Influenza: an Overview

Description/Etiology

Influenza (also known as “the flu”) is a highly contagious respiratory disease caused by RNA viruses of the Orthomyxoviridae family. Influenza is an acute febrile illness with manifestations that range in severity from mild fatigue to respiratory failure and death.

Influenza viruses are classified as type A, type B, or type C. Type A, the most common influenza form, infects mammals and birds and is responsible for the annual influenza epidemics and historic pandemics (i.e., worldwide epidemics). Type B can also produce seasonal outbreaks, while type C, which is the least common, usually causes a mild respiratory illness. Influenza A viruses are further classified into subtypes according to their surface glycoproteins, which function to facilitate the cellular infection: hemagglutinin (HA) and neuraminidase (NA; e.g., H1N1, H5N1). Influenza viruses can mutate into different strains with minor changes (i.e., antigenic drift) or major changes (i.e., antigenic shift) in the structure of the HA and NA glycoproteins. Antigenic drift in a virus occurs more commonly than antigenic shift and is responsible for the antigenic variability of the influenza A subtypes that makes recognition by the immune system difficult. However, when a more radical antigenic shift occurs, a novel strain may appear, against which there is no immunity among humans, producing a pandemic.

Seasonal influenza occurs in epidemics every year, usually during the winter months (e.g., December through March in the Northern Hemisphere), although influenza peaks can begin as early as October and extend into the month of May. Non-pandemic strains cause seasonal influenza, with type A accounting for roughly 80% of illnesses and type B accounting for roughly 20%. The circulating subtypes of influenza A include H1N1, H1N2, and H3N3 (see Quick Lesson About…Influenza, Seasonal). In April 2009, a new variant of the influenza type A H1N1 virus, originating from swine, was detected. The new virus strain, referred to as “Pandemic (H1N1) 2009,” is the result of a re-assortment of gene segments from one human, one avian, and two swine influenza A viruses. It spread worldwide and caused a public health emergency that was declared resolved in August 2010; the Pandemic (H1N1) virus, however, is expected to continue circulating with other strains of subtypes H1N1 and H3N2 during the next few years in a seasonal pattern (see Quick Lesson About…Influenza, Pandemic (H1N1) 2009). Avian influenza viruses (e.g., H5N1), which usually infect poultry or wild birds but have the potential to infect humans who come into direct contact with infected birds, cause severe manifestations and high mortality rates (see Quick Lesson About…Avian Influenza (H5N1)).

Humans are infected with influenza by inhalation of large droplets expelled from an infected person when coughing or sneezing, or by direct contact of the eyes, nose, or mouth with recently contaminated articles harboring the virus; patients hospitalized with influenza are typically cared for using droplet isolation precautions to prevent disease transmission (for more information, see Nursing Practice & Skill … Implementing Isolation Precautions for Patients with Seasonal Influenza). The virus invades the airway and respiratory tract cells, where it replicates and causes cellular dysfunction and possibly death. Accurate diagnosis of influenza based on symptoms alone is difficult because of overlap with other upper respiratory tract infections such as adenoviruses, enteroviruses, and paramyxoviruses. Definitive diagnosis requires laboratory testing.
Antiviral medications are effective at minimizing the severity of symptoms, especially if taken within 48 hours of symptom onset, and may be prescribed to individuals at high risk for complications (see Risk Factors, below). Treatment is typically supportive (e.g., antipyretics, analgesics) and tailored to prevent or manage serious complications (e.g., secondary pneumonia); the very young and the very old are more likely to develop serious complications (for more information, see Quick Lesson About ... Influenza, Seasonal, in Children and Adolescents, and see Quick Lesson About ... Influenza, Seasonal, in Older Adults). Vaccination is the gold standard for preventing seasonal influenza; annual influenza vaccines target types A and B, which are responsible for most seasonal epidemics in humans (for more information, see series of Quick Lesson, Evidence-Based Care Sheet, and Nursing Practice & Skill papers on influenza vaccination). However, constant surveillance and adjustments to the composition of influenza vaccines are necessary to guard against outbreaks from antigenic variants.

Facts and Figures
An estimated 3,000,000–5,000,000 cases of severe influenza occur worldwide each year, resulting in 250,000–500,000 deaths. Before the advent of universal vaccination, approximately 95 million cases of influenza occurred in the United States each year, including 10–40% of healthy children. Currently, influenza results in > 50,000 deaths in the United States annually.

Risk Factors
Crowded environments increase the risk for epidemics. Individuals at risk for complications include very young children, pregnant women, people ≥ 65 years of age, and those with chronic diseases or conditions, including pulmonary disease, cardiovascular disease, metabolic diseases, hemoglobinopathies, cancer, immunosuppression, and neuromuscular diseases that affect respiratory function.

