INFLUENZA: VACCINATION AND GUIDELINES FOR SAFE PRESCRIBING

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Topic Overview

Influenza vaccine can be effective for preventing influenza illness. Vaccine efficacy varies based on the influenza variant, the severity of a particular flu season, and differences in the flu shots that are prepared for a particular flu season. The Centers for Disease Control and Prevention recommends that everyone six months of age and older receive an annual vaccination. The best way to protect against influenza includes recognition of symptoms and prevention of spread, and annual vaccination. A summary of the latest information on the epidemiology of influenza, and its signs, symptoms, and complications. Treatments with antivirals are available for influenza. Adverse events from vaccination administration or antivirals may occur and clinicians should be aware of proper reporting of these events.

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Target Audience: This continuing education activity is intended for licensed pharmacists and associates to update knowledge on influenza vaccination and on safe prescribing guidelines.

How to Earn Credit: From May 10, 2021, through May 9, 2024, participants must:

1) Read the "learning objectives" and "author and planning team disclosures;"
2) Study the section entitled "educational activity;" and
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Educational Objectives: Upon completion of this educational activity, participants should be able to:

1. **Identify** the types and spread of influenza virus as a worldwide concern
2. **Describe** the environmental and behavioral factors of influenza virus

3. **Compare** the risks and corresponding complications of influenza, and of the benefits and risks of vaccination
4. **Identify** influenza prevention, immunization, treatment, and preparedness in the event of an adverse reaction

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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 millions of people in the United States and millions worldwide every year. Influenza vaccines can be effective for preventing influenza illness, the severity of the illness, and may reduce the need for hospitalization. Vaccine efficacy varies based on the influenza variant, the severity of a particular flu season, and differences in the flu shots that are prepared for a particular flu season. Treatments may include antivirals for influenza. Adverse events from vaccination administration or antiviral treatments may occur.

Influenza Virus

Influenza is a common and highly infectious RNA virus. There are four types of the virus: types A, B, C, and D.[1] Type A and B are the cause of the yearly, seasonal epidemics that are informally referred to as the flu season. Type C can cause serious illnesses in children but it does not cause epidemics and type D is found only in cattle.[1,2]

The influenza virus is transmitted in two ways: 1) infected droplets that become airborne when someone coughs, sneezes, spits, or talks may enter the respiratory tract through the mucosal surfaces of the trachea and the bronchi; and, 2) direct contact with infected objects, *i.e.*, touching a telephone handset or shaking hands with someone whose hands are contaminated with the virus.[3] A person with influenza may be contagious for days.[4-6]

Infected Droplets

The influenza virus is spread quite easily by infected droplets but there are also circumstances that limit this mode of transmission. The infected droplets usually do not travel very far (usually < 6 feet).[3,7] They do not remain in the air for a long time, and environmental conditions affect how long they are viable. For example, if the humidity in the air is low and the air

temperature is cold the survival time of infected airborne droplets will be increased.[8] If someone has influenza, all respiratory secretions and body fluids are potentially contaminated.[9]

Contact Transmission

The contact transmission occurs when an uninfected person touches a surface that is contaminated with influenza virus.[9,10] Once the virus is on the skin of an uninfected person it can then enter the body by contact with the mucosal surfaces of the conjunctiva, the mouth, or the nose.

Viable influenza virus has been found to persist for several weeks on environmental surfaces.[10] Surface contamination with influenza virus during influenza season appears to be common, and Perry, *et al.* (2016) noted that "... fomites and surface contamination caused by large respiratory droplets may play a significant role in transmission."[8]

Epidemiology of Influenza

Influenza is highly contagious, and it is a common cause of epidemics.[6] Each year 10%-20% of the world's population develops an influenza infection, and every year in the United States millions of people get the flu. There are thousands of deaths from influenza, and hundreds of thousands of people are hospitalized because they have an influenza infection.[6] Influenza epidemics are noteworthy for several reasons. They occur every year, during the winter but the severity and outcomes of these outbreaks can differs.[11]

Annual Epidemics

For most people, flu season has become an expected and unremarkable event that happens each winter. The human immune system develops antibodies after a viral exposure and vaccines are widely used to combat the flu.[11]

With antibodies and vaccines, one might wonder why influenza epidemics happen annually. The answer is that the influenza virus adapts.[6,12,13] Influenza viruses can periodically change their hemagglutinin and neuraminidase, glycoproteins on the surface of the virus that the pathogen needs to initiate and spread an infection and to enter cells. These glycoproteins also act as antigens. Major changes are referred to as antigenic *shifts*.[12] Minor changes are referred to as antigenic *drifts*.[11] Antigenic drifts occur almost annually, while antigenic shifts may be spaced out by years or decades.[12] Moreover, antigenic shifts are more likely to be the cause of pandemics or epidemics, whereas antigenic drifts are usually associated with regional epidemics.[12] Prior exposure to influenza and vaccination can provide immunity to influenza but because of antigenic drift, which occurs almost annually, this protection may only last for several years.[12,13] In addition, these seasonal changes make it difficult to determine the timing and formulation of the annual flu vaccine. Vaccine efficacy is particularly impacted by the timing of vaccinations because even with an effective flu vaccine formulation, the vaccine is more effective if given in the months *before* an influenza epidemic hits its peak.[14]

Seasonal Variations

Influenza and influenza infections are endemic. The virus is always present, and people may get influenza infections every month of the year. The flu season varies from year to year, and differs based on geographical regions and climate. In the U.S., "influenza activity often begins to increase in October. Most of the time flu activity peaks between December and February, although activity can last as late as May."[11] This variation in the occurrence of influenza infections - commonly known as the flu season - is a well-documented phenomenon, and in areas with a temperate climate like the U.S., this may be due to low humidity and dry air, more time spent indoors (thus closer and more frequent interpersonal contacts), a seasonal decrease in immune system functioning, and decreased mucociliary clearance of the virus because of dry, humid air.[15-17]

Severity and Outcomes

Influenza outbreaks vary in severity. This is likely due to the number of people who are susceptible, the rate of vaccination, and the intrinsic virulence of a particular strain of the virus. Children are affected first. Local surveillance data should be monitored by clinicians to determine the types and subtypes of influenza viruses circulating in communities.[18]

Older adults and people who have certain medical conditions are at a higher risk for complications, hospitalization, and death. The death rate from influenza has been estimated to be 1.4–16.7 per 100,000 cases, and outbreaks typically last for two to three months.[17] The Centers for Disease Control and Prevention (CDC) publishes local or regional surveillance data on the annual spread of influenza.[18]

Clinical Features and Diagnosis

Viral shedding of influenza begins 24-48 hours before the infected person becomes symptomatic, and the greater the degree of shedding the more contagious the source will be.[17-18] Influenza is contagious 1-2 days before an infected person becomes symptomatic and is contagious for approximately 5-7 days after symptoms begin.[17-18] Studies show that the average duration of shedding is reported to be 4.8 days with shedding ending by day 7. Children, adults with comorbid and/or chronic medical conditions, immunocompromised people, and hospitalized patients have longer periods of viral shedding.[17] They can infect other people somewhat longer (up to ten days) after the symptoms begin.[17]

