Influenza Immunization

Elizabeth Boldon, RN, MSN

Elizabeth Boldon is a Nurse Education Specialist at Mayo Clinic in Rochester, Minnesota. She received a BSN from Allen College in Waterloo, Iowa in 2002 and an MSN with a focus in education from the University of Phoenix in 2008. She has bedside nursing experience in medical neurology and the neuroscience ICU.

Abstract:
Influenza vaccine can be effective for preventing influenza illness. It is not known if vaccination reduces the risk of subsequent hospital admission among patients with vaccine failure and laboratory confirmed influenza illness. The Centers for Disease Control and Prevention (CDC) recommends that everyone six months of age and older receive an annual vaccination. The best way to protect against influenza is discussed, which includes recognition of symptoms and prevention of spread, and annual vaccination.
Continuing Nursing Education Course Director & Planners
William A. Cook, PhD,  Director, Douglas Lawrence, MA, Webmaster,
Susan DePasquale, CGRN, MSN, FPMHNP-BC, Lead Nurse Planner

Accreditation Statement
This activity has been planned and implemented in accordance with the policies of NurseCe4Less.com and the continuing nursing education requirements of the American Nurses Credentialing Center's Commission on Accreditation for registered nurses.

Credit Designation
This educational activity is credited for 1.5 hours. Nurses may only claim credit commensurate with the credit awarded for completion of this course activity.

Course Author & Planner Disclosure Policy Statements
It is the policy of NurseCe4Less.com to ensure objectivity, transparency, and best practice in clinical education for all CNE educational activities. All authors and course planners participating in the planning or implementation of a CNE activity are expected to disclose to course participants any relevant conflict of interest that may arise.

Statement of Need
Influenza can be spread through direct contact with an infected individual. Preventive measures can help to control disease spread through an educated healthcare and public sector. Necessary education includes immunization and treatment.

Course Purpose
To enable the learner to increase their knowledge of influenza prevention, immunization, and treatment.
Learning Objectives

1. Describe the symptoms of influenza.
2. Explain the benefits of the influenza immunization.
3. Describe the treatment of influenza.

Target Audience

Advanced Practice Registered Nurses, Registered Nurses, Licensed Practical Nurses, and Associates

Course Author & Director Disclosures

Elizabeth Boldon, RN, MSN, William S. Cook, PhD, Douglas Lawrence, MA, Susan DePasquale, CGRN, MSN, FPMHNP-BC – all have no disclosures

Acknowledgement of Commercial Support

There is no commercial support for this course.

Activity Review Information:

Reviewed by Susan DePasquale, CGRN, MSN, FPMHNP-BC.

Release Date: 6/24/2015  Termination Date: 6/24/2018

Please take time to complete the self-assessment Knowledge Questions before reading the article. Opportunity to complete a self-assessment of knowledge learned will be provided at the end of the course.
1. True or False: The Centers for Disease Control and Prevention recommends that a person as young as six months of age receive an annual vaccination.
   
   a. True
   b. False

2. _________________ is the most common complication of influenza.
   
   a. Ischemic heart disease
   b. Transverse myelitis
   c. Myocarditis
   d. Pneumonia

3. Typically, influenza is treated with
   
   a. an antiviral medication, such as oseltamivir (Tamiflu)
   b. a seasonal influenza vaccine
   c. fluids and rest
   d. trivalent vaccines

4. A seasonal influenza vaccine protects against influenza viruses if
   
   a. the vaccine is administered at least two weeks before infection.
   b. the seasonal virus is the same as or similar to those used to make the vaccine.
   c. the vaccinated person has had influenza in the past.
   d. the seasonal virus is a new strain that has not built resistance to the prior year’s influenza vaccinations.
5. **The following statement is true about influenza vaccinations:**

   a. influenza vaccines called “trivalent vaccines,” are made specifically to protect against viruses with novel antigens.

   b. recent studies have shown that seasonal influenza vaccination provide minimal benefit to the public health, if at all.

   c. influenza vaccines cannot cause the influenza.

   d. healthcare providers should not get the nasal spray vaccine if they work in special environments (*i.e.*, bone marrow transplant units) because of reports of vaccine virus transmission in those settings.
**Introduction**

Influenza is a highly contagious, viral infection of the nose, throat, and lungs that occurs most often in the late fall, winter, and early spring. It is a serious infection, which affects more than 60 million individuals in the United States every year.

