

UNDERSTANDING INFLUENZA

Abstract

Influenza, also called the flu, is one of the most common infectious diseases. It is common because of the ease that it may be transmitted from one person to another. There are specific signs and symptoms of an influenza infection. Influenza is distinctively different from a cold. An influenza patient will develop a cough, fever, malaise, and muscle aches but within two to five days the immune system controls the infection, the signs and symptoms abate, and there are no long-term consequences. The amount and infectious level of influenza virus shed into air and passed on between hand contact or contaminated surfaces is not fully known. Nonetheless, well known prevention and health guidelines and treatment exist that both patients, family and healthcare workers should follow.

Learning Objectives

1. Explain the microorganism that causes the flu.
2. Describe the common signs and symptoms of an influenza infection.
3. Describe the differences between the cold and the flu.
4. Identify the complications of an influenza infection.
5. Identify people at risk for complications of an influenza infection.
6. Identify the basic care measures and medications for influenza patients.

Introduction

Influenza, also called the flu, is one of the most common infectious diseases. It is common because of the ease that it may be transmitted from one person to another. Because of the large numbers of individuals that may contract the flu, techniques have been developed to help prevent its transmission. Prevention is also important because certain population groups are at risk of complications from influenza. Influenza is generally a harmless experience, accompanied by flu symptoms. Influenza is usually self-limiting but once a person has the flu, there are treatments that may be used to minimize the symptoms.

The Influenza Virus

Influenza is caused by a virus. Viruses are primitive, microscopic organisms that are ubiquitous; they are everywhere in the environment, and they infect plants, animals, bacteria, and humans. Some viruses such as the influenza virus are relatively harmless, and other viruses like the human immunodeficiency virus (HIV) are quite deadly. Because it is less harmful, influenza infection is not a reportable disease like acquired immune deficiency syndrome (AIDS) or hepatitis, so the exact number of cases that occur in any year is not known. According to the World Health Organization (WHO), however, tens of millions of people are infected with influenza every winter and most people have had a flu infection at least once. The amount of lost personal time and time from work is significant. Even mild cases of the flu account for many lost days at work and countless visits to emergency rooms and physicians' offices.

Influenza is typically referred to as the flu, and these two terms will be used interchangeably in the remaining sections. There are many different types of viruses but they do share some characteristics. The influenza virus is in many ways a typical virus that shares the following characteristics with other viruses.

The influenza virus is infectious. It can be spread from one person to another. This type of transmission of a virus is called horizontal transmission. If the virus is transmitted from a mother to an unborn child, this is called vertical transmission. Viruses differ in their ability to be transmitted from person to person and the influenza virus is considered to be highly contagious.

The influenza virus mutates. Viruses are always mutating, and the influenza virus is always mutating in an attempt to protect itself against an immune system. Viral mutation happens when a virus undergoes a spontaneous change in its form and a new strain of the virus appears. The human immune system functions, in part, by “recognizing” and “remembering” dangerous bacteria and viruses. This ability to recognize and remember, is the defense mechanism a person has against harmful microorganisms. By remembering a previous infection, the immune system can quickly mount a defense; however, viruses have defense mechanisms, as well, and one of the primary ones is the ability to mutate or change.

Mutations are a survival mechanism that allows viruses to avoid detection by the immune system, remain in the host, and develop resistance to drugs. These mutations are one of the reasons why the flu vaccine changes every year. Each year, a vaccine is prepared from

the previous year's virus, which raises questions whether the vaccine will be effective against that year's virus that may have mutated.

Viruses differ in terms of their virulence. Virulence is a term that means the ability of an infectious organism to establish itself in the body and to cause harm. The influenza virus can easily invade and infect, but its ability to cause harm is relatively very low; an influenza infection is rarely deadly. However, the variation in a virus's virulence also depends in part on the host (person who is infected). As regarding the host, people 65 years of age and older, children who are 5 years of age or younger, people who have a compromised immune system, women who are pregnant, people who have certain medical conditions, or people who do not have access to good medical care are susceptible to serious influenza infections and complications.