In adults, an influenza infection is characterized by fatigue, fever, headache, malaise, and myalgias. The fever is typically 37.8-40.0°C, but can be higher.[19] Respiratory signs and symptoms include non-productive cough, nasal stuffiness, and sore throat.[19] The onset is abrupt. The worst effects usually last several days, but many people are fatigued and weak for weeks after an influenza infection has effectively ended. An influenza infection in a child is similar but the fever will usually be higher, the respiratory signs are

less pronounced. A child with influenza is more likely to have gastrointestinal (GI) problems like anorexia, diarrhea, and vomiting.[19] In adults and children, leukocytosis is the only prominent laboratory abnormality.[17]

In most cases influenza is diagnosed using clinical criteria. In 2018, the Infectious Diseases Society of America updated its 2009 guidelines on diagnosis and treatment for seasonal influenza.[20] A patient is diagnosed with influenza if the patient has the signs and symptoms that are typical of the flu and if the illness has occurred during flu season.[19,21] "Cough and fever provide the most predictive signs and symptoms when influenza viruses are circulating in the community."[20] Laboratory confirmation of the presence of the virus is not necessary or recommended unless certain criteria are present. In outpatient cases, laboratory confirmation is important to obtain for patients who are immunocompromised or who are at high risk for complications from influenza. This would include patients with an illness with flu-like symptoms out of flu season, pneumonia, or nonspecific respiratory illness (*e.g.*, cough without fever)."[19]

In patients who need hospitalization, laboratory confirmation should be used in the following patients: patients with pneumonia, or other acute respiratory illness, regardless of the presence or absence of fever; patients with an acute and deteriorating cardiopulmonary disease (*e.g.*, asthma or congestive heart failure) to help prevent these conditions from being worsened by the flu; and patients at risk for developing respiratory symptoms distress.[19,21] Laboratory confirmation helps clinicians make treatment and management decisions, such as prescribing antivirals.[21]

The tests for influenza can be done on essentially any secretion from the respiratory tract. The rapid diagnostic test will usually be performed on a nasopharyngeal swab and the results are typically ready (depending on the specific test) in 15 minutes.[22]

Complications of Influenza

For most adults and children, influenza illnesses are short-lived. People who have the flu feel very sick for a few days and they experience fatigue after the acute signs or symptoms of flu have diminished. Influenza is usually self-limiting and the patient fully recovers.[19]

For at-risk populations, influenza can cause dangerous complications and death.[19] Risk factors for developing complications include medical conditions and personal demographics. Influenza can affect virtually every organ system of the body. The CDC has reported that influenza complications "can vary by age, immune status, and underlying medical conditions."[21] Examples of complications include "worsening of underlying chronic medical conditions (*e.g.*, worsening of congestive cardiac failure; asthma exacerbation; exacerbation of chronic obstructive pulmonary disease); lower respiratory tract disease (pneumonia, bronchiolitis, croup, respiratory failure); invasive bacterial co-infection; cardiac (*e.g.*, myocarditis); musculoskeletal (*e.g.*, myositis, rhabdomyolysis); neurologic (*e.g.*, encephalopathy, encephalitis); multi-organ failure (septic shock, renal failure, respiratory failure)."[21]

There have been approximately 44 cases of influenza-associated myocarditis in adults, and in children, neurologic complications of influenza have been reported to be 2.8 per 100,000 cases.[23] Health clinicians should be alert that most of these uncommon, rare complications are more likely to occur in patients who are very young, very old, hospitalized, or who have one of the other risk factors.[23]

Pneumonia is the most common complication of influenza.[24] The combination of influenza and pneumonia is a leading cause of mortality in the United States. Garg, *et al*. (2015) reported that an estimated 29% of adults hospitalized because of an influenza infection had pneumonia, and other researchers studying similar populations found an incidence of pneumonia in 49% (2005-2008).[24] In adults and children, most cases of pneumonia caused

by influenza occur in patients who have risk factors, *i.e.*, age > 65, comorbid medical conditions, or patients who are very young.[24,25]

The association between influenza and asthma is not clear. Influenza outbreaks have been associated with hospitalizations for asthma exacerbations, and asthma has been reported to be the most common pre-existing disease in patients who have been hospitalized for influenza.[26,27] However, the literature raises uncertainty about the degree of asthma exacerbation that occurs as a result of influenza.[26,27]

Treatment and Prevention of Influenza Infection

The primary goals of treating patients who have influenza or are at risk for developing the disease are to prevent the disease from developing using vaccines, and where appropriate, antivirals, to treat patients who have influenza with standard, supportive care, and monitor them for complications of influenza. During treatment, healthcare professionals must follow proper infection control techniques and precautions.[28-31]

Annual Vaccination and Vaccine Efficacy (VE)

The CDC recommends annual vaccination against influenza for everyone 6 months of age and older and influenza vaccination is especially important for people who have risk factors that make them susceptible to a severe influenza infection or to complications of influenza.[32] It is also critical for healthcare workers to be vaccinated as they work directly with vulnerable populations.[32]

People who should *not* be vaccinated are children < 6 months old, and anyone who has had a severe reaction to influenza vaccinations.[32] Also, anyone who had Guillain-Barré Syndrome within 6 weeks of an influenza vaccination should avoid being vaccinated.[32,33]

There are also contraindications to giving specific types of influenza vaccines. The *trivalent* preparations protect against types of influenza A

viruses and one type of influenza B virus; the *quadrivalent* preparations protect against two types of influenza A viruses and two types of influenza B viruses.[33-35] Depending on the formulation, influenza vaccines can be given intradermally, intramuscularly, or nasally. The choice of which vaccine preparation to use depends on the year, the patient's age and comorbidities, and the risk of adverse reactions.[33-35] Vaccination against influenza can prevent the disease. From 2005 to 2017, the effectiveness of influenza vaccination has ranged from 10%-60%; and the average effectiveness in the past 5 years has been 42%.[34]

Influenza vaccines cannot cause influenza. Influenza vaccines that are administered with a needle are currently made in two ways: 1) the vaccine is made either with viruses that have been inactivated (killed) and are not infectious, or 2) the vaccine does not contain influenza viruses at all (which is the case for recombinant influenza vaccines).[36-38] The nasal spray influenza vaccine does contain live viruses; however, the viruses are attenuated (weakened), and therefore cannot cause flu illness.[38]

There remains a continuing need to evaluate the efficacy of influenza vaccines with regard to their efficacy against subtypes or lineages, as well as how they perform based on timing, *i.e.*, vaccination early in the flu season versus vaccination late in the season.[39] A 2017 Canadian study found that the trivalent influenza vaccine "was highly effective against A viruses and moderately effective against B viruses." It was less effective against other strains that were circulating during what was characterized as a "mild [flu] season in Canada."[39] The debate will continue regarding the effectiveness of influenza vaccines as randomized controlled trials continue to evaluate outcomes for vaccinated and unvaccinated individuals.[40]

