

## INFLUENZA-ASSOCIATED CONDITIONS

### REPORTING INFORMATION

- **Class B (pediatric mortality):** Report by the end of the next business day after the case or suspected case presents and/or a positive laboratory result to the local health department where the patient resides. If patient residence is unknown, report to the local health department in which the reporting health care provider or laboratory is located.
- **Class B (hospitalization):** Report by the end of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism: [Ohio Confidential Reportable Disease form](#) (HEA 3334, rev. 1/09), [Positive Laboratory Findings for Reportable Disease form](#) (HEA 3333, rev. 8/05), the local health department via the Ohio Disease Reporting System (ODRS), or telephone.
- [CDC Influenza-Associated Pediatric Deaths Case Report Form \(OMB No. 0920-0007\)](#) is available for use to assist in local disease investigation and contact tracing activities. This form should be sent to the Ohio Department of Health (ODH), and information collected from the form should be entered into ODRS where fields are available. The mailing address for this form is: Ohio Department of Health, Bureau of Infectious Disease Surveillance and Investigation [tentative bureau name as of November 2008, name subject to Public Health Council review], 246 N. High Street, Columbus, OH 43215.
- [ODH Influenza-associated Hospitalization Confidential Case Report Form](#) (HEA 7192, rev. 10/08) is available for use to assist in local disease investigation and contact tracing activities. Information collected from the form should be entered into ODRS and not sent to ODH, unless otherwise requested.

### AGENT

Influenza viruses A, B and C. Influenza A strains are sub-classified by two antigens, hemagglutinin (H) and neuraminidase (N). Recent influenza A viruses that have circulated among humans have included H1N1 and H3N2. Influenza A and B viruses are responsible for widespread outbreaks, while Influenza C cases occur sporadically.

### CASE DEFINITIONS

#### **Influenza-associated Pediatric Mortality**

##### **Clinical Presentation**

A death resulting from a clinically compatible illness that was confirmed to be influenza by an appropriate laboratory or rapid diagnostic test in a person aged <18 years. There should be no period of complete recovery between the illness and death.

A death should not be reported if:

1. There is no laboratory confirmation of influenza virus infection.
2. The influenza illness is followed by full recovery to baseline health status prior to death.
3. The death occurs in a person 18 years or older.
4. After review and consultation, there is an alternative agreed upon cause of death.

### **Laboratory Criteria for Diagnosis**

Laboratory testing for influenza virus infection may be done on pre- or post-mortem clinical specimens, and include identification of influenza A or B virus infections by a positive result by at least one of the following:

- Influenza virus isolation in tissue cell culture from respiratory specimens,
- Reverse-transcriptase polymerase chain reaction (RT-PCR) testing of respiratory specimens,
- Direct or indirect immunofluorescent antibody staining of respiratory specimens,
- Commercial rapid influenza diagnostic testing of respiratory specimens,
- Immunohistochemical (IHC) staining for influenza viral antigens in respiratory tract tissue from autopsy specimens,
- Four-fold rise in influenza hemagglutination inhibition (HI) antibody titer in paired acute and convalescent sera.

### **Comment**

Serologic testing for influenza is available in a limited number of laboratories, and should only be considered as evidence of recent infection if a four-fold rise in influenza (H1) antibody titer is demonstrated in paired sera. Single serum samples are not interpretable. The time frame between the drawing of acute and convalescent sera should be between 2-3 weeks.

### **Case Classification**

Suspect: A death meeting the clinical criteria but pending laboratory confirmation.

Confirmed: A death meeting the clinical criteria that is laboratory confirmed.

Not a Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case.

### **Influenza-associated Hospitalization**

#### **Clinical Presentation**

An illness compatible with influenza virus infection that must result in hospitalization.

A hospitalization should not be reported if:

1. There is no laboratory confirmation of influenza virus infection.
2. The positive influenza test is from a specimen obtained more than 3 days after hospital admission (to minimize the reporting of hospital acquired rather than community acquired infections).
3. The patient was not admitted for a respiratory illness or respiratory symptom illness onset began after the first 3 days of hospital admission (to minimize the reporting of hospital acquired rather than community acquired infections).