Common symptoms of influenza include a high fever (101°F – 102°F) that begins suddenly, muscle or body aches, chills, tiredness, and sudden onset. Influenza frequently causes people to miss school and work but in some cases there are severe complications such as pneumonia. In the United States, more than 200,000 individuals are hospitalized annually and between 3,000 - 49,000 die from influenza-related complications.¹

The best way to protect against influenza is to receive an influenza vaccination every year. The Centers for Disease Control and Prevention (CDC) recommends that everyone six months of age and older receive an annual vaccination. The best time to get vaccinated is in the early fall, as soon as the vaccine is available. However, vaccination in December or even later is still beneficial because the virus that causes influenza circulates into a new year. The number of influenza cases usually peaks around February, but this peak can come earlier or later (ranging from December to May).¹

**What Is Influenza?**

Influenza is an acute respiratory illness caused by influenza A or B viruses that occur in outbreaks and epidemics worldwide, mainly during the winter season. Signs and symptoms of upper and/or lower respiratory tract involvement are present, along with indications of systemic illness such as fever, headache, myalgia, and weakness. Although acutely debilitating, influenza is a self-limited infection in the general population; however, it is
associated with increased morbidity and mortality in certain high-risk populations.²

The CDC, in collaboration with the World Health Organization (WHO) and its reporting network, tracks influenza virus cases throughout the world to monitor disease activity and to predict the appropriate components for the annual influenza vaccine. This information, which is updated weekly, is available at the CDC web site.²

**Symptoms Of Influenza**

Influenza characteristically begins with the abrupt onset of fever, headache, myalgia, and malaise, following an incubation period of one to four days. These symptoms are accompanied by manifestations of respiratory tract illness, such as nonproductive cough, sore throat, and nasal discharge. In some cases, the onset is so abrupt that patients can recall the precise time at which illness began. However, influenza infections also have a broad spectrum of other presentations that can range from afebrile respiratory illnesses similar to the common cold, to illnesses in which systemic signs and symptoms predominate with relatively little clinical indication of respiratory tract involvement.²

Physical findings generally are few in cases of uncomplicated influenza. The patient may appear hot and flushed; oropharyngeal abnormalities other than hyperemia are uncommon, even with complaints of severe sore throat. Physical examination of the chest is generally unremarkable in uncomplicated influenza.

Patients with uncomplicated influenza usually gradually improve over two to five days, although the illness may last for one week or more. Some patients
have persistent symptoms of weakness or easy fatigability, referred to as *post-influenza asthenia*, which last for several weeks.²

**Complications of Influenza**

Pneumonia is the most common complication of influenza, but other complications, especially involving muscle and the central nervous system, can also occur. Pneumonia as a complication of influenza occurs more often in those with chronic underlying illnesses. Pneumonia should be suspected when symptoms persist and increase instead of resolving in a patient with acute influenza. High fever, dyspnea, and even progression to cyanosis can be seen in these patients.

Central nervous system disease (CNS) may be a complication of influenza, including encephalopathy, encephalitis, transverse myelitis, aseptic meningitis, and Guillain-Barré syndrome. However, the pathogenesis of the CNS illnesses associated with influenza remains poorly understood.

Several cardiac complications have been described in patients with influenza infection:

- Some patients develop electrocardiographic (ECG) changes with influenza, but this may be attributed to underlying cardiac disease rather than to direct involvement of the heart with influenza virus.

- Some research suggests a link between myocardial infarction (MI) and influenza.