Influenza protection in older adults has been described as suboptimal and therefore outbreaks of influenza in the older population, notably in controlled groups residing in nursing homes, are poor where 80% to 98% of residents had received vaccination.[33] Also, a large nationwide sample of U.S., Medicare beneficiaries showed that vaccination in adults 18 to 64 years of age

was inversely associated with influenza-related illness in individuals ≥ 65 years of age.[33]

The CDC performs an analysis of data to estimate flu vaccination guidelines for the U.S., population.[32] Moderate to severe influenza seasons, such as the one that took place in 2012 to 2013, showed that a vaccine for people ≥ 65 years of age with a 10% effectiveness and 66% coverage would have avoided an estimated 13,000 hospitalizations and a vaccine with 40% effectiveness would have avoided an estimated 60,000 hospitalizations.[33] Influenza vaccination corresponded with a lower intensive care unit (ICU) admission and in-hospital length of stay as well as mortality.[33]

Antivirals

Treatment with antiviral medication can shorten the duration of an influenza infection by approximately one to two days.[42] Additionally, antivirals may reduce the risk of complications, and they can reduce viral shedding and viral titers. Unlike influenza vaccines, antiviral drugs are very helpful for people who are in a high-risk group and, compared to vaccines, the efficacy of the antivirals is not affected as much by antigenic drift.[42]

The antivirals used to prevent influenza are neuraminidase inhibitors.[43] These drugs work by hindering the activity of the enzyme neuraminidase and by doing so, they prevent virions from being spread to uninfected cells. The neuraminidase inhibitors that are Food and Drug Administration (FDA) approved for preventing influenza are oseltamivir (oral), trade name Tamiflu®, peramivir (injectable), and zanamivir (nasal inhalant).[43] All three antivirals are effective against influenza A and B.[43] Oseltamivir and zanamivir are the most commonly used, and peramivir is given to patients who cannot tolerate oral medications and/or cannot use an inhaled medication.[43]

The indications for use of one of the antivirals include patients who 1) have a severe influenza infection, *i.e.*, hospitalization is needed or a lower respiratory tract infection has occurred, 2) have risk factors for developing severe infection and/or complications, and 3) are pregnant women or women

who are up to two weeks postpartum.[43] Antiviral treatment is not recommended for people who are < 65 years of age, do not have risk factors, and have a mild case of the flu; however, a clinician may decide that a patient in one of these categories may be helped by an antiviral.[43]

Therapy with an antiviral should be given as soon as possible, preferably within 48 hours of the onset of influenza symptoms. The earlier treatment is initiated, the more likely it is to be successful, and antiviral treatment should not be withheld while waiting for laboratory confirmation of an influenza infection.[43,44] In a patient who is hospitalized or who has a severe case of flu, starting antiviral treatment after 48 hours may provide some benefit. For example, there are studies that suggest that antiviral treatment may benefit these patients even when started up to 5 days after onset of the illness.[37]

The duration of antiviral therapy for treatment of influenza is 5 days for oseltamivir and zanamivir, and one dose of peramivir. A longer duration of therapy can be used if the patient is seriously ill, and prophylactic use of the drugs typically lasts 1 to 3 weeks.[43]

Adverse effects of neuraminidase inhibitors are seldom severe. Nausea, vomiting, headache, and pain are common adverse effects of oseltamivir.[43] Diarrhea is a common adverse effect of peramivir. Zanamivir (aerosol inhaler) is not recommended for patients who have pre-existing airway disease, such as asthma and/or chronic obstructive pulmonary disease (COPD), as there have been reports of bronchospasm when the drug is given to this patient population.[43] Widespread prophylactic use of antiviral medication is not endorsed by the CDC; however, antiviral medication should be considered for high-risk individuals who have been exposed to influenza, people who are immunocompromised and might not respond to vaccination, people where the influenza vaccination is contraindicated and there has been exposure to influenza, and when treating residents of institutions, *i.e.*, long-term care facilities, during an outbreak.[44,45]

New Antiviral

Officials with the FDA have approved baloxavir marboxil (Xofluza®, Shionogi) for the treatment of acute, uncomplicated influenza in patients aged 12 years and older who have been symptomatic for no more than 48 hours.[46,47] The approval marks the first new antiviral flu treatment with a novel mechanism of action backed by the agency in nearly 20 years.[46,47]

The safety and efficacy of baloxavir marboxil, an antiviral drug taken as a single oral dose, was demonstrated in 2 randomized controlled clinical trials of 1,832 patients where participants were assigned to receive either Xofluza®, a placebo, or another antiviral flu treatment within 48 hours of experiencing flu symptoms. In both trials, patients treated with Xofluza® had a shorter time to alleviation of symptoms compared with patients who took the placebo.[45,46] In the second trial, there was no difference in the time to alleviation of symptoms between subjects who received Xofluza® and those who received the other flu treatment.[47]

Xofluza® is the first and only antiviral drug with a novel proposed mechanism of action that has demonstrated efficacy in a wide range of influenza viruses, including oseltamivir-resistant strains and avian strains (H7N9, H5N1) in non-clinical trials. It is a single-dose oral medicine. Unlike other currently available antiviral treatments, Xofluza® is the first in a new class of antivirals designed to inhibit polymerase acidic endonuclease, an enzyme essential for viral replication.[47] The most common adverse reactions in patients taking baloxavir marboxil include diarrhea and bronchitis.[47]

Infection Control

When caring for a patient who has an influenza infection, health clinicians must always use and observe Standard Precautions, Droplet Precautions, and Respiratory Hygiene and Cough Etiquette.[28-31]

Standard Precautions

Standard Precautions include hand hygiene, appropriate use of personal protective equipment (PPE), Respiratory Hygiene and Cough Etiquette, safe injection practices, and safe handling of potentially contaminated equipment or surfaces in the patient environment.[28-31]

Droplet Precautions

If a patient has confirmed or suspected influenza, healthcare providers should follow droplet precautions for 7 days after the onset of the illness or until 24 hours after the fever and respiratory symptoms have resolved, whichever is longer. Droplet precautions include:[28-31]

- Patient should be in a single room.
- Clinicians should wear a mask when providing patient care or if within 3 feet of the infected person; and, clinicians should perform hand hygiene before entering the room and after removing the mask.
- Clinicians should wear the appropriate PPE if contact with secretions is expected or possible, such as, goggles, face shield, and gown.

Respiratory Hygiene/Cough Etiquette

Covering the mouth and nose with a tissue should be done when someone is coughing or sneezing.[28-31] The used tissue should be placed in the nearest waste receptacle. Hand hygiene should be carried out by using soap and water or an alcohol-based hand rub after contact with respiratory secretions or contaminated objects.[28-31]

Use of a Mask Versus Respirator

Influenza is spread by infected droplets.[31] Because droplets are relatively large and do not travel far (≤ 6 feet) and do not remain airborne for long, a paper surgical mask is sufficient PPE when caring for a patient who has influenza.[31] Pathogens such as smallpox are much smaller, travel farther, and

remain airborne longer. With airborne transmission, a higher level of respiratory protection is required (*i.e.*, N-95 respirator or its equivalent).[31]

There is evidence that for the influenza virus these distinctions in terms of distance travelled and time airborne may not be true. There may be airborne transmission of influenza and not only during aerosol-generating procedures like bronchoscopy or endotracheal intubation.[31] Surgical masks do appear to offer a sufficient level of protection against influenza transmission and the CDC recommends their use for preventing influenza transmission.[31] The N-95 respirator may offer a superior level of protection against transmission of influenza but at this time there is not enough evidence to recommend that an N-95 respirator is needed when providing basic patient care to a patient who has or may have influenza.[31] The N-95 respirator or its equivalent should be used if a clinician is involved in an aerosol-generating procedure and the patient has influenza.[3]

Children and Pregnant Women

Children and pregnant women are at greater risk of presenting with a severe case of influenza or acquiring complications from it. Within the child population, certain groups, such as American Indian and Alaskan Native children, also present with greater risks.

