Influenza Essay, Research Paper

Clinical Features of Influenza

Influenza, commonly called “the flu,” is caused by viruses that infect the respiratory tract. Compared with most other viral respiratory infections, such as the common cold, influenza infection often causes a more severe illness. Typical clinical features of influenza include fever (usually 100oF to 103oF in adults and often even higher in children) and respiratory symptoms, such as cough, sore throat, runny or

stuffy nose, as well as headache, muscle aches, and often extreme fatigue. Although nausea, vomiting, and

diarrhea can sometimes accompany influenza infection, especially in children, gastrointestinal

symptoms are rarely prominent. The term “stomach flu” is a misnomer that is sometimes used to describe gastrointestinal illnesses caused by other microorganisms.

Most people who get the flu recover completely in 1 to 2 weeks, but some people develop

serious and potentially lifethreatening medical complications, such as pneumonia. In an

average year, influenza is associated with about 20,000 deaths nationwide and many more

hospitalizations. Flu related complications can occur at any age; however,the elderly and

people with chronic health problems are much more likely to develop serious complications

after influenza infection than are younger, healthier people.

The Influenza Viruses

Influenza viruses are divided into three types, designated A, B, and C. Influenza types A

and B are responsible for epidemics of respiratory illness that occur almost every winter

and are often associated with increased rates for hospitalization and death. Influenza type

C differs from types A and B in some important ways. Type C infection usually causes

either a very mild respiratory illness or no symptoms at all; it does not cause epidemics

and does not have the severe public health impact that influenza types A and B do. Efforts

to control the impact of influenza are aimed at types A and B, and the remainder of this

discussion will be devoted only to these two types.

Influenza viruses continually change over time, usually by mutation. This constant

changing enables the virus to evade the immune system of its host, so that people are

susceptible to influenza virus infection throughout life. This process works as follows: a

person infected with influenza virus develops antibody against that virus; as the virus

changes, the “older” antibody no longer recognizes the “newer” virus, and reinfection can

occur. The older antibody can, however, provide partial protection against reinfection.

Currently, three different influenza strains circulate worldwide: two type A viruses and one

type B. Type A viruses are divided into subtypes based on differences in two viral proteins

called the hemagglutinin (H) and the neuraminidase (N). The current subtypes of influenza

A are designated A(H1N1) and A(H3N2).

Influenza type A viruses undergo two kinds of changes. One is a series of mutations that

occur over time and cause a gradual evolution of the virus. This is called antigenic “drift.”

The other kind of change is an abrupt change in the hemagglutinin and/or the

neuraminidase proteins. This is called antigenic “shift.” In this case, a new subtype of the

virus suddenly emerges. Type A viruses undergo both kinds of changes; influenza type B

viruses change only by the more gradual process of antigenic drift.

Natural History of Human Influenza

Influenza A and B viruses continually undergo antigenic drift. This process accounts for

most of the changes that occur in the viruses from one influenza season to another.

Antigenic shift occurs only occasionally. When it does occur, large numbers of people,

and sometimes the entire population, have no antibody protection against the virus. This

results in a worldwide epidemic, called a pandemic. During this century, pandemics

occurred in 1918, 1957, and 1968, each of which resulted in large numbers of deaths, as

noted below.

Mortality associated with pandemics:

1918-19 “Spanish flu” A(H1N1) — Caused the highest known influenza-related

mortality: approximately 500,000 deaths occurred in the United States, 20 million

worldwide.

1957-58 “Asian flu” A(H2N2) — 70,000 deaths in the United States.

1968-69 “Hong-Kong flu” A(H3N2) — 34,000 deaths in the United States.

The emergence of the “Hong Kong flu” in 1968-69 marked the beginning of the type

A(H3N2) era. When this virus first emerged, it was associated with lower mortality than

that caused by the two previous pandemic viruses. Several possible reasons for this lower

mortality have been hypothesized. First, only the hemagglutinin changed from the “Asian”

strain [type A(H2N2)]; the neuraminidase (N2) stayed the same, and therefore existing

antibody could be expected to offer some protection. A second possibility is suggested by

evidence that a virus with a similar hemagglutinin may have circulated from the late 1890s

to the early 1900s. If this were the case, people who were in their sixties and older in 1968

may have had some protection from antibody acquired in their youth.

There are still many things about influenza viruses that are not understood. Although the

newly emerged type A(H3N2) virus caused only moderate mortality in 1968 compared with

other pandemic viruses, this virus has continued to cause substantial mortality as it has

continued to circulate and evolve. In the years since its emergence, type A(H3N2)

epidemics have caused approximately 400,000 deaths in the United States alone, and

more than 90% of these deaths have occurred among elderly people. Of the influenza

viruses currently in worldwide circulation, A(H3N2) still has the most severe overall impact.

The other influenza A subtype currently in circulation, type A(H1N1), also has an

interesting history. After the devastating pandemic of 1918-19, this subtype continued to

circulate and undergo antigenic drift. It periodically caused large epidemics, but never on

the scale of the 1918-19 pandemic. When the “Asian” strain [(A(H2N2)] emerged in 1957,

the A(H1N1) viruses disappeared (as did the A(H2N2) viruses when the “Hong Kong” virus

emerged in 1968). In 1977, the A(H1N1) viruses reappeared and have cocirculated with

A(H3N2) viruses ever since. However, the impact of A(H1N1) has been different during its

most recent appearance. The virus that reappeared in 1977 was virtually identical to an

A(H1N1) virus that circulated in 1950. Therefore, most people born before 1950 were

immune, and epidemics caused by A(H1N1) viruses since 1977 have primarily affected

younger people. The fact that the elderly appear to have natural protection against current

A(H1N1) viruses probably explains the low mortality associated with recent epidemics in

which this subtype was the predominant strain. However, as A(H1N1) viruses continue to

evolve, they could begin to have a more severe impact on the elderly.

