

Clinical manifestations

The clinical features of uncomplicated influenza are virtually • indistinguishable from those of other respiratory viral infections. Influenza is classically characterized by an abrupt onset of headache, high-grade fever, chills, dry cough, pharyngeal irritation, myalgias, malaise, and anorexia. The fever lasts an average of 3 days (range of 2 to 8 days). The cough, initially nonproductive and nonpurulent, may persist for weeks. Bronchial hyper-reactivity and small-airway dysfunction are often present in influenza virus infection. In the presence of asthma or structural lung disease, wheezing may be a prominent manifestation [\[24\]](#). Vomiting and diarrhea, while rare in seasonal influenza, have been frequently reported in infections with the 2009 pandemic influenza A H1N1v strain [\[10\]](#), particularly in childre

- The clinical presentation of influenza in the immuno-compromised host may be more subtle and manifest only as coryza; similarly, the classic fever symptom may be absent in the older patient, who may present only with lethargy, confusion, anorexia, and cough [[27](#)]. Influenza pneumonia and respiratory complications in patients with Th1 defects, such as HIV infection, are uncommon.

- Pneumonia and the acute respiratory distress syndrome (ARDS) account for the majority of severe morbidity and mortality that accompany pandemic influenza infection [[14](#)]. Pneumonia may occur as a continuum of the acute influenza syndrome when caused by the virus alone (primary pneumonia) or as a mixed viral and bacterial infection after a delay of a few days (secondary pneumonia) [[28](#)]. Identifying patients who are more likely to develop severe complications from influenza pneumonia requires a high clinical vigilance. Commonly used pneumonia severity assessment tools, such as the Pneumonia Severity Index [[29](#)] or CURB65 [[30](#)], are not useful in deciding which patients to hospitalize in the context of primary influenza pneumonia since these tools have not been developed and validated during a pandemic scenario

Thus, careful triage in the emergency department and early identification of young patients with decreased oxygen saturation, respiratory rate above 25, concomitant diarrhea, or hypotension are crucial. Elevated lactate dehydrogenase, creatine phosphokinase, and creatinine at hospital admission may also serve as prognostic indicators of severe disease [\[14\]](#). C-reactive protein and procalcitonin are increased during this acute lung injury stage of early fibroproliferation. •

The most ominous cases are those infections that progress rapidly to ARDS and multilobar alveolar opacification. These patients usually present with gradually increasing dyspnea and severe hypoxemia after an antecedent of 2 to 5 days of typical influenza symptoms [[14](#)]. The cough is usually productive of thin, often bloody, sputum with few cells. Hypoxemia increases progressively to the point of respiratory failure requiring intubation and mechanical ventilation, often after only one day of hospitalization •

- The radiological appearance of primary influenza pneumonia can be difficult to distinguish on chest x-ray from pulmonary edema, given the presence of perihilar congestion and hazy opacification, at least in the lower lobes (Figure [1a, b](#)). Pleural effusions may also be present. Computed tomography scans (Figure [\(Figure2\)2](#)) can add further diagnostic insight and may be useful to differentiate primary viral pneumonia from bronchiolitis and interstitial pneumonias, which occur frequently in children and young adults but have a benign outcome.

Concomitant myopericarditis should be •
excluded by echocardiography. Concurrent
pulmonary emboli, as suggested by early case
reports from hospitalized patients with
pandemic influenza A H1N1v 2009 in the US
[[13](#)], may further contribute to clinical
deterioration in some patients. However, the
occurrence of concomitant pulmonary emboli
has not been reproduced in other geographic
regions so far.

Bacterial co-infection, though uncommonly • reported in the early stages of the 2009 H1N1 pandemic, may be more prevalent than initially thought. A recent analysis of lung specimens from 77 fatal cases of pandemic H1N1v 2009 infection found a prevalence of concurrent bacterial pneumonia in 29% of these patients [31]. The most common co-infecting bacterial pathogens were pneumococcus, *Staphylococcus aureus*, and *Streptococcus pyogenes*, with a median duration of illness of 6 days

PREVENTION

- • Influenza vaccines are effective in the prevention of influenza illness, although improved vaccines are needed.
- • Inactivated and live-attenuated vaccines are available in trivalent and quadrivalent formulations