Children

Children are at greater risk of severe influenza or complications by virtue of their age.[2,18] The flu is more dangerous than the common cold for children.[2,18] Some children are even at higher risk. Children younger than 5 years of age, especially those younger than 2 years old – are at higher risk of serious flu-related complications than older children. Children with underlying medical conditions are also at greater risk.[2]

Children > 6 months of age need to receive a flu vaccine for their protection, and for the protection of others from transmission of the flu.

Children < 6 months of age are too young to be vaccinated. The best way to protect them is to make sure people around them are vaccinated.[2]

For children who are 6 months of age to 5 years, they are at risk for flu-related *hospitalization*. Children who get the flu should receive medical attention due to potential complications that may arise. The complications that can occur from the flu include pneumonia, dehydration, exacerbation of long-term medical problems like heart disease or asthma, brain dysfunction such as encephalopathy, sinus problems and ear infections. In rare cases, flu complications can lead to a child's death.[2,18]

As mentioned above, flu seasons vary in severity but each year, millions of children get sick with seasonal flu and thousands of children are hospitalized.[2] In children < 18 years, the rate of influenza has been reported to be between 10 and 40 percent during a typical influenza season.[2] Symptomatic influenza in children < 18 years is estimated to be 9%. The CDC estimates that since 2010, flu-related hospitalizations among children younger than 5 years ranged from 7,000 to 26,000 in the United States. Even children in this age group who are otherwise healthy are at risk simply because of their age.[2]

American Indian and Alaskan Native Children

American Indian and Alaskan Native children are more likely to have severe flu illness that results in hospitalization or death.[49] Between 2006–2008, the lower respiratory tract infection (LRTI)-associated hospitalization rate for American Indian and Alaskan Native children (< 5 years of age) was "approximately 1.6 times higher than the corresponding general US child rate."[49]

There was higher disparity noted in infants (< 1 year) and in children in Alaska and the Southwest regions within American Indian and Alaskan Native communities.[49] Since the H1N1 outbreak (2009–2010), the 13-valent pneumococcal conjugate vaccine (PCV13) replaced 7-valent PCV (March 2010).[49] During the 2009 H1N1 influenza pandemic period, infant influenza-

associated hospitalizations was approximately 3 times higher for AI/AN infants (9.9) than US infants (3.3, 95% CI: 2.7–2.9) and about 12 times higher for AI/AN infants in Alaska (38.9) for the year.[49]

The immunization rates for American Indian and Alaskan native in U.S., communities tend to be lower than the rates reported in others. During the H1N1 influenza pandemic (2009–2010), the morbidity and mortality rates were higher in American Indian and Alaskan native communities than the general US population.[49] In 2010–2011, an estimated 67% of American Indian and Alaskan native children (6 months to 4 years) were vaccinated. Influenza morbidity and mortality in American Indian and Alaskan native could have reduced with improved vaccination rates.[49]

Improved influenza vaccination coverage for child care and pre-school settings could reduce rates of influenza and hospitalizations in American Indian and Alaskan native children. Pregnant women administered the vaccine may also correspond with lower influenza rates in infants; however, maternal influenza vaccination rates have reportedly stayed low.[49]

Children Aged 6 months - 18 years with Chronic Health Problems

Chronic health problems in children from the ages of 6 months through 18 years include the following conditions:[50,51]

- Asthma
- Neurological and neurodevelopmental conditions [including disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy (seizure disorders), stroke, intellectual disability (mental retardation), moderate to severe developmental delay, muscular dystrophy, or spinal cord injury
- Chronic lung disease (such as chronic obstructive pulmonary disease [COPD] and cystic fibrosis)
- Heart disease (such as congenital heart disease, congestive heart failure and coronary artery disease)
- Blood disorders (such as sickle cell disease)

- Endocrine disorders (such as diabetes mellitus)
- Kidney disorders
- Liver disorders
- Metabolic disorders (such as inherited metabolic disorders and mitochondrial disorders)
- Weakened immune system due to disease or medication (such as people with HIV or AIDS, or cancer, or those on chronic steroids)
- Children who are taking aspirin or salicylate-containing medicines
- Children with extreme obesity (body mass index (BMI) of 40 or more)

Children 6 months and older should get an annual influenza vaccine. Flu shots, nasal spray vaccine, and special vaccination instructions for children should be provided by pharmacists and prescribers during well child assessments.[50,51]

Advisory Committee on Immunization Practices and Pregnancy

Pregnant women have a higher risk for serious influenza complications than women who are not pregnant.[52] The signs and symptoms of an influenza infection are the same as for other populations, and the testing and treatment are the same.

The Advisory Committee on Immunization Practices (ACIP) recommends that all women who are or may become pregnant during the influenza season should be given influenza vaccination.[53] Pregnant women and women who are two weeks postpartum or lost a pregnancy in the preceding two weeks who have or are suspected of having an influenza infection should be promptly treated with an antiviral medication (but not with a live attenuated formulation).[53] These same groups should be given prophylactic antivirals if, in the opinion of a clinician, they have had a significant exposure to influenza.[53] Oseltamivir and zanamivir are safe for pregnant women and fetuses.[53]

Role of Pharmacists and Interdisciplinary Professionals

The CDC provides pharmacists, pharmacy technicians and other health clinicians ongoing information and updates on influenza outbreaks, treatments and recommendations for seasonal influenza immunization prevention. This section provides some general recommendations for the prevention of influenza that pharmacists and associates can reference when advising individuals in their own communities.