### **Comment**

Hospitalization is defined as an admission to an inpatient ward of the hospital. Patients who are admitted to and discharged from the hospital on the same day are considered hospitalized. An overnight stay is not required. Emergency room and outpatient visits are not hospitalizations. However, if the person is admitted to an inpatient ward directly following an emergency room or outpatient visit then he/she should be considered hospitalized. In this situation, date of admission should be the date the patient was admitted to the ward, not first seen in the emergency room or outpatient clinic.

### **Laboratory Criteria for Diagnosis**

Laboratory testing for influenza virus infection may be done on pre- or post-mortem clinical specimens, and include identification of influenza A or B virus infections by a positive result by at least one of the following:

- Influenza virus isolation in tissue cell culture from respiratory specimens,
- Reverse-transcriptase polymerase chain reaction (RT-PCR) testing of respiratory specimens,
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### **Comment**

Serologic testing for influenza is available in a limited number of laboratories, and should only be considered as evidence of recent infection if a four-fold rise in influenza (H1) antibody titer is demonstrated in paired sera. Single serum samples are not interpretable. The time frame between the drawing of acute and convalescent sera should be between 2-3 weeks.

### **Case Classification**

Confirmed: A hospitalization that was determined to be influenza-related and confirmed by an appropriate laboratory or rapid diagnostic test.

Not A Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case.

### **Comment**

Laboratory or rapid test confirmation is required as part of the case definition; therefore, all reported cases will be classified as confirmed.

## **SIGNS AND SYMPTOMS**

Uncomplicated influenza illness is characterized by the abrupt onset of constitutional and respiratory signs and symptoms (e.g. fever, myalgia, headache, malaise, nonproductive cough, sore throat, and rhinitis). Among children, otitis media, nausea, and vomiting also are commonly reported with influenza illness. Uncomplicated influenza illness typically resolves after 3–7 days for the majority of persons, although cough and malaise can persist for >2 weeks. However, influenza virus infections can cause primary influenza viral pneumonia; exacerbate underlying medical conditions (e.g. pulmonary or cardiac disease); lead to secondary bacterial pneumonia, sinusitis, or otitis media; or contribute to co-infections with other viral or bacterial pathogens. Young children with influenza virus infection might have initial symptoms mimicking bacterial sepsis with high fevers, and febrile seizures have been reported in 6%–20% of children hospitalized with influenza virus infection. Population-based studies among hospitalized children with laboratory-confirmed influenza have demonstrated that although the majority of hospitalizations are brief (2 or fewer days), 4%–11% of children hospitalized with laboratory-confirmed influenza required treatment in the intensive care unit, and 3% required mechanical ventilation. Among 1,308 hospitalized children in one study, 80% were aged <5 years, and 27% were aged <6 months. Influenza virus infection also has been uncommonly associated with encephalopathy, transverse myelitis, myositis, myocarditis, pericarditis, and Reye syndrome.

Influenza infections may be asymptomatic or may produce a wide spectrum of manifestations from mild to severe.

## DIAGNOSIS

- Influenza virus isolation in tissue cell culture from respiratory specimens,
- Reverse-transcriptase polymerase chain reaction testing of respiratory specimens,
- Immunofluorescent antibody staining (direct or indirect) of respiratory specimens,
- Rapid influenza diagnostic testing of respiratory specimens.

## EPIDEMIOLOGY

### Source

Humans are the reservoir of human influenza viruses. Different antigenic subtypes occur in other species; mammalian reservoirs (e.g. swine) and avian reservoirs (e.g. ducks) may be the sources of new human subtypes via genetic reassortment.

