive one dose.

3. Can influenza vaccine be administered simultaneously with other vaccines?

Influenza vaccines can be administered simultaneously with other vaccines.

4. Do any of Scott's contacts need influenza vaccine and if so, what type?

Household contacts of high-risk persons should receive influenza vaccine, either TIV or LAIV. Use of LAIV is limited to healthy non-pregnant persons aged 2 to 49 years.

Take Home Points

Influenza vaccination is recommended for all children aged ≥ 6 months; children with chronic medical conditions should receive inactivated vaccine whereas healthy children aged ≥ 2 years can receive either inactivated or live attenuated vaccine. Household contacts of high-risk persons should be vaccinated.

INFLUENZA SAMPLE TEST

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

1. In the elderly, the most common symptom(s) of influenza is (are)
 - a. Cough only
 - b. Vomiting only
 - c. Vomiting and diarrhea
 - d. Cough, aches, headache, sore throat
 - e. Rhinorrhea and vomiting

2. Which of the following is true?
 - a. Any infant is a candidate for influenza vaccine
 - b. Healthy children 2 to 12 years can receive either TIV or LAIV
 - c. Allergy to erythromycin is a valid contraindication to influenza vaccine
 - d. The first trimester of pregnancy is an absolute contraindication to influenza vaccine
 - e. Anaphylaxis to duck feathers is a valid contraindication to influenza vaccine

3. Which of the following is true?
 - a. A family history of grand mal convulsions is a valid contraindication to influenza vaccine
 - b. Unopened influenza vaccine vials from the preceding year can be used in the following season
 - c. Elderly persons with influenza usually display symptoms similar to those of young adults
 - d. Children who are younger than 9 years old and receiving influenza vaccine for the first time should receive 2 doses, 4 weeks apart
 - e. A family history of allergies is a valid contraindication to influenza vaccine

4. Influenza is characterized by the following
 - a. Highest incidence is in children.
 - b. Highest case-fatality rates are found in the elderly.
 - c. Highest incidence is in the elderly.
 - d. B and C are correct.
 - e. A and B are correct.

5. The risks from inactivated influenza vaccine are less than from actual influenza because
 - a. The vaccine has been used safely in HIV patients
 - b. The vaccine is administered intramuscularly
 - c. The vaccine contains inactivated, killed virus
 - d. Amantadine is administered simultaneously

6. Which is the most important to increase influenza vaccination rates for a practice?
 - a. Postcard about influenza sent to patients
 - b. Public service announcements
 - c. Provider (e.g., physician) sets a target goal for the vaccination rates in his practice and monitors progress
 - d. Antiviral samples and literature
 - e. Poster in the waiting room about influenza.

7. At office visits in the fall for mild acute afebrile illnesses, influenza vaccine should
 - a. Be postponed until the patient has recovered
 - b. Be administered if the benefit of vaccination outweighs any potential risks from the illness

- c. Be administered unless patient has anaphylactic hypersensitivity to eggs or other valid contraindications, thereby preventing a missed opportunity.
 - d. Not be administered because it is temporally contraindicated.
8. Mike, a 5-year-old with asthma, is coughing and has clear rhinorrhea. Influenza-like illnesses have been documented in Mike's community. Two days after Mike's illness started, his 31-year-old father had symptoms of cough, generalized myalgia, sore throat, and headache.
- a. Their illnesses are related and are most likely due to *Corynebacterium diphtheriae*.
 - b. Their illnesses are most likely unrelated because the symptoms are so different.
 - c. Their illnesses are related and are most likely due to *Streptococcus*.
 - d. Their illnesses are related and preventable by vaccination.
 - e. Their illnesses are likely due to *Legionella*.
9. Mary, a 26-year-old graduate student, was diagnosed with influenza; an outbreak of influenza type A is occurring in the community. She is staying at her grandmother's house. Her grandmother has chronic obstructive lung disease. Her grandmother should
- a. Receive influenza vaccine only
 - b. Receive an antiviral agent if her renal function is excellent.
 - c. Receive an antiviral agent and influenza vaccine
 - d. Receive an antiviral agent and, if she is not allergic to penicillin, influenza vaccine
 - e. Receive an antiviral agent but not pneumococcal vaccination

10. John, a 45-year-old insulin-dependent diabetic, has symptoms of fever, myalgia, sore throat, and chills that began yesterday (January 3). Influenza type A is in the community. He should
- a. Receive an antiviral agent and influenza vaccine.
 - b. Not receive an antiviral agent because he may have renal failure secondary to diabetes
 - c. Not receive an antiviral agent because his illness has started
 - d. Not receive an antiviral agent because of its interaction with insulin.
 - e. Not receive influenza vaccine because it is too late in the season.

INFLUENZA TEST ANSWER KEY

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