Although most types of the influenza virus are not highly potent, the influenza virus can mutate and produce a strain that is dangerous. The Spanish flu epidemic in 1918 has been described as one of the worst plagues in history and an estimated 100 million people died worldwide.

There is no cure for influenza. Although much progress has been made, effective treatment for viruses has been difficult to develop and this is true regarding the influenza virus. Vaccination against the influenza virus is effective to a certain degree but the available medications for treating influenza have limited applications.

Viruses are everywhere in the environment, and the influenza virus is no exception. There are millions of different types of viruses surrounding people at all times. Viruses are present on a person's skin,

or in a person's gastrointestinal tract and lungs. The influenza virus is no different.

Transmission of Influenza

The primary way that influenza is transmitted from person to person is by the respiratory route. The influenza virus lives in the passages of the respiratory tract, such as the nose, mouth, throat, and lungs. When someone who has been infected coughs, sneezes, or talks, tiny droplets of moisture that are saturated with the virus are spread in the air. Many of these droplets fall harmlessly to the ground; however, some of the infected droplets may be inhaled by a person in the vicinity; other infected droplets land on objects such as a computer keyboard, door handles and telephone receivers. If someone touches these objects and there is hand-to-mouth contact the virus can enter the respiratory tract. In most cases the influenza virus only survives outside the body for one to two days but if there is a high concentration of the virus on an object that is handled frequently, for example, paper money, the virus can survive for much longer.

The influenza virus can be spread by the respiratory route to anyone who is within six feet of an infected person. Past that point the infected droplets sink to the ground or surrounding surfaces.

The influenza virus begins to replicate (multiply) within four to six hours after it has entered the respiratory tract. The incubation period for the influenza virus, which is defined as the period of time between when an infection begins and when signs and symptoms (coughing, sneezing, fever) of the disease are noticeable, is anywhere between 18

hours to four days after infection. Someone who has the influenza virus is infectious during this incubation period.

Many healthy adults with influenza may be able to infect other people one day *before* symptoms develop and up to five to seven days *after* they have become symptomatic. Children and people who have a compromised immune system may transmit the virus for seven days or longer. Some people can be infected with the influenza virus and not develop signs and symptoms but they can still transmit the virus to another person.

Influenza Signs and Symptoms

The “flu season” is in the winter, usually from November to March. There have been several theories as to why influenza infections happen in the winter. It may be that people spend more time indoors and in close proximity to each other in the winter. The increased time spent indoors during the winter months also means that people have less exposure to sunlight. Sunlight is needed to synthesize vitamin D, inadequate levels of vitamin D may weaken the immune system, and vitamin D deficiency has been associated with increased susceptibility to influenza. Increased time indoors and lack of sunlight resulting in low vitamin D blood levels may increase an individual’s susceptibility to influenza.

Flu season tends to happen during November to March because the influenza virus lives longer and is believed to spread better in the cold dry air of the winter. Influenza infections usually develop quickly and some patients can remember exactly when the infection began.

Influenza has been described as a respiratory virus that causes non-respiratory signs and symptoms and this is an accurate description. An infection with influenza produces a cough, nasal discharge or a runny nose, and a sore throat. However, these are often not the most noticeable or troublesome parts of an influenza infection. Each case of influenza presents a bit differently, but the following are common signs and symptoms of an influenza infection.

Table 1: Signs and Symptoms of Influenza Infection

<p>Chills Cough, sometimes severe Fatigue is one of the most prominent symptoms of the flu Fever over 102°, sometimes as high as 106° (fever is often higher in children than in adults) Headache can be severe in cases of the flu Malaise Muscle aches Nasal congestion, nasal discharge (less common) Sore throat (less common)</p>
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Most of the clinical presentation of an influenza infection is subjective; there are very few physical findings that can be found on an examination. The diagnosis of influenza is usually a clinical diagnosis. It is made by examination, interviewing the patient, and ruling out other illnesses that present with similar signs and symptoms such as a cold or pneumonia. Laboratory tests are not particularly helpful for confirming a diagnosis of influenza and would seldom be used.