The CDC Health Advisory has recommended that health clinicians in general should rule out influenza activity when approached by patients with symptoms. Moreover, all health professionals treating and interacting with patients in the hospital should consider them as high-risk for having influenza and advise them on the available antiviral agents.[54]

CDC Recommendations: Influenza Season 2020-2021

Although the prevention of influenza depends on the virus strain being circulated, the influenza vaccination is recommended to prevent influenza and to prevent complications resulting from becoming infected. Between 2017–18 flu season, an estimated 7.1 million illnesses, 3.7 million medical visits, 109,000 hospitalizations, and 8,000 deaths were prevented.[54] The CDC reported an estimated vaccine effectiveness of "38% (62% against influenza A[H1N1]pdm09 viruses, 22% against influenza A[H3N2] viruses, and 50% against influenza B viruses)."[54] Additionally, the CDC reported the following concerns for influenza preparedness 2020-2021:[54]

- The novel coronavirus, SARS-CoV-2, (COVID-19) exists as a global pandemic with common signs and symptoms that include fever, cough, and dyspnea, which are similar to an influenza illness.
- It is unknown how SARS-CoV-2 will circulate during the 2020–21 influenza season.
- Influenza vaccination of persons ≥ 6 months years of age "can reduce prevalence of illness caused by influenza, and can also reduce symptoms that might be confused with those of COVID-19."[54]

The CDC announced that the circulation of SARS-CoV-2 that causes COVID-19 during the 2020–21 influenza season is expected to be active in the United States. Stay-at-home orders and social distancing strategies to reduce the spread of SARS-CoV-2 will need to be accommodated by influenza immunization strategies. Education on SARS-CoV-2 illness and guidance for vaccine planning during the pandemic is available at the CDC website at: https://www.cdc.gov/vaccines/pandemic-guidance/index.html.[55] The U.S., health system has become overly stressed due to COVID-19 pandemic cases and the prevention of influenza through immunization will help to alleviate further outpatient illnesses and hospitalizations.[55]

Vaccine Selection

The guidance for vaccine selection for specific populations are updated by the CDC and are consistent with Food and Drug Administration (FDA) indications and prescribing information for flu vaccination. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach involves new substantial changes in the recommendations for influenza vaccination relative to new populations not previously recommended for vaccination.[54]

Annual influenza vaccination (all persons aged ≥ 6 months) continues to be recommended for anyone who does not have contraindications. No influenza vaccine product is preferred over another available "licensed, recommended, and appropriate product."[46] The CDC has identified flu immunization changes during 2020-2021:[46]

- Recommendations for Northern Hemisphere influenza vaccines are made by WHO and a summary of the WHO selection of the 2020–21 Northern Hemisphere vaccine viruses can be accessed by pharmacists at: https://www.who.int/influenza/vaccines/virus/recommendations/2020-21_north/enexternal icon
- The FDA considers the recommendations of the WHO, reviews the data, and then basically decides on influenza vaccines marketed in the United

States. The 2020–21 influenza vaccines information are available at https://www.fda.gov/advisory-committees/advisory-committee-calendar/vaccines-and-related-biological-products-advisory-committee-march-4-2020-meeting-announcementexternal icon

- The FDA is the authority on influenza vaccine safety, immunogenicity, and effectiveness in the U.S. Information for Fluzone High-Dose Quadrivalent (HD-IIV4); and for Fluad Quadrivalent (aIIV4) is available for clinicians at the following websites:
  - Fluzone High-Dose Quadrivalent: https://www.fda.gov/vaccines-blood-biologics/vaccines/fluzone-quadrivalent
  - Fluad Quadrivalent: https://www.fda.gov/vaccines-blood-biologics/fluad-quadrivalentexternal icon

The 2020–21 U.S. influenza vaccines include updates to the influenza A(H1N1)pdm09, influenza A(H3N2), and influenza B/Victoria components.[54] The CDC announced updated components in both trivalent and quadrivalent vaccines. An additional influenza B virus component from the B/Yamagata lineage will be included in the quadrivalent vaccines (unchanged from the 2019-2020 quadrivalent influenza vaccines), Egg-based influenza vaccines will contain hemagglutinin (HA) derived from varied influenza-like viruses. Cell culture–based inactivated (ccIIV4) and recombinant (RIV4) influenza vaccines will contain HA derived from varied influenza like viruses. These are identified in the CDC 2020-2021 update.[54]

FDA licensed influenza vaccines for the 2020–21 season includes 1) Fluzone High-Dose Quadrivalent (HD-IIV4) (2019) approved for persons aged ≥ 65 years; and, is expected to replace the trivalent formulation of Fluzone High-Dose (HD-IIV3) that was previously on the market. The Fluzone High-Dose Quadrivalent (0.7 mL) dose is higher than the trivalent Fluzone High-Dose (0.5 mL). Fluzone High-Dose Quadrivalent contains 4 times the amount of HA per vaccine virus in each dose (similar to Fluzone High-Dose) compared with standard-dose inactivated influenza vaccines (60 μg per virus, versus 15 μg in standard-dose IIVs).[54]

Fluad Quadrivalent (aIIV4) was licensed for use by the FDA in February 2020 for persons aged ≥ 65 years. Fluad Quadrivalent and the previously licensed trivalent formulation of Fluad (aIIV3) are expected to be available for use in the 2020–21 influenza season. Other changes include the following:[52]

- Contraindications and Precautions for the Use of LAIV4, *i.e.*, cochlear implant, anatomic and functional asplenia, cranial CSF leak and other active communication between the CSF and oropharynx, nasopharynx, nose, or ear
- LAIV4 use
- Severe egg allergy precautions are needed only if a vaccine other than ccIIV4 or RIV4 is used.

The CDC states that "annual influenza vaccination is recommended for all persons aged ≥ 6 months who do not have contraindications."[46] The CDC also addresses "timing of vaccination, considerations for specific populations, the use of specific vaccines, and contraindications and precautions."[46] Prescribers and pharmacists are able to reference the CDC recommendations when providing individuals with the updated changes for influenza session 2020-2021. In brief, the CDC recommends that efforts should be made to optimize vaccination coverage before influenza begins in the community and that available vaccination should continue to be offered as long there are active cases of influenza. During routine health visits and hospitalizations, vaccinations should be offered; however, revaccination (booster dose) is not needed for individuals who have been fully vaccinated during the influenza season.[46]

High Risk Populations and 2021 Recommendations

High risk populations for medical complications due to influenza include those at increased risk for severe illness and complications from influenza and for influenza-related outpatient, emergency department, or hospital visits. In addition to children (aged 6 through 59 months) and pregnant women, as previously noted, other persons at risk include:[54]

- Children and adolescents (6 months through 18 years of age) prescribed aspirin- or salicylate-containing medications and at possible risk of Reye syndrome after influenza virus infection
- Persons aged ≥ 50 years
- Adults and children diagnosed with chronic pulmonary (including asthma), cardiovascular (excluding isolated hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus)
- Immunocompromised persons, for any cause, *i.e.*, medication-induced or human immunodeficiency virus [HIV] infection
- Nursing home and other long-term care residents
- American Indians/Alaska Natives; and
- Extremely obese persons (body mass index ≥ 40 for adults).