- Some studies show an increase of hospitalization related to ischemic heart disease (IHD) and death among those with influenza.
• Myocarditis and pericarditis have generally been considered rare complications of influenza but current research suggests they may not be related.

**Causes of Influenza**

Influenza viruses travel through the air in droplets when someone with the infection coughs, sneezes or talks. Droplets can be inhaled directly, or the germs can be picked up from an object — such as a telephone or computer keyboard — and then transferred to the eyes, nose or mouth.

People with the virus are likely contagious from the day before symptoms first appear until five to ten days after symptoms begin. Children and people with weakened immune systems may be contagious for a slightly longer time.

Influenza viruses are constantly changing, with new strains appearing regularly. If a person has had influenza in the past, their body has already made antibodies to fight that particular strain of the virus. If future influenza viruses are similar to those they have encountered before, either by having the disease or by vaccination, those antibodies may prevent infection or lessen its severity.

Antibodies against flu viruses a person has encountered in the past cannot protect them from new influenza subtypes that are very different immunologically from what they had before. A number of virus subtypes have appeared in humans since the pandemic, global epidemic, of 1918, which killed tens of millions of people.
Risk Factors for Influenza

Factors that may increase the risk of developing influenza or its complications include:

- **Age**
  
  Seasonal influenza tends to target young children and people over 65; however, the pandemic H1N1 virus that surfaced in 2009 appeared to be most common in teenagers and young adults.

- **Occupation**
  
  Healthcare workers and childcare personnel are more likely to have close contact with people infected with influenza.

- **Living conditions**
  
  People who live in facilities along with many other residents, such as nursing homes, dormitories, group homes or military barracks, are more likely to develop influenza.

- **Weakened immune system**
  
  Cancer treatments, anti-rejection drugs, corticosteroids and HIV/AIDS can weaken the immune system. This can make it easier to catch influenza and may also increase the risk of developing complications.

- **Chronic illnesses**
  
  Chronic conditions, such as asthma, diabetes or heart problems, may increase the risk of influenza complications.
Pregnancy

Pregnant women are more likely to develop influenza complications, particularly in the second and third trimesters.

Diagnosis Of Influenza

Influenza can be difficult to diagnose based on clinical symptoms alone because the initial symptoms of influenza can be similar to those caused by other infectious agents. Appropriate treatment of patients with respiratory illness depends on accurate and timely diagnosis.

Early diagnosis of influenza can reduce the inappropriate use of antibiotics and provide the option of using antiviral therapy. However, because certain bacterial infections can produce symptoms similar to influenza, bacterial infections should be considered and appropriately treated, if suspected. In addition, bacterial infections can occur as a complication of influenza.

Influenza surveillance information and diagnostic testing can aid clinical judgment and help guide treatment decisions. Influenza surveillance by state and local health departments and the CDC can provide information regarding the presence of influenza viruses in the community. Surveillance can also identify the predominant circulating types, influenza A subtypes, and strains of influenza.4

A number of tests can help in the diagnosis of influenza but tests do not need to be done on all patients. For individual patients, tests are most useful when they are likely to give a health provider results that will help with diagnosis and treatment decisions. During a respiratory illness outbreak in a closed setting (i.e., hospitals, nursing home, cruise ship, boarding school,
summer camp); however, testing for influenza can be very helpful in determining if influenza is the cause of the outbreak.

Preferred respiratory samples for influenza testing include nasopharyngeal or nasal swab, and nasal wash or aspirate, depending on which type of test is used. Samples should be collected within the first four days of illness. Rapid influenza diagnostic tests provide results within 15 minutes or less; viral culture provides results in three to ten days. Most of the rapid influenza diagnostic tests that can be done in a physician’s office are approximately 50 - 70% sensitive for detecting influenza and approximately greater than 90% specific. Therefore, false negative results are more common than false positive results, especially during peak influenza activity.\(^4\)