### Occurrence

Influenza occurs in pandemics, epidemics, localized outbreaks and as sporadic cases. Epidemics and pandemics follow the introduction of influenza strains that are different from the previously circulating strains. New strains occur when there is a slight variation of an existing strain (i.e. antigenic drift) or the appearance of completely different strain (i.e. antigenic shift). Influenza activity occurs predominately during the winter and early spring. Influenza A is characterized by moderate to severe illness in the winter, which affects all age groups. Attack rates are higher for school age children than for preschoolers or adults. Influenza B virus infections tend to be clinically milder than infections due to influenza A viruses, with attack rates decreased in adults due to decreased antigenic drift and consequent immunologic stability. Influenza C virus infections are rarely reported as a cause of human illness; most cases are probably subclinical.

### Mode of Transmission

Direct person-to-person contact through droplet spread or via articles recently contaminated with nasopharyngeal secretions.

### Period of Communicability

Most adults may be able to infect others beginning 1 day before symptoms develop and up to 5 days after the onset of illness. Children may be infectious for 10 days or more after onset of symptoms. Severely immunocompromised persons can shed virus for weeks or months.

### Incubation Period

1-4 days, with an average of 2 days.

## PUBLIC HEALTH MANAGEMENT

### Case

#### Case Treatment

Primarily symptomatic. Aspirin should not be used to treat infants, children or teenagers with influenza, because of the increased risk for developing Reye syndrome. Although annual vaccination is the primary strategy for preventing complications of influenza virus infections, antiviral medications with activity against influenza viruses can be effective for the chemoprophylaxis and treatment of influenza.

When started within the first **two days** of onset of influenza illness, an influenza antiviral medication can reduce illness severity and shorten the duration of fever and symptoms.

Four antiviral medications in two classes are currently approved for use in the United States: the adamantanes – adamantine and rimantadine – and the neuraminidase inhibitors – zanamivir and oseltamivir. Because resistance of influenza A viruses to adamantanes can occur spontaneously or emerge rapidly during treatment, the Centers for

Disease Control and Prevention (CDC) has recommended that adamantanes not be used for treatment or chemoprophylaxis of influenza A infections. Zanamivir and oseltamivir are active against both influenza A and B viruses. Zanamivir is approved for treatment of uncomplicated influenza infections in persons 7 years of age and older and for chemoprophylaxis in persons 5 years of age and older. Oseltamivir is approved for treatment or chemoprophylaxis of influenza in persons 1 year of age and older.

#### Isolation

Impractical under most situations for seasonal influenza.

#### **Contacts**

Investigation of contacts is impractical under most situations for seasonal influenza.

#### **Prevention and Control**

Annual vaccination is the most important method of prevention of influenza infection. Annual influenza vaccination is recommended for all individuals 6 months old and older and specifically for individuals at increased risk for influenza-associated complications and their close contacts, including health care workers. Please refer to current Advisory Committee on Immunization Practices (ACIP) recommendations for target groups: <http://www.cdc.gov/vaccines/pubs/ACIP-list.htm>.

Non-pharmacologic interventions (e.g. frequent handwashing and improved respiratory hygiene) are reasonable and inexpensive ways that have demonstrated to reduce the overall incidence of respiratory diseases, but they should not replace vaccination as the most important method to prevent influenza infection. Individuals should stay home when sick and avoid contact with ill individuals.

#### **Special Information**

The closing of schools for seasonal influenza has not been shown to be an effective control measure but may be necessary because of extensive absenteeism. Hospitals may have increased demand and may discourage elective admissions.

**What is influenza?**

Influenza (the flu) is a contagious viral respiratory infection of the nose, throat, bronchial tubes and lungs. There are two main types of influenza virus: A and B. Type A virus tends to cause more severe illness than type B. Each type includes many different strains which tend to change each year.

**When does influenza occur?**

In temperate climate regions, epidemics of influenza occur nearly annually in the winter (from November through March in the Northern Hemisphere and from April through September in the Southern Hemisphere). In the tropics, the flu can occur any time of year.

**Who gets influenza?**

Anyone can get the flu (even healthy people) and serious complications from influenza can happen at any age.