Immunocompromised individuals can include those with a variety of conditions at risk of severe infections.[54] Information on the use of influenza vaccines in immunocompromised individuals is limited. Vaccination before or after an immunocompromising intervention could be a consideration. The Infectious Diseases Society of America (IDSA) provides guidance on the selection and timing of vaccines in specific immunocompromised states. Persons with congenital immune deficiencies and persons receiving cancer chemotherapy or immunosuppressive medications will need to be considered case by case for consideration of influenza vaccination.[54]

Health care personnel with potential exposure to patients or to infectious materials may receive any influenza vaccine that is indicated. The CDC states that "Persons who care for severely immunocompromised persons requiring a protected environment should receive either IIV or RIV4. ACIP and the Healthcare Infection Control Practices Advisory Committee (HICPAC) have previously recommended that health care personnel who receive LAIV should avoid providing care for severely immunosuppressed patients requiring a protected environment for 7 days after vaccination and that hospital visitors who have received LAIV should avoid contact with such persons for 7 days after vaccination. Such persons need not be restricted from caring for or visiting less severely immunosuppressed patients."[52]

Children aged 6 through 35 months may receive any one of the four IIV4s licensed for this age group and the doses differ. The CDC states that vaccines for children aged 6 through 35 months include:[52]

- 0.25 mL per dose of Afluria Quadrivalent (containing 7.5 *µ*g of HA per vaccine virus); or
- 0.5 mL per dose of Fluarix Quadrivalent (containing 15 *µ*g of HA per vaccine virus); or
- 0.5 mL per dose of FluLaval Quadrivalent (containing 15 *µ*g of HA per vaccine virus); or
- Either 0.25 mL per dose (containing 7.5 *µ*g of HA per vaccine virus) or 0.5 mL per dose (containing 15 *µ*g of HA per vaccine virus) of Fluzone Quadrivalent.

Healthy children aged ≥ 2 years may receive LAIV4, 0.2 mL intranasally (0.1 mL in each nostril). For children aged < 2 years, LAIV4 has not been approved for administration.[46] Caution is needed in the administration of an age-appropriate vaccine and dose. Influenza vaccine types and doses for children at varying ages are available at the CDC website.[46]

Pregnant and postpartum women are considered at higher risk for severe illness and complications from influenza, notably during the second and third trimesters. The American College of Obstetricians and Gynecologists has recommended that "all women who are pregnant or who might be pregnant or postpartum during the influenza season receive influenza vaccine. Any licensed, recommended, and age-appropriate IIV or RIV4 may be used. LAIV4 should not be used during pregnancy."[46] A pregnant woman may receive the influenza vaccine at any time during pregnancy throughout the influenza season. Influenza vaccine types and doses during pregnancy are available at the CDC website.

Comorbidity and mortality in the older population due to influenza has been well documented. As discussed previously, the use of influenza vaccines in older adults is based on comparative studies of vaccine efficacy and effectiveness with a focus on Fluzone High-Dose (HD-IIV3), Flublok

Quadrivalent (RIV4), and Fluad (aIIV3). These three vaccines have been compared with standard-dose, non-adjuvanted IIV (SD-IIV3) and HD-IIV3 "has been the most extensively studied in this regard, and evidence has accumulated for its superior efficacy and effectiveness compared with SD-IIV3 in this population."[46]

During the 2020–21 season, quadrivalent formulations of high-dose (HD-IIV4) and adjuvanted (aIIV4) influenza vaccines are expected to be available for administration in older people.[52] Amongst other research studies, the Centers for Medicare and Medicaid Services and Veterans Administration have participated in a cluster-randomized trial of HD-IIV3 compared with SD-IIV among older adults in nursing homes; HD-IIV3 provided better protection than SD-IIV3 against influenza and the potential for secondary complications.[52] HD-IIV3 is expected to be replaced by Fluzone High-Dose Quadrivalent (HD-IIV4) during influenza season 2020-2021. The CDC reported that HD-IIV4 showed noninferior immunogenicity to HD-IIV3 in a two-season randomized trial and relative efficacy or effectiveness as compared with standard-dose non-adjuvanted IIV4 has not been made available.[46]

Fluad Quadrivalent (aIIV4) is also expected to be available during the 2020-21 flu season, however data comparing the efficacy or effectiveness of aIIV4 with non-adjuvanted IIV4 against laboratory-confirmed influenza remains unknown. In older people, vaccination should not be delayed if a specific product is unavailable and, for persons ≥ 65 years of age, any age-appropriate IIV formulation (standard dose or high dose, trivalent or quadrivalent, non-adjuvanted or adjuvanted) or RIV4 can be administered as an acceptable option.[46]

Medical Conditions and History of Egg Allergies

Other complicating conditions such as a history of Guillain-Barré Syndrome (GBS) within 6 weeks of a previous dose of any type of influenza vaccine is discussed by the CDC recommendations for the safe, appropriate administration of influenza vaccination. GBS is considered a precaution to

vaccination.[46] Individuals with GBS within 6 weeks of a previous influenza vaccination should avoid vaccination and antiviral chemoprophylaxis may be considered for these persons.[46] The benefits and risks of influenza vaccination in an individual with GBS should be considered in cases of higher risk for severe complications from influenza.

The possibility of an egg-allergic reaction to influenza vaccines is a concern. Influenza vaccines, except for RIV4 (Flublok Quadrivalent) for people ≥ 18 years of age, and ccIIV4 (Flucelvax Quadrivalent) for those people ≥ 4 years of age may contain trace amounts of egg proteins.[52] An office emergency plan and cardiopulmonary resuscitation preparedness should be in place for pharmacists and other health professionals administering the influenza vaccine. Post-vaccination observation is not required for egg-allergic individuals. However, patients who receive an influenza vaccine are recommended to remain seated or supine for 15 minutes post administration to avoid possible syncope and injury. People with a history egg allergy require the following precautions:[46]

- For urticaria only in a person with known egg allergy, any licensed, recommended influenza vaccine (*i.e.*, IIV, RIV4, or LAIV4) may be used.
- For reactions other than urticaria (angioedema or swelling, respiratory distress, lightheadedness, or recurrent vomiting, requiring epinephrine or another emergency medical intervention) may receive any licensed, recommended influenza vaccine (*i.e.*, IIV, RIV4, or LAIV4) appropriate to the person's age and health status.
- A previous severe allergic reaction to influenza vaccine, regardless of the vaccine used, is a contraindication to future vaccination.

Travelers and Influenza Vaccination

There are variations of influenza occurring in varied geographic areas. The CDC notes that in temperate climate regions of the Northern and Southern hemispheres, "influenza activity is seasonal, occurring approximately from October–May in the Northern Hemisphere and April–September in the

Southern Hemisphere."[46] Influenza might occur throughout the year in tropical regions.[46]

People who travel may become exposed to influenza while traveling to regions where influenza is actively circulating or when traveling with large groups of people, such as on a plane or cruise ship. The use of influenza vaccination prior to travelling may lower the risk of influenza, and vaccination has been suggested at least 2 weeks prior to travelling. Unvaccinated residents of the U.S., are at higher risk for influenza complications during the previous Northern Hemisphere fall or winter and should consider influenza vaccine administration before travelling to the tropics, the Southern Hemisphere (April–September), or on cruise ships or with large groups travelling to any location.[46] Health providers and pharmacists may discuss influenza risk before a person travels.

Special Considerations of Influenza Vaccination

The dosage, administration, contraindications, and precautions of influenza vaccines licensed for use during the 2020-2021 influenza season are available at the CDC website portal for health professionals. Storage and handling of vaccines can also be reviewed at the CDC website at: https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/index.html.[55] The CDC states that "influenza vaccines should be protected from light and stored at temperatures that are recommended on the package insert. Recommended storage temperatures are generally 36°F–46°F (2°C–8°C) and should be maintained at all times with adequate refrigeration and temperature monitoring. Vaccine that has frozen should be discarded. Vaccines should not be used beyond the expiration date on the label."[46]

Influenza surveillance, prevention, and control is available at the CDC website: https://www.cdc.gov/flu. Surveillance data is updated weekly on FluView (https://www.cdc.gov/flu/weekly) and on FluView Interactive (https://www.cdc.gov/flu/weekly/fluviewinteractive.htm).[46] CDC-INFO is available at 1-800-232-4636 to health professionals and pharmacists for additional information.