**Treatment of influenza**

Typically, influenza is treated with nothing more than fluids and rest. However, in some cases, there may be a need to prescribe an antiviral medication, such as oseltamivir (Tamiflu) or zanamivir (Relenza). If taken soon after a person notices symptoms (24 to 48 hours), these drugs may shorten the illness by one-half to three days and help prevent serious complications.\(^3\)

Oseltamivir is an oral medication. Zanamivir is inhaled through a device similar to an asthma inhaler and shouldn't be used by anyone with respiratory problems, such as asthma and lung disease. Antiviral side effects may include nausea and vomiting. Oseltamivir has also been associated with delirium and self-harm behaviors in teenagers. Some researchers recommend further study on both of these drugs because of uncertainty about their effects beyond a slight reduction in the time of illness. Some
studies have suggested that these medications can also help reduce the severity of complications.⁴

An additional concern is that some strains of influenza have become resistant to oseltamivir and to amantadine and rimantadine (Flumadine), which are older, antiviral drugs. The CDC recommends prompt initiation of antiviral therapy for individuals with suspected or confirmed influenza infection and any of the following features:²

- Illness requiring hospitalization
- Progressive, severe, or complicated illness, regardless of previous health or vaccination status
- Risk factors for influenza complications, including:
  - Age ≥ 65 years
  - Pregnant women and women up to two weeks postpartum (including those who have had pregnancy loss)
  - Individuals with certain medical conditions that put them at increased risk for complications (those with underlying health issues or who are immunocompromised, also the very young and very old)

**Prevention Of Influenza**

As described above, influenza is an acute respiratory illness caused by influenza A or B viruses. It occurs in epidemics nearly every year, mainly during the winter season in temperate climates. Influenza viruses change their antigenic characteristics frequently, and their subsequent spread depends upon the susceptibility of the population to viruses with novel antigens. Annual influenza vaccination is an important public health measure for preventing influenza infection. The protection provided by influenza
vaccines is based upon induction of virus-neutralizing antibodies, mainly against the viral hemagglutinin.\textsuperscript{1}

The seasonal influenza vaccine protects against the influenza viruses that research indicates will be most common during the upcoming season. Traditional influenza vaccines, called trivalent vaccines, are made to protect against three influenza viruses; an influenza A (H1N1) virus, an influenza A (H3N2) virus, and an influenza B virus. There also are influenza “quadrivalent” vaccines, which are made to protect against four influenza viruses. These vaccines protect against the same viruses as the trivalent vaccine as well as an additional B virus.\textsuperscript{4}

The seasonal influenza vaccine protects against the influenza viruses that research indicates will be most common during the upcoming season. Antibodies develop in the body about two weeks after vaccination. These antibodies provide protection against infection from viruses that are the same as or similar to those used to make the vaccine.\textsuperscript{4}

Influenza vaccines \textit{cannot} cause the influenza. Influenza vaccines that are administered with a needle are currently made in two ways: the vaccine is made either with viruses that have been ‘inactivated’ (killed) and are therefore not infectious, or, with no influenza viruses at all (which is the case for recombinant influenza vaccine). The nasal spray influenza vaccine does contain live viruses. However, the viruses are attenuated (weakened), and therefore cannot cause flu illness. The weakened viruses are cold adapted, which means they are designed to only cause infection at the cooler temperatures found within the nose. The viruses cannot infect the lungs or other areas where warmer temperatures exist.\textsuperscript{4}

Influenza vaccines are safe. Serious problems from the influenza vaccine are very rare. The most common side effect that a person is likely to experience is either soreness where the injection was given, or runny nose in the case
of nasal spray. These side effects are generally mild and usually go away after a day or two.⁴

Everyone six months of age and older should get an influenza vaccine every season. This recommendation has been in place since February 24, 2010, when CDC’s Advisory Committee on Immunization Practices (ACIP) voted for “universal” flu vaccination in the United States to expand protection against the influenza virus to more people. Vaccination to prevent influenza is particularly important for people who are at high risk of serious complications from influenza.⁴