Signs and Symptoms/Clinical Presentation
Clinical presentation, severity of illness, risk for complications, and prognosis vary depending on the influenza viral type and strain, patient age, and coexisting conditions. Seasonal influenza usually causes a self-limited, mild illness, but it can become severe and patients can develop life-threatening complications. Avian influenza results in severe illness with rapid worsening of symptoms. Pandemic (H1N1) 2009 produces similar symptoms to those of seasonal influenza, but complications can occur in at-risk populations. Symptoms of uncomplicated influenza include sudden onset of fever, cough, malaise, headache, sneezing, stuffy/runny nose, sore throat, red/runny eyes, muscle pain, diarrhea, nausea, and vomiting. Complicated or severe disease is characterized by dyspnea, tachypnea, radiological evidence of lower respiratory tract illness, secondary infection, sepsis, encephalopathy, dehydration, multi-organ failure, and exacerbations of coexisting conditions (e.g., heart failure, diabetes mellitus, asthma). Progressive disease is defined by cardiovascular insufficiency, neurologic complications, severe dehydration, or sustained bacterial/viral proliferation.

Assessment
› Laboratory Tests That May Be Ordered
  • CBC can reveal leukopenia, relative lymphopenia, and thrombocytopenia
  • Viral culture of nasopharyngeal and/or throat secretions is the gold standard for diagnosis of influenza, but the test does not produce timely results; reverse transcription polymerase chain reaction (RT-PCR) testing will rapidly detect and differentiate influenza viruses from clinical specimens in affected individuals
  • Fluorescent antibody testing (e.g., immunofluorescence assays) will identify antibodies from nasal, throat, or sputum specimens in infected individuals, but it does not differentiate between Pandemic (H1N1) 2009 and seasonal flu subtypes
  • Rapid influenza diagnostic tests detect the presence of influenza antigens in respiratory specimens; some of these tests differentiate influenza type A from type B, but none can distinguish between type A subtypes
  – In 2014, the U.S. Food and Drug Administration approved a point-of-care influenza test that provides results within 15 minutes and has a > 90% sensitivity
› Other Diagnostic Tests/Studies
  • Chest X-ray can be ordered if primary or secondary pneumonia is suspected
  • Arterial blood gases (ABGs) detect hypoxemia in severe cases of influenza

Treatment Goals
› Provide Symptomatic Relief and Reduce Risk for Disease Transmission
  • Monitor vital signs, assess all physiologic systems, and review laboratory/diagnostic study results; immediately report abnormalities and administer the following, as ordered:
Antipyretics/analgesics (e.g., ibuprofen, acetaminophen) to reduce fever and pain
- **Do not administer aspirin to children or teenagers < 16 years of age, because it can cause Reye syndrome**
- Antibiotics if secondary bacterial pneumonia is suspected
- Antivirals (e.g., oseltamivir, zanamivir) to shorten the duration and severity of symptoms and reduce risk for complications, if indicated

- Administer prescribed supplemental oxygen and monitor for complications
- Follow facility infection control protocols—namely, droplet precautions—to limit the spread of seasonal influenza and protocols for mandated reporting of infectious disease

### Provide Emotional Support and Patient Education
- Assess patient’s anxiety level and coping ability; educate and encourage discussion about influenza transmission, potential complications, and risks and benefits of treatment and vaccination; provide written information to reinforce verbal education
- Patients who are placed on isolation precautions can experience negative feelings, depression, and decreased self-esteem; can have a perception that they are excluded; and may require additional psychosocial support

### Food for Thought
- The annual influenza vaccine has traditionally provided protection against 3 influenza subtypes—typically an A-H1, an A-H3, and a B. A quadrivalent influenza vaccine that protects against a second influenza B strain is now available
- Researchers conducting a systematic review and meta-analysis whereby evidence from observational studies was utilized report that the use of corticosteroids used to treat complications stemming from influenza illness was associated with increased mortality (Rodrigo et al., 2015)
- Healthcare workers can spread influenza to patients even if they are not symptomatic; developing herdimmunity among healthcare workers can reduce the risk of spreading the virus within the work environment (Glasper, 2017)
- During the 2015–2016 influenza season, only 47% of persons residing in rural areas (defined as locations populated by < 50,000 people) were vaccinated for influenza; they possess a 170% increased risk of death during the influenza season in comparison to other non-rural populations (Chinnis et al., 2017)

### Red Flags
- Women in the third trimester of pregnancy are at increased risk for complications of influenza
- Because of changing susceptibility profiles and increased viral drug resistance, it is important to be aware of current patterns of resistance of influenza viruses to influenza antiviral medications
- The U.S. Centers for Disease Control and Prevention (CDC) tested a total of 4,192 influenza virus specimens since October 1, 2014, and found high levels of resistance to amantadine and rimantadine; in addition, 1.6% of these specimens were resistant to oseltamivir. All of the seasonal influenza A (H3N2) and influenza B viral specimens tested were sensitive to both oseltamivir and zanamivir (Appiah et al., 2015)

### What Do I Need to Tell the Patient/Patient’s Family?
- Educate about strategies to prevent viral spread, including respiratory etiquette (e.g., covering mouth/nose with tissue when coughing/sneezing), maintaining good hand hygiene, and using surgical masks
- Advise the patient to stay at home for at least 24 hours after fever resolves, avoid contact with others, rest, drink plenty of fluids to prevent dehydration, and seek emergency care if symptoms of complications appear or if there is no improvement within 72 hours of the onset of symptoms

### References