**How is it spread?**

The flu is spread, or transmitted, when a person who has the flu coughs or sneezes and sends flu virus into the air and other people inhale the virus. The virus enters the nose, throat or lungs of the other people and begins to multiply, causing symptoms of influenza. Influenza may, less often, be spread when a person touches a surface that has flu virus on it (a door handle, for instance) and then touches his or her nose or mouth.

**What are the symptoms of influenza?**

Typical flu symptoms include sudden onset of body aches, fever and respiratory symptoms (such as cough, sore throat, or runny nose). While vomiting, diarrhea and being "sick to your stomach" can sometimes be related to the flu (particularly in children), these problems are rarely the main symptoms of influenza and they are often due to infection with a different virus or a bacteria or parasite. Most people who get influenza will recover in one to two weeks, but some people will develop life-threatening complications as a result of the flu.

**What are some possible complications from an infection with influenza?**

People aged 65 years and older, pregnant women, people of any age with chronic medical conditions and very young children are more likely to get complications from influenza. Some of the complications caused by flu include pneumonia, dehydration and worsening of chronic medical conditions, such as congestive heart failure, asthma or diabetes. Children may get sinus problems and ear infections as complications from the flu. Uncommon complications of influenza include myositis, myocarditis and Reye syndrome (generally associated with the use of aspirin and other salicylate-containing medications in children and adolescents with influenza-like illness). Approximately 36,000 people die each year in the United States from the flu or related complications.

**How soon do symptoms appear?**

The incubation period for influenza is one to four days.

**How is influenza diagnosed?**

It is very difficult to distinguish the flu from other viral or bacterial causes of respiratory illnesses on the basis of symptoms alone. A test can confirm that an illness is influenza if the patient is tested within the first two to three days after symptoms begin. In addition, a doctor's examination may be needed to determine whether a person has another infection that is a complication of influenza.

**When and for how long is a person able to spread influenza?**

The period when an infected person is contagious depends on the person. Adults may be contagious from one day before becoming ill to 3 to 7 days after they develop symptoms. Some children are contagious for longer than a week.

**Does past infection with influenza make a person immune?**

Generally, no. The viruses that cause flu frequently change, so people who have been infected or given a flu shot in previous years may become infected with a new strain. Because of this, and because any immunity produced by the flu shot may decrease in the year after vaccination, people should be vaccinated against the flu every year.

**Who should be vaccinated?**

Annual vaccination against influenza is recommended for all individuals 6 months of age and older and specifically for individuals at high risk for influenza-associated complications (such as individuals  $\geq 50$  years of age, children aged 6 months through 18 years of age, pregnant women, those of any age with certain chronic medical conditions, and people who live in nursing homes and other long-term care facilities) and their close contacts (people who live with or care for those at high risk).

**What is the treatment for influenza?**

An individual who becomes sick with the flu should rest, drink plenty of liquids, avoid using alcohol and tobacco, and take medication to relieve the symptoms of the flu. (Never give aspirin to children or teenagers who have flu-like symptoms (and particularly fever) without first speaking to your doctor. Giving aspirin to children and teenagers who have influenza can cause a rare but serious illness called Reye syndrome.)

Influenza is caused by a virus, so antibiotics don't work to cure it. Although a flu shot is the best way to prevent the flu, antiviral drugs are other tools that can be used to help prevent and treat influenza. All of these drugs must be prescribed by a doctor. These drugs are effective against flu viruses, but they are not effective against other viruses or bacteria that can cause symptoms similar to influenza. These drugs are not effective for treating bacterial infections that can occur as complications of influenza.

**What can be done to control or prevent influenza?**

The single best way to prevent the flu is for individuals, especially persons at high risk for serious complications from the flu, to get a flu shot each fall. Occasionally, physicians may prescribe antiviral medications after exposure to prevent some individuals from getting the flu. Good handwashing, respiratory hygiene (e.g. covering coughs and sneezes), staying home if sick and avoiding sick people are also good preventive measures for any illness.