It is especially important for healthcare workers to receive an influenza vaccination annually as it protects them as well as their patients and family members. Most healthy adults may be able to infect others beginning one day before symptoms develop and up to five to seven days after becoming sick. Children may pass the virus for longer. Symptoms start one to four days after the virus enters the body. That means that a person may be able to pass on the influenza virus to someone else before they know they are sick, as well as while they are sick. Some persons can be infected with the influenza virus but have no symptoms. During this time, those persons may still spread the virus to others.⁴

Trivalent flu vaccine protects against two influenza A viruses (an H1N1 and an H3N2) and an influenza B virus. The following trivalent flu vaccines are available:

- *Standard-dose trivalent shots* (IIV3) that are manufactured using virus grown in eggs. Different influenza shots are approved for people of different ages, but there are influenza shots that are approved for use in people as young as six months of age and up.
• An intradermal trivalent shot, which is injected into the skin instead of the muscle and uses a much smaller needle than the regular influenza shot. It is approved for people 18 through 64 years of age.

• A high-dose trivalent shot, approved for people 65 and older.

• A trivalent shot containing virus grown in cell culture, which is approved for people 18 and older.

• A recombinant trivalent shot that is egg-free, approved for people 18 years and older. (This can be given to people with egg allergies).

The quadrivalent influenza vaccine protects against two influenza A viruses and two influenza B viruses. The following quadrivalent influenza vaccines are available:

• A quadrivalent flu shot.

• A quadrivalent nasal spray vaccine, approved for people two through 49 years of age (recommended preferentially for healthy children two years through eight years old when immediately available and there are no contraindications or precautions).

Nearly all healthy, non-pregnant healthcare workers, may receive nasal spray vaccine if eligible, including those who come in contact with newborn infants (i.e., persons working in the neonatal intensive care unit, or NICU), pregnant women, persons with a solid organ transplant, persons receiving chemotherapy, and persons with HIV/AIDS.4

However, healthcare providers should not get the nasal spray vaccine if they are providing medical care for patients who require special environments in the hospital because they are profoundly immunocompromised, for example, if they work in bone marrow transplant units. This is intended as an extra precaution and is not based on reports of vaccine virus transmission in those
settings. The influenza shot is preferred for vaccinating healthcare workers who are in close contact with severely immunocompromised patients who are being cared for in a protective environment. These healthcare workers may still get nasal spray vaccine, but they must avoid contact with such patients for seven days after getting vaccinated.

No special precautions (i.e., masks or gloves) are necessary for healthcare personnel who have been vaccinated with nasal spray vaccine and who do not work with patients undergoing bone marrow transplantation.

The CDC recommends getting vaccinated soon after it becomes available, and ideally by October. However, as long as influenza viruses are circulating, vaccination should continue to be offered throughout the influenza season, even in January or later. While seasonal influenza outbreaks can happen as early as October, most of the time, influenza activity peaks in January or later. Since it takes about two weeks after vaccination for antibodies to develop in the body that protect against influenza virus infection, it is best that people get vaccinated so they are protected before influenza begins spreading in their community.4

Annual immunization is necessary even if the previous year's vaccine contained one or more of the antigens to be administered because immunity declines during the year following vaccination.

How well the influenza vaccine works (or its ability to prevent influenza illness) can range widely from season to season. A vaccine’s effectiveness also can vary depending on who is being vaccinated. At least two factors play an important role in determining the likelihood that an influenza vaccine will protect a person from influenza illness: a) characteristics of the person being vaccinated (such as his or her age and health), and b) the similarity or "match" between the influenza viruses the influenza vaccine is designed to protect against and the influenza viruses spreading in the community.
During years when the influenza vaccine is not well matched to circulating viruses, it is possible that no benefit from influenza vaccination may be observed. During years when there is a good match between the influenza vaccine and circulating viruses, it is possible to measure substantial benefits from vaccination in terms of preventing influenza illness. However, even during years when the vaccine match is very good, the benefits of vaccination will vary across the population, depending on characteristics of the person being vaccinated and even, potentially, which vaccine was used.