The rapid influenza diagnostic test (RIDT) uses a nasal or throat swab to detect the presence of influenza viruses in nasal or throat

secretions. The results are available within 15 minutes. The RIDTs can confirm that someone has an influenza infection. However, the tests are not completely accurate or sensitive and false negative results and false positive results are possible. Some physicians may use the RIDT to decide which patients to treat with antiviral drugs but for most people the RIDT is not necessary.

An influenza infection can be debilitating. Many people feel too ill or weak to get out of bed. Fortunately, as mentioned earlier, an influenza infection is self-limiting in most cases. The majority of people feel sick for two to five days, then recover within the week. Occasionally the respiratory symptoms and the fever will resolve but feelings of fatigue and weakness will persist for several weeks. In some cases, serious complications can occur and each year in the United States there are a few thousand deaths from influenza and its complications.

Influenza versus the Common Cold

Whenever someone has a cough, fatigue, fever, and runny nose the first question many people ask is: do I have a cold or the flu? It is a reasonable question as the signs and symptoms of a cold and an influenza infection are somewhat alike, and they are both respiratory tract illnesses that are caused by viruses and they both occur during the same time, the winter months. Because of these similarities it can be difficult to know if someone has a cold or the flu, yet there are some differences between the illnesses that clearly distinguish one from the other.

- A cold begins gradually. A case of the flu usually begins more quickly and dramatically.

- Someone with the flu will have a fever and the fever can be as high as 102° to 105° while a person who has a cold may not have a fever at all or worst, a mild one.
- Fatigue is a prominent symptom of the flu and can last for several weeks, but someone who has a cold will usually just feel a little run down for a day or two.
- Someone with a cold will tend to have nasal congestion and/or excess nasal secretions and sneeze a lot (a stuffy, runny nose) but these are less common or absent in cases of the flu.
- A sore throat is common with a cold, but unusual with the flu.
- Cough can be quite prolonged and severe with a flu, but much less so with a cold.
- People who have the flu often complain of chills and muscle aches.
- Headache is a very common symptom of the flu, but very unusual in someone who has a cold.
- The signs and symptoms of the flu are more intense than those of a cold, for example, the fever is higher and the level of fatigue is more intense.
- A cold does not last as long as a flu.
- The flu can cause serious complications, a cold will not.

Table 2: Influenza and Cold: Signs and Symptoms

<p>Cold: Gradual onset, short duration, stuffy nose, sore throat, mild to moderate cough, no risk of serious complications</p> <p>Influenza: Rapid onset, long duration, chills, cough (often severe), fever up to 105° or higher, fatigue (sometimes severe), headache (sometimes severe), malaise, muscle aches, potential for serious complications</p>
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In addition to differences in the onset, duration of the illness, and the type and intensity of the signs and symptoms, there are differences between the cold and the flu in terms of treatment. The most important differences between a cold and the flu in this respect are that 1) there are medications that can be used to prevent and treat the flu, and 2) if someone has the flu medical clinicians will be more alert for possible serious complications, especially if the patient has certain risk factors.

Complications of Influenza

For most people, a case of the flu is a miserable experience but not a serious medical issue. They will feel terrible for a few days or a week and then recover without a problem but for some people influenza can be serious. The flu can develop into bronchitis, pneumonia, a sinus infection or other systemic complications. In addition, the fever, lack of appetite and other aspects of an influenza can aggravate pre-existing medical conditions such as asthma, congestive heart failure, diabetes, and emphysema. Someone who has one of these medical conditions and develops an influenza infection could easily develop a dangerous change in blood sugar or a respiratory infection.

