



Prevention of Influenza: Recommendations for Influenza Immunization of Children, 2006–2007

Committee on Infectious Diseases

Organizational Principles to Guide and
Define the Child Health Care System and/or
Improve the Health of All Children

ABSTRACT

The purpose of this statement is to update recommendations for routine use of influenza vaccine in children for the 2006–2007 influenza season. The American Academy of Pediatrics recommends annual influenza immunization for (1) children with high-risk conditions who are 6 months and older; (2) healthy children 6 through 59 months of age; (3) household contacts and out-of-home caregivers of children with high-risk conditions and all healthy children younger than 5 years; and (4) health care professionals. Other children, adolescents, and adults can be immunized to decrease the impact of influenza as indicated in the *Red Book: 2006 Report of the Committee on Infectious Diseases*.

KEY POINTS RELEVANT FOR THE 2006–2007 INFLUENZA SEASON

1. The recommended age range of children for annual influenza immunization has been expanded to include all healthy children 6 through 59 months of age. Studies indicate that healthy children younger than 24 months of age and children of all ages with chronic heart and lung conditions are hospitalized for influenza infection and its complications at rates similar to those experienced by the elderly. This recommendation was extended to include healthy children 24 through 59 months of age, in part, on the basis of documentation of the significant morbidity in this age group, which results in additional office and emergency department visits and increased use of antimicrobial agents. This preschool-aged cohort is also an important potential source of transmission of influenza to household members and others in the community.
2. Household contacts and out-of-home caregivers of either high-risk children and adolescents or all healthy children younger than 5 years should also receive influenza vaccine each year. To reduce the risk of exposure to influenza, especially in infants younger than 6 months, who are too young to be immunized, it is essential that all contacts of high-risk children and all children younger than 5 years be immunized each year.
3. All high-risk children of any age, all healthy children 6 through 59 months of age, and all healthy 5- to 18-year-olds who are contacts of either high-risk persons or children younger than 5 years should be identified, and their parents should be informed that annual influenza immunization is due (Fig 1).

www.pediatrics.org/cgi/doi/10.1542/peds.2007-0164

doi:10.1542/peds.2007-0164

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Key Words

influenza, vaccine, immunization, epidemiology, children, adolescents

Abbreviations

TIV—trivalent inactivated influenza vaccine

LAIV—live-attenuated influenza vaccine

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275). Copyright © 2007 by the American Academy of Pediatrics



FIGURE 1
Influenza algorithm for 2006–2007.

- Previously unimmunized children 6 months to younger than 9 years of age should receive 2 doses of influenza vaccine to maximize protection during the influenza season.
 - Available data suggest that children younger than 9 years who did not receive the second dose of influenza vaccine in the initial year that influenza vaccine was given may not be adequately protected with only 1 dose the next influenza season. In this group, levels of protection can be suboptimal, especially if the antigenic specificity of the predominant strains has changed from the previous year. Thus, the American Academy of Pediatrics recommends that 2 doses be given to these children the following influenza season.* This recommendation applies only to the influenza season that follows the first year that a child younger than 9 years receives influenza vaccine.
4. Two of the 3 strains in the 2006–2007 influenza vaccine are different from last year’s vaccine. On the basis of global surveillance of influenza virus isolates, the influenza vaccine formulated for this season contains new components to match the strains expected to circulate this year.
 5. Amantidine and rimantadine should not be prescribed during this influenza season. Widespread resistance to these antiviral medications now exists among influenza A viral strains. Therefore, the only antiviral therapies available for chemoprophylaxis or treatment of influenza in children this year are the neuraminidase inhibitors (ie, oseltamivir or zanamivir), which should be prescribed as recommended in the *Red Book: 2006 Report of the Committee on Infectious Diseases*.
 6. Influenza vaccine should be offered throughout the influenza season, well into late winter and up to May 1, 2007. Because the influenza season peaks in January and February and often extends into March and beyond, administration of influenza vaccine later in

the season can still offer protection to recipients during that specific influenza season. Therefore, if a child requires 2 doses of the influenza vaccine this year, the second dose can still be given later in the season. There may be more than 1 peak of activity during an influenza season, so later immunization may still help protect from a later peak caused by a different strain of the influenza virus that season (Fig 2).

7. Outreach and infrastructure to immunize more children should be developed. All health care professionals, influenza campaign organizers, and public health agencies should work together, especially if prioritization for administering influenza vaccine is indicated when vaccine supplies become delayed or limited.

INFLUENZA VACCINES

Tables 1 and 2 summarize information on the 2 types of influenza vaccine used to immunize both children and adults—trivalent inactivated influenza vaccine (TIV) and live-attenuated influenza vaccine (LAIV)—as well as the licensed age group of each available preparation. Both vaccines contain 3 virus strains (2 strains of influenza A [subtypes H1N1 and H3N2] and 1 strain of influenza B) that are selected annually on the basis of the viruses anticipated to be circulating during the upcoming influenza season. Children with serious allergies to chicken or egg proteins should not receive these vaccines, because both TIV and LAIV are developed with embryonated hen eggs. Inactivated influenza vaccine is preferred for close contacts of very severely immunosuppressed people.

TIV is an inactivated vaccine, administered intramuscularly, that contains killed viruses and, therefore, cannot produce signs or symptoms of influenza caused by active virus infection. The most common symptoms associated with TIV administration are soreness at the injection site and fever. Fever, usually occurring 6 to 24 hours after immunization, affects approximately 10% to 35% of children younger than 2 years. Mild systemic symptoms such as nausea, lethargy, headache, muscle aches, and chills also can occur with TIV injection.