The Vaccine Adverse Event Reporting System (VAERS) involves mandatory reporting, and all health professionals may report any clinically significant immunization adverse event to VAERS.[46] There is also the National Vaccine Injury Compensation Program (VICP) that provides "a mechanism through which compensation can be paid on behalf of a person determined to have been injured or to have died as a result of receiving a vaccine covered by VICP."[46]

Anaphylaxis Preparedness and Response

Influenza vaccines are administered in multiple settings and by various licensed healthcare professionals, that can be found in pharmacies, at schools, job sites, and at medical provider offices. The CDC states: "All vaccines should be administered in settings in which personnel and equipment for rapid recognition and treatment of anaphylaxis are available. ACIP recommends that all vaccination providers be certified in cardiopulmonary resuscitation (CPR), have an office emergency plan, and ensure that all staff are familiar with the plan."[56] Emergency responses are also published by the CDC.[56]

Infants and Children

In children, the most common signs and symptoms of anaphylaxis tend to involve sudden onset of generalized urticaria, angioedema, flushing, and pruritus. The CDC notes that 10 to 20% of patients have no skin findings.[56] Other critical rapid onset of symptoms that clinicians and patients should be aware of include stridor, wheezing, dyspnea, increased work of breathing, retractions, persistent cough, cyanosis), signs of poor perfusion, abdominal pain, vomiting, dysrhythmia, hypotension, and collapse.[56]

The initial line of treatment when anaphylaxis occurs consists of administering epinephrine. A child is defined by the CDC as prepubescent and weighing around 40 kg., however consideration should be given to an obese child who may weigh > 40 kg. The CDC states that *no* absolute

contraindications to epinephrine exist in case of anaphylaxis. The recommended dose and administration of intramuscular epinephrine 1 mg/mL preparation is listed by the CDC as:[56]

- Inject Epinephrine 0.01 mg/kg intramuscularly in the mid-outer thigh.
- Large children (>50 kg): the maximum is 0.5 mg per dose.
- No response or inadequate response: repeat injection in 5 to 15 minutes (or more frequently).
- Prompt IM injection of epinephrine: expect patients to respond to one, two, or at most, three injections.
- Poor perfusion or response to epinephrine injections: prepare IV epinephrine for infusion
- Epinephrine infusion: for an emergency response protocol, each site should be prepared for the administration of epinephrine 0.1 to 1 mcg/kg/minute continuous infusion (titrated to effect), following a failed or inadequate response to epinephrine intramuscular injection and intravenous saline.

Other emergency protocols include the administration of oxygen, corticosteroids, and intravenous fluids as outlined in the following table.[56] As mentioned previously, the patient should be positioned flat or reclining, as tolerated, and the lower extremities should be elevated.[56]

Health clinicians and/or other emergency response teams are referred to vaccination package instructions or insert on the preparation and administration of epinephrine for continuous intravenous infusions. The CDC also references *UpToDate* for helpful instruction on the treatment of anaphylaxis.[52,56]

In a case of anaphylaxis, the infusion of epinephrine and possibly a vasopressor will require continuous noninvasive monitoring of the patient's blood pressure, heart rate and function, and oxygen saturation.[56] The medications listed in the table as appropriate for the treatment for anaphylaxis are not to be administered as initial or a sole treatment.[56] In a child who weighs 70 kg, the initial infusion rate of epinephrine is 7 mcg/minute (similar

to the recommended range of 2 to 10 mcg/minute *non–weight-based dosing* for adults when a patient's weight is unknown or cannot be estimated.[56]

Children: Emergency Treatment for Anaphylaxis[56]

AIRWAY	Immediate Intubation: For angioedema by the most experienced person to avoid complete obstruction. Be prepared for cricothyrotomy, if needed.
	Oxygen: Administer 8 to 10 L/minute by facemask or up to 100% oxygen, as needed.
INTRAVENOUS FLUID	Normal Saline Rapid Bolus: ● Infuse 20 mL/kg. ● Reevaluate and repeat fluid boluses (20 mL/kg), as needed. ● Massive fluid shifts with severe loss of intravascular volume can occur. ● Monitor urine output.
MONITORING	Continuous noninvasive hemodynamic monitoring and pulse oximetry monitoring is required. Urine Output monitoring: For all patients with severe hypotension or shock who are receiving IV fluid resuscitation
MEDICATIONS	Albuterol: For bronchospasm resistant to IM epinephrine, give albuterol 0.15 mg/kg (minimum dose: 2.5 mg) in 3 mL saline inhaled via nebulizer. Repeat, as needed. H1 antihistamine: Consider giving diphenhydramine 1 mg/kg (max 40 mg) IV given over 5 minutes, or cetirizine (children age 6 months to 5 years can receive 2.5 mg IV, those 6 to 11 years of age can receive 5 or 10 mg IV, over 2 minutes). H2 antihistamine: Consider giving famotidine 0.25 mg/kg (max 20 mg) IV, over at least 2 minutes. Glucocorticoid: Consider giving methylprednisolone 1 mg/kg (max 125 mg) IV. Vasopressors: ● Large amounts of IV crystalloid may be needed to maintain blood pressure. ● A second vasopressor (in addition to epinephrine) may be needed. ● An infusion pump is required for all vasopressors administered intravenously. ● Titrate doses continuously according to the continuous monitoring of blood pressure and cardiac rate/function monitored Monitor oxygenation by pulse oximetry

*Intramuscular = IM; Intravenous = IV

Adults

The CDC also publishes protocols for the emergency treatment of anaphylaxis in adults. The medications listed in the table as appropriate for the treatment for anaphylaxis are not to be administered as initial or a sole treatment.[53] Continuous noninvasive monitoring of blood pressure, heart rate and function, and oxygen saturation are required for all patients who receive vasopressor treatment.[53] Non–weight-based dosing is recommended for all adults where the actual weight cannot be obtained or is unknown.[56]

In adults, the most common signs and symptoms include generalized urticaria, angioedema, flushing, pruritus. An estimated 10-20% of patients will show no skin findings.[56] The rapid progression of symptoms is a danger sign and can include respiratory distress (stridor, wheezing, dyspnea, increased work of breathing, persistent cough, and cyanosis), vomiting, abdominal pain, hypotension, dysrhythmia, chest pain, and collapse.[56] As in children, epinephrine is the first-line treatment when anaphylaxis occurs in adults. No absolute contraindications to epinephrine exists in the setting of anaphylaxis.[56]

Epinephrine (1 mg/mL preparation) is administered as 0.3 to 0.5 mg intramuscularly, preferably in the mid-outer thigh.[56] Epinephrine can be repeated every 5 to 15 minutes or more frequently, as needed.[56] When epinephrine intramuscularly is injected promptly, the majority of patients will respond with the administration of one, two, or three doses at the most. Intravenous epinephrine is administered in cases of poor response.[56]