Pneumonia

Pneumonia is the most common complication associated with influenza infection. It can be caused by bacteria, a virus, or both. Influenza may disrupt the normal functioning of the immune system, predisposing certain people to developing pneumonia. Influenza-associated pneumonia is most common in children and the elderly, and it can be a very serious complication. Typically, influenza-associated pneumonia happens after the primary influenza infection has resolved, it typically

develops rapidly, often within hours, and influenza-associated pneumonia is a significant cause of both morbidity and mortality. Signs and symptoms of this complication include a productive cough, fever, and weakness.

Other Complications

Pneumonia is by far the most common complication of influenza infection but other organ systems can be affected. Influenza infection can cause a primary infection of the heart (myocarditis, pericarditis), primary infection of and damage to the muscles (myositis), kidney damage, and serious infections of the nervous system. These complications can be devastating but fortunately they are relatively rare, occurring primarily in at-risk groups.

Children are more likely to develop otitis media (middle ear infection) and pneumonia.

Pre-existing Medical Conditions

People who have cardiac or pulmonary diseases, people who have diabetes, or people who have a compromised immune system may suffer from complications or worsening of these diseases if they develop an influenza infection. Asthma, congestive heart failure, emphysema, and heart disease can affect oxygen delivery. Influenza is a disease of the respiratory tract, so the flu can be especially dangerous for people who have these cardiac or pulmonary diseases and a decreased ability to circulate blood or transport oxygen. For people with diabetes, the dehydration, fever, and stress associated with the flu can cause hyperglycemia or hypoglycemia.

Fortunately, complications of influenza are unusual and they typically occur in specific populations who are at risk. However, for those people an influenza infection can be very serious. There are approximately 200,000 hospitalizations and 49,000 deaths each year in the United States that are caused by influenza.

At Risk Populations for Influenza Complications

People who are 65 years of age or older, children who are younger than five (and especially children under the age of two), women who are pregnant, and people who have certain medical conditions are more likely to develop complications from influenza, such as pulmonary or cardiac problems. In older and younger age groups the immune system may either not be fully developed (children) or may be relatively weak (people > age 65). The elderly are likely to have cardiac and/or pulmonary diseases, diabetes, kidney disease, or neurological diseases and these will make them more susceptible to pneumonia and other influenza-associated complications.

Women who are pregnant are more likely to develop an influenza infection. The infection is typically worse than it would be for a woman who is not pregnant, and pregnant women are more likely to develop pneumonia and require hospitalization. The mortality rate from influenza is higher in pregnant women.

People with a compromised immune system would obviously be at a higher risk for developing influenza-associated complications. This would include people who have a pre-existing infection with human immunodeficiency virus (HIV), who are undergoing chemotherapy, or who will be having or have a transplant procedure and are taking immunosuppressant drugs.

Table 4: At Risk Populations for Influenza-Associated Complications

<p>Age five years of age or younger Morbidly obese Native Americans and Alaskan Natives Age 65 years of age or older Pregnant and postpartum women (past two weeks) Diagnosed with cancer Compromised immune system Chronic cardiac, kidney, liver, pulmonary, or neurological diseases Residents of nursing home or long-term care facilities</p>

Flu-like signs or symptoms may be accompanied by neck pain and confusion. This may indicate the presence of a serious neurological condition called meningitis. The patient should see a medical clinician when exhibiting these symptoms.

Treatment of Influenza

A routine case of the flu does not require the attention of a medical clinician and can be managed at home with rest, supportive care, and time to recover. However, if flu-like signs and symptoms are present a clinician should be consulted if any of the following specific situations apply.

There is a high risk for developing complications. Remember what the high risk groups are: the elderly, pregnant women, the very young, people with a compromised immune system, and people with a serious pre-existing medical disease. All of these people are susceptible to influenza-associated complications and/or worsening of their pre-existing medical conditions, and they should see a medical clinician if they suspect they have the flu.