Influenza Vaccine

Much of the illness and death caused by influenza can be prevented by annual influenza

vaccination. Influenza vaccine is specifically recommended for people who are at high risk

for developing serious complications as a result of influenza infection. These highrisk

groups include all people aged 65 years or older and people of any age with chronic

diseases of the heart, lung or kidneys, diabetes, immunosuppression, or severe forms of

anemia. Other groups for whom vaccine is specifically recommended are residents of

nursing homes and other chroniccare facilities housing patients of any age with chronic

medical conditions, and children and teenagers who are receiving longterm aspirin therapy

and who may therefore be at risk for developing Reye syndrome after an influenza virus

infection. Influenza vaccine is also recommended for people who are in close or frequent

contact with anyone in the highrisk groups defined above. These people include health care

personnel and volunteers who work with highrisk patients and people who live in a

household with a highrisk person.

Although annual influenza vaccination has long been recommended for people in the

highrisk groups, many still do not receive the vaccine. Some people are not vaccinated

because of misperceptions about influenza and the vaccine. They mistakenly perceive

influenza as merely a nuisance and believe that the vaccine causes unpleasant side

effects or that it may even cause the flu. The truth is that influenza vaccine causes no side

effects in most people. The most serious side effect that can occur after influenza

vaccination is an allergic reaction in people who have severe allergy to eggs, since the

viruses used in the vaccine are grown in hens’ eggs. For this reason, people who have an

allergy to eggs should not receive influenza vaccine.

Less than onethird of those who receive vaccine have some soreness at the vaccination

site, and about 5% to 10% experience mild side effects, such as headache or low-grade

fever for about a day after vaccination. These side effects are most likely to occur in

children who have not been exposed to influenza virus in the past.

Nevertheless, some older people remember earlier influenza vaccines that did, in fact,

produce more unpleasant side effects. Vaccines produced from the 1940s to the mid1960s

were not as highly purified as modern influenza vaccines, and it was these impurities that

caused most of the side effects. Since the side effects associated with these early

vaccines, such as fever, headache, muscle aches, and fatigue, were similar to some of the

symptoms of influenza, people believed that the vaccine had caused them to get the flu.

However, influenza vaccine produced in the United States has never been capable of

causing influenza. The only type of influenza vaccine that has been licensed in the United

States to the present time is made from killed influenza viruses, which cannot cause

infection. An influenza vaccine that is made with live influenza viruses has been developed

and may be marketed in the future. This vaccine is made with viruses that can confer

immunity but do not cause classic influenza symptoms.

Some people do not receive influenza vaccine because they believe it is not very effective.

There are several different reasons for this belief. People who have received influenza

vaccine may subsequently have an illness that is mistaken for influenza, and they believe

that the vaccine failed to protect them. In other cases, people who have received vaccine

may indeed have an influenza infection. Overall vaccine effectiveness varies from year to

year, depending upon thedegree of similarity between the influenza virus strains included in

the vaccine and the strain or strains that circulate during the influenza season. Because

the vaccine strains must be chosen 9 to 10 months before the influenza season, and

because influenza viruses mutate over time, sometimes mutations occur in the circulating

strains between the time vaccine strains are chosen and the next influenza season is over.

These mutations sometimes reduce the ability of the vaccineinduced antibody to inhibit the

newly mutated virus, thereby reducing vaccine efficacy.

Vaccine efficacy also varies from one person to another. Studies of healthy young adults

have shown influenza vaccine to be 70% to 90% effective in preventing illness. In the

elderly and those with certain chronic medical conditions, the vaccine is often less effective

in preventing illness than in reducing the severity of illness and the risk of serious

complications and death. Studies have shown the vaccine to reduce hospitalization by

about 70% and death by about 85% among the elderly who are not in nursing homes.

Among nursing home residents, vaccine can reduce the risk of hospitalization by about

50%, the risk of pneumonia by about 60%, and the risk of death by 75% to 80%. When

antigenic drift results in the circulating virus becoming different from the vaccine strain,

overall efficacy may be reduced, especially in preventing illness, but the vaccine is still

likely to lessen the severity of the illness and to prevent complications and death.

Why the Vaccine Must Be Taken Every Year

Although only a few different influenza viruses circulate at any given time, people continue

to become ill with the flu throughout their lives. The reason for this continuing susceptibility

is that influenza viruses are continually changing, usually as a result of mutations in the

viral genes. Currently, there are three different influenza virus strains, and the vaccine

contains viruses representing each strain. Each year the vaccine is updated to include the

most current influenza virus strains. The fact that influenza viruses continually change is

one of the reasons vaccine must be taken every year. Another reason is that antibody

produced by the host in response to the vaccine declines over time, and antibody levels

are often low one year after vaccination.

When To Receive Influenza Vaccine

In the United States, influenza usually occurs from about November until April. Typically,

activity is very low until December, and peak activity most often occurs between January

and March. Influenza vaccine should be administered between September and

midNovember. The optimal time for organized vaccination programs for persons at high risk

for influenzarelated medical complications is usually the period from October to

midNovember. It takes about 1 to 2 weeks after vaccination for antibody against influenza

to develop and provide protection.