TABLE 102-1 Antiviral Chemotherapy and Chemoprophylaxis for Influenza

INFECTION	DRUG	ROUTE	DOSAGE
Influenza A and B: treatment	Oseltamivir	Oral	Adults: 75 mg bid × 5 days Children aged 1-12 years: 30-75 mg bid, depending on weight [†] , × 5 days
	Zanamivir	Inhaled orally	Adults and children aged ≥7 yr: 10 mg bid × 5 days
Influenza A: treatment	Amantadine*	Oral	Adults: 100 mg qd or bid × 5-7 days Children aged 1-9 yr: 5 mg/kg/day (maximum, 150 mg/day) × 5-7 days
	Rimantadine*	Oral	100 mg qd or bid × 5-7 days in adults
Influenza A and B: prophylaxis	Oseltamivir	Oral	Adults: 75 mg/day Children aged ≥1 yr: 30-75 mg/day, depending on weight [†]
	Zanamivir	Inhaled orally	Adults and children aged ≥5 yr: 10 mg/day
Influenza A: prophylaxis	Amantadine* or rimantadine*	Oral	Adults: 200 mg/day Children aged 1-9 yr: 5 mg/kg/day (maximum, 150 mg/day)

*Amantadine and rimantadine are not considered for use because of widespread resistance in influenza A/H3N2 and A/H1N1 viruses currently circulating (2012-2013). They may be considered if sensitivities become reestablished.

[†]For detailed dosage recommendations in children aged <1 yr, see www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm.

Vaccination for Adults

Everyone 6 months of age and older is recommended •
to get an annual influenza vaccine, including even
healthy adults. Vaccination is especially important
for [people at higher risk](#) of serious influenza
complications or people who live with or care for
people at higher risk for serious influenza
complications.

Persons working in health care settings also should be •
vaccinated annually against influenza. Vaccination
of [health care professionals](#) has been associated with
reduced work absenteeism and with fewer deaths
among nursing home patients.

Groups at high risk for severe disease and complications secondary to 2009 pandemic H1N1

- underlying pulmonary (asthma)
- and cardiac comorbid conditions,
- some immunosuppressive states,
- pregnancy and post-partum states,
- diabetes mellitus,
- obesity
- , in children,
- prior neurological disabilities
- Severe primary H1N1 influenza pneumonia can also affect young adults without any underlying comorbidities

Following is a list of all the health and age factors that are known to increase a person's risk of getting serious flu complications:

- Adults 65 years and older
- Children younger than 2 years old¹
- Asthma
- Neurologic and neurodevelopment conditions
- Blood disorders (such as sickle cell disease)
- Chronic lung disease (such as chronic obstructive pulmonary disease [COPD] and cystic fibrosis)
- Endocrine disorders (such as diabetes mellitus)
- Heart disease (such as congenital heart disease, congestive heart failure and coronary artery disease)

- Kidney diseases
- Liver disorders
- Metabolic disorders (such as inherited metabolic disorders and mitochondrial disorders)
- People who are obese with a body mass index [BMI] of 40 or higher
- People younger than 19 years old on long-term aspirin- or salicylate-containing medications.
- People with a weakened immune system due to disease (such as people with HIV or AIDS, or some cancers such as leukemia) or medications (such as those receiving chemotherapy or radiation treatment for cancer, or persons with chronic conditions requiring chronic corticosteroids or other drugs that suppress the immune system)

People who have had a stroke •

Other people at higher risk from flu

- Pregnant people and people up to 2 weeks after the end of pregnancy
- People who live in nursing homes and other long-term care facilities
- People from certain racial and ethnic minority groups are at increased risk for hospitalization with flu, including non-Hispanic Black persons, Hispanic or Latino persons, and American Indian or Alaska Native persons
- ¹ Although all children younger than 5 years old are considered at higher risk of serious flu complications, the highest risk is for those younger than 2 years old, with the highest hospitalization and death rates among infants younger than 6 months old.

The objectives of vaccination include •
protection of the individual, as well as
protection of the population through herd
immunity. Antiviral drugs can also be used
prophylactically in selected circumstances.

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THERAPY

- Antiviral therapy with oseltamivir, zanamivir, or peramivir is available and may shorten the duration of illness and reduce the rate of complications. •

Therapy is most effective when used early in the course of illness (see Table 102-1). •