An example of a high-risk influenza case would be a child with an influenza infection who is one year of age or younger and who has a fever greater than 100°. The fever may be accompanied by a rash, difficulty breathing, rapid breathing, persistent vomiting, an inability to eat or drink, or a cough that produces a "whooping" sound. Children of this age do not have a mature immune system and they become dehydrated much more easily than do older children and adults. Children in this group should see a physician if it is suspected that they have the flu.

For adults or children who do not fit into one of those three categories (the elderly, pregnant women, the very young), a medical clinician should be consulted when the person is wheezing while taking breathes, there is persistent nausea and vomiting (food and fluids cannot be tolerated or kept down), chest pain or difficulty breathing, and persistent diarrhea. Medical attention should also be sought if the flu-like symptoms are getting worse every day, the fever lasts more than three days, if there are flu-like signs and symptoms but also signs and symptoms that are not typical of the illness, or the fever goes away and then returns.

In most cases, medical clinicians do not perform specific tests to diagnose the flu. The physician will interview and examine the patient and the typical signs and symptoms of the flu are considered to be sufficient evidence to make the diagnosis. If the clinician is not sure that the patient has the flu, a throat culture, blood tests or x-rays may be ordered, and these tests may be ordered especially if the patient has atypical signs and symptoms or has a high risk of developing complications.

The patient should check with a medical clinician before taking *any* medication. Most over-the-counter medications can be taken safely by most people who have the flu but these drugs could be contraindicated for people with certain medical conditions or they could interact with prescription medications.

If the patient clearly has a case of influenza and is not high risk, treatment can consist of simple supportive care. Antibiotics are not effective in treating viruses. Antibiotics are only effective for treating infections caused bacteria, so they are not used in treating a viral infection such as influenza. "Home remedies," and "time to recover" are usually all that is needed. These may be implemented by using the following strategies.

- Rest: No strenuous physical activity. Limit social contacts.
- Fluids: It is not particularly important what the patient drinks, it is important that the patient does drink so whatever fluid he or she likes and can tolerate is the best choice.
- Treating symptoms: Fever and muscle aches can be treated with the over-the-counter analgesics acetaminophen and ibuprofen. Do not use aspirin. Cough can be treated with over-the-counter cough suppressants.
- Guidelines for Health Prevention: Follow the recommended guidelines for health prevention. Most primary care providers will review that annually with the patient.

There are oral, intranasal and intravenous antiviral medications that can be used to treat influenza.

- Peramivir (brand name Rapivab) can be given intravenously (IV).

- Oseltamivir (brand name Tamiflu) can be given orally.
- Zanamivir (brand name Relenza) can be given intranasally.

These antiviral medications work by preventing the influenza virus from being released from infected cells. They have been shown to decrease the duration of influenza infection by one-half day to three days if they are given promptly but it is not clear if they reduce the risk of influenza-associated complications or mortality. However, peramivir, oseltamivir, or zanamivir (when deciding which drug to use depending on the circumstances) are recommended for people who are hospitalized because of the flu and for high-risk individuals.

Antibiotics cannot be used to treat influenza. Influenza is an infection caused by a virus, and antibiotics are only effective for treating infections caused by bacteria.

Prevention of Influenza Infection

Influenza is highly contagious but there is no need to isolate people who have the flu. People who have an active case of the flu should certainly limit their social contacts until they have recovered, and they should strictly avoid contact with people who have a high risk of developing complications. But by understanding how the flu is spread and using some basic hygiene techniques, transmission of the flu can be greatly reduced. In order to limit the spread of influenza, during the flu season everyone should observe recommended safety practices.

Handwashing:

Hand washing is one of the most effective infection control techniques to prevent transmission of the flu. Soap and water or an alcohol-based hand sanitizer can be used. People should wash their hands, cover their face or mouth when they cough or sneeze, or if they touch their eyes, mouth, or nose.

Personal Hygiene:

Good personal hygiene should be used. A person should avoid touching the eyes, mouth, or nose during the flu season and if the flu has been contracted. The influenza virus can be spread from these areas to a person's hand and fingers and then to the environment.