Each season researchers try to determine how well influenza vaccines work to regularly assess and confirm the value of influenza vaccination as a public health intervention. Study results about how well an influenza vaccine works can vary based on study design, outcome(s) measured, population studied and the season in which the influenza vaccine was studied. These differences can make it difficult to compare one study’s results with another’s.

While determining how well an influenza vaccine works is challenging, in general, recent studies have supported the conclusion that influenza vaccination benefits public health, especially when the influenza vaccine is well matched to circulating influenza viruses.⁴

**Summary**

Influenza is a serious disease that can lead to hospitalization and sometimes death. Every influenza season is different, and influenza infection can affect people differently. Even healthy people can get very sick from the influenza virus and spread it to others. Over a period of 31 seasons between 1976 and 2007, estimates of influenza-associated deaths in the United States ranged from a low of about 3,000 to a high of about 49,000 people. During a regular influenza season, about 90% of deaths occur in people 65 years and
older. “Flu season” in the United States can begin as early as October and lasts as late as May.

During this time, influenza viruses are circulating at higher levels in the U.S. population. An annual seasonal influenza vaccine (either the influenza shot or the nasal spray influenza vaccine) is the best way to reduce the chances that a person will get seasonal influenza and spread it to others. When more people get vaccinated against the influenza virus, less influenza can spread through that community. It is especially important for healthcare workers to receive an influenza vaccination annually due to their contact with patients.

Please take time to help the NURSECE4LESS.COM course planners evaluate nursing knowledge needs met following completion of this course by completing the self-assessment Knowledge Questions after reading the article. Correct Answers, page 21.
1. True or False: The Centers for Disease Control and Prevention recommends that a person as young as six months of age receive an annual vaccination.
   a. True
   b. False

2. _______________________ is the most common complication of influenza.
   a. Ischemic heart disease
   b. Transverse myelitis
   c. Myocarditis
   d. Pneumonia

3. Typically, influenza is treated with
   a. an antiviral medication, such as oseltamivir (Tamiflu)
   b. a seasonal influenza vaccine
   c. fluids and rest
   d. trivalent vaccines

4. A seasonal influenza vaccine protects against influenza viruses if
   a. the vaccine is administered at least two weeks before infection.
   b. the seasonal virus is the same as or similar to those used to make the vaccine.
   c. the vaccinated person has had influenza in the past.
   d. the seasonal virus is a new strain that has not built resistance to the prior year’s influenza vaccinations.
5. The following statement is true about influenza vaccinations:

a. influenza vaccines called “trivalent vaccines,” are made specifically to protect against viruses with novel antigens.

b. recent studies have shown that seasonal influenza vaccination provide minimal benefit to the public health, if at all.

c. influenza vaccines cannot cause the influenza.

d. healthcare providers should not get the nasal spray vaccine if they work in special environments (i.e., bone marrow transplant units) because of reports of vaccine virus transmission in those settings.

Correct Answers:

1. a
2. d
3. c
4. b
5. c
REFERENCE SECTION

The reference section of in-text citations include published works intended as helpful material for further reading. Unpublished works and personal communications are not included in this section, although may appear within the study text.


The information presented in this course is intended solely for the use of healthcare professionals taking this course, for credit, from NurseCe4Less.com. The information is designed to assist healthcare professionals, including nurses, in addressing issues associated with healthcare.

The information provided in this course is general in nature, and is not designed to address any specific situation.

This publication in no way absolves facilities of their responsibility for the appropriate orientation of healthcare professionals. Hospitals or other organizations using this publication as a part of their own orientation processes should review the contents of this publication to ensure accuracy and compliance before using this publication.

Hospitals and facilities that use this publication agree to defend and indemnify, and shall hold NurseCe4Less.com, including its parent(s), subsidiaries, affiliates, officers/directors, and employees from liability resulting from the use of this publication.

The contents of this publication may not be reproduced without written permission from NurseCe4Less.com.