Influenza vaccines are considered safe and effective, but adverse events do occur and should be reported immediately when they are encountered. Adverse events range from minor to rare and severe allergic reactions such as anaphylaxis.[56] The CDC states that detailed epidemiologic studies are needed to compare the incidence of adverse events among people who receive a vaccination compared to incidence among unvaccinated individuals.[56]

Adult: Emergency Treatment for Anaphylaxis[56]

AIRWAY	Immediate Intubation: For angioedema by the most experienced person to avoid complete obstruction. Be prepared for cricothyrotomy, if needed.
	Oxygen: Administer 8 to 10 L/minute by facemask or up to 100% oxygen, as needed.
INTRAVENOUS FLUID	Normal Saline Rapid Bolus: ● Infuse 1-2 L intra. ● Reevaluate and repeat fluid boluses, as needed. ● Massive fluid shifts with severe loss of intravascular volume can occur. ● Monitor urine output.
MONITORING	Continuous noninvasive hemodynamic monitoring and pulse oximetry monitoring is required. Urine Output monitoring: For all patients with severe hypotension or shock who are receiving IV fluid resuscitation
MEDICATIONS	Albuterol (salbutamol): Administer 2.5 to 5 mg in 3 mL saline via nebulizer for bronchospasm resistant to epinephrine intramuscular. Repeat, as needed. H1 Antihistamine: Cetirizine 10 mg IV (over 2 minutes) or diphenhydramine 25 to 50 mg IV (over 5 minutes) for urticaria and itching only H2 antihistamine: Famotidine 20 mg IV (over 2 minutes). Glucocorticoid: Methylprednisolone 125 mg IV. Vasopressors: ● A second vasopressor (in addition to epinephrine) may be needed. ● An infusion pump is required for all vasopressors administered intravenously. ● Titrate doses continuously according to the continuous monitoring of blood pressure and cardiac rate/function monitored ● Monitor oxygenation by pulse oximetry Glucagon: 1 to 5 mg IV over 5 minutes, followed by infusion of 5 to 15 mcg/minute for patients prescribed beta blockers, as they may not respond to epinephrine. Vomiting can occur with rapid administration of glucagon.

*Intramuscular = IM; Intravenous = IV

Summary

Influenza is a common infectious disease that affects millions of people every year. Influenza is caused by the influenza virus, and the virus is transmitted by contact and/or inhalation with infected droplets, spread by coughing, sneezing, spitting, or touching environmental objects or surfaces with contaminated hands.

Outbreaks of influenza happen every year. In the northern hemisphere, these outbreaks occur during the winter months and they are commonly called the flu season. Environmental and social factors are the cause of the seasonal occurrence of outbreaks. There are three different strains of influenza virus that cause the disease in humans; types A, B, C, and changes in the antigenic profile of the influenza virus explain why outbreaks are an annual occurrence. Most cases of influenza are mild and self-limiting. People who contract influenza typically will have cough, fever, and malaise for a few days and recover completely. However, serious complications and death are possible, particularly in high-risk populations, such as the very young, the very old, and in people who have coexisting medical comorbidities. The primary goals of influenza treatment have been clearly delineated.

The CDC website is an invaluable source of information about seasonal influenza. The CDC publishes current information about influenza, such as what strains are affecting the population, what vaccine should be used, and the proper storage and handling of vaccines. Vaccination is recommended for everyone at 6 months of age or older. Vaccination is particularly important for people and/or cultural groups who have risk factors for developing a serious case of influenza or for developing complications of influenza, as well as for the individuals who work with vulnerable populations.

The prevention of influenza is a key role of pharmacists and other health associates when advising people in their own communities. During routine health visits and hospitalizations, vaccinations should be offered.

Course Test

1. The Centers for Disease Control and Prevention recommends an annual flu vaccination once a person reaches

a. six months of age.
b. age twelve.
c. three months of age.
d. 65 years of age.

2. _____ is the most common complication of influenza.

a. Ischemic heart disease
b. Transverse myelitis
c. Myocarditis
d. Pneumonia

3. True or False: Influenza vaccines cause influenza in approximately 6% of vaccinated individuals.

a. True
b. False

4. Children who have the flu can infect other people _____ after the symptoms begin.

a. two weeks
b. 5-7 days
c. up to 10 days
d. 1-2 days

5. Which of the following statements is true about influenza vaccinations?

a. Influenza vaccines called "trivalent vaccines" protect against two types of influenza B viruses.
b. A revaccination (booster dose) is usually needed for individuals who have been fully vaccinated during the influenza season.
c. In adults and children, leukocytosis is the only prominent laboratory abnormality.
d. Nasal preparations does not contain live viruses.

6. _____ is not recommended for patients who have pre-existing airway disease, such as asthma and/or chronic obstructive pulmonary disease (COPD).

a. Zanamivir
b. Oseltamivir
c. Peramivir
d. Baloxavir marboxil

7. The Advisory Committee on Immunization Practices (ACIP) recommends that women who are or may become pregnant during the influenza season

a. should be treated with a live attenuated antiviral medication.
b. should not take oseltamivir or zanamivir because they are not safe for pregnant women and fetuses.
c. should be given influenza vaccination.
d. All of the above

8. _____ has been reported to be the most common pre-existing disease in patients who have been hospitalized for influenza.

a. Tuberculosis
b. Asthma
c. Dysphagia
d. Myocarditis

9. True or False: Surgical masks do not offer sufficient protection against influenza transmission so the CDC recommends that clinicians wear an N-95 respirator when they are caring for a patient who has influenza.

a. True
b. False

10. Antiviral medication should be given to a patient with influenza

a. after laboratory confirmation of an influenza infection.
b. only if influenza symptoms persist for more than 48 hours.
c. as soon as possible.
d. before, not after, the onset of influenza symptoms.

11. The best way to protect children younger than 6 months of age is to

a. make sure people around them are vaccinated.
b. use a nasal spray vaccine.
c. test them for influenza infection.
d. use the new antiviral drug, baloxavir marboxil.

12. _____ is a new antiviral that inhibits polymerase acidic endonuclease, an enzyme essential for viral replication.

a. Zanamivir
b. Oseltamivir
c. Baloxavir marboxil
d. Peramivir

13. If a patient has confirmed or suspected influenza, healthcare providers should follow droplet precautions

a. after onset of a fever.
b. if respiratory symptoms are present.
c. for a minimum of 10 days.
d. for 7 days after flu onset or until 24 hours after the fever and respiratory symptoms have resolved, whichever is longer.

14. In children, the most common signs and symptoms of anaphylaxis tend to involve sudden onset of

a. generalized urticaria.
b. angioedema.
c. flushing and pruritus.
d. All of the above

15. A patient who was diagnosed with Guillain-Barré Syndrome (GBS) within 6 weeks of an influenza vaccination,

a. should be vaccinated with one dose, not a second dose.
b. may be vaccinated because there is no link between GBS and flu vaccines.
c. should not be vaccinated.
d. may be vaccinated and receive a second dose if needed.

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