Respiratory Hygiene and Cough Etiquette:

Respiratory hygiene and cough etiquette is part of Standard Precautions, the Centers for Disease Control and Prevention (CDC) recommended infection control practices. Practicing good respiratory hygiene and cough etiquette consists of a person: 1) covering the nose and mouth with a tissue when coughing or sneezing, 2) making sure to dispose of used tissue properly by placing it in the trash immediately after use, 3) handwashing with soap and water or an alcohol-based hand rub after discarding the tissue.

Avoiding Contact with Others:

One of the most effective methods of preventing the spread of influenza is to limit social contacts during the flu season. A person should avoid contacting other people when feeling sick and until at least 24 hours after symptoms of flu, such as a fever has ended. Conversely, a person should try and avoid contact with someone who has the flu.

Flu Vaccine

The flu vaccine is one of the best ways to prevent getting the flu, and it is 70-90% effective. The vaccine can be given by injection or given as a nasal preparation that is squirted in the nose. The nasal flu vaccine can only be given to people from the ages of 2 to 49, and there are many people for whom its use is contraindicated.

Children under the age of six months should not be given the flu vaccine, injectable or nasal. It takes approximately 2 weeks for the vaccine to work, and the vaccine must be given before the flu season starts so most people receive it in October or November.

People who are at high risk for developing complications, people who work with high-risk patients, people who live in close proximity to large groups of others (nursing home residents, college students living in dormitories), and anyone 50 years of age or older should receive the flu vaccine. The side effects of the vaccine are usually mild and include soreness at the injection site, a slight fever, and muscle aches. The flu vaccine will not cause an infection with influenza; a person cannot get the flu from the flu vaccine.

Because the influenza virus mutates, flu vaccines must be developed that are specifically designed to prevent infection with the strain of influenza that is expected. This is why the flu vaccine changes each year and there can be delays in its production and delivery. The CDC recommends that the following members of the public get a flu vaccine.

- Children aged 6 months through 4 years (59 months)
- People aged 50 years and older
- People with chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus)
- People who are immunosuppressed (including those with immunosuppression caused by medications or by human immunodeficiency virus)
- Women who are or will be pregnant during the influenza season
- People who are aged 6 months through 18 years and receiving long-term aspirin therapy and who therefore might be at risk for experiencing Reye syndrome after influenza virus infection.
- People who are residents of nursing homes and other chronic-care facilities
- American Indians/Alaska Natives
- People who are morbidly obese (a body-mass index that is 40 or greater).

In addition, the CDC recommends that the following healthcare professionals get a flu vaccine: 1) household contacts and caregivers of children younger than 5 years and adults aged 50 years and older, with particular emphasis on vaccinating contacts of children aged younger than 6 months, and 2) household contacts and caregivers of people with medical conditions that put them at higher risk for severe complications from influenza.

Summary

Influenza is a very common infectious disease caused by the influenza virus and is primarily transmitted by inhalation of infected respiratory

droplets that are exhaled when an infected person cough, sneezes, or talks. Transmission of influenza can also happen by hand-to-mouth contact when environmental surfaces are contaminated. The incubation period for the influenza virus is anywhere between 18 hours and four days after infection. Someone who has the influenza virus is infectious during the incubation period. Many healthy adults with influenza may be able to infect other people one day *before* symptoms develop and up to five to seven days *after* they have become symptomatic. Most cases of influenza happen during the winter, flu season.

The flu vaccine is one of the best ways to prevent getting the flu and is administered by way of injection or as a nasal preparation. Medication and prevention of the flu have been reviewed. Healthcare workers are often required to have an annual flu shot or nasal route to prevent contracting it and/or passing on the virus to others. The Certified Nurse Assistant may be offered annual immunization to protect against the flu, especially if working in a high risk area, such as a nursing home or with a known high risk patient population.