TIV is administered intramuscularly into the anterolateral thigh of infants and young children and into the deltoid muscle of older children and adults (injection-site recommendations are outlined in the *Red Book: 2006 Report of the Committee on Infectious Diseases*). Recent concerns about thimerosal have prompted some parents to reconsider influenza immunization. However, the benefits of protecting children against the known risks of influenza far outweigh the theoretic risks associated with the small amounts of thimerosal in some currently available forms of influenza vaccine. In addition, certain types of TIV without thimerosal can be obtained, including single-dose Fluzone (sanofi pasteur, Swiftwater, PA)

*This recommendation differs from that of the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention. Because of discordant recommendations, the American Academy of Pediatrics Committee on Infectious Diseases reexamined the available data at its October 2006 meeting and reaffirmed its decision for 2 doses the second year on the basis of the following: (1) the serologic data suggest that more children would potentially be protected by giving 2 doses the following year, especially because the formulation of influenza vaccine routinely changes to match circulating strains of virus; (2) it would be easier for the practitioner to implement this strategy if the recommendation were to give 2 doses the second year whenever only 1 dose was given in the first year, rather than if a different recommendation were made annually on the basis of whether the formulation of the vaccine had changed from the previous year; (3) vaccine supply is adequate during the 2006–2007 influenza season to implement this recommendation; although delivery has been delayed, if it has not happened already, all orders will be filled very shortly; (4) a review of immunization records is necessary with each immunization visit, so deciding on the need for a second dose should not cause any increased hardship; and (5) taking the position that this cohort of children should not be included for 2 doses because it poses an increased burden for the pediatrician ignores the primary goal of this proposal—to reduce the burden of influenza for pediatric patients by improving their immunization status.

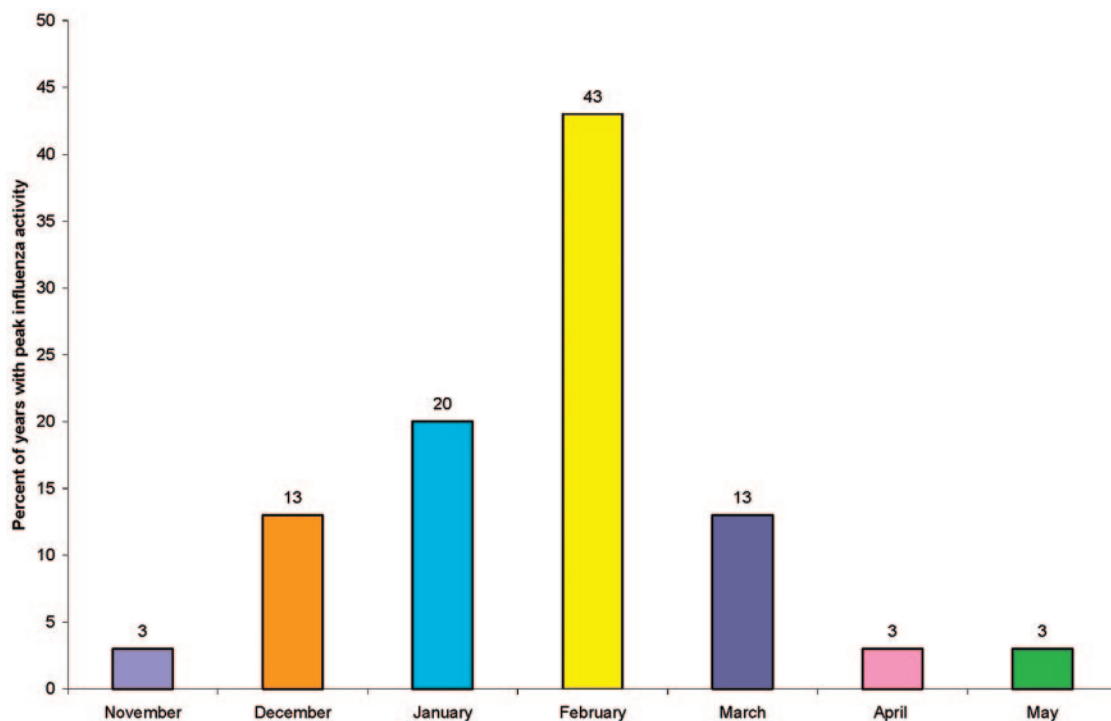


FIGURE 2
Peak influenza activity according to month (%) from 1976 to 2006.

TABLE 1 Licensed Influenza Vaccines for Different Age Groups: United States, 2006–2007 Season

Vaccine Type	Trade Name	Manufacturer	Dose, mL/Presentation	Thimerosal Mercury Content, μg of Hg per 0.5-mL Dose	Age Group
Inactivated					
TIV	Fluzone	sanofi pasteur	0.25/prefilled syringe	0	6–35 mo
			0.5/prefilled syringe	0	≥ 36 mo
			0.5/vial	0	≥ 36 mo
			5.0/multidose vial	25	≥ 6 mo
TIV	Fluvirin	Novartis (formerly Chiron)	0.5/prefilled syringe	<1.0	≥ 4 y
			5.0/multidose vial	24.5	≥ 4 y
			0.5/prefilled syringe	<1.25	≥ 18 y
TIV	Flulaval	GlaxoSmithKline	10/multidose vial	25	≥ 18 y
Live-attenuated					
LAIV	FluMist	MedImmune	0.5/sprayer	0	5–49 y

Adapted from Centers for Disease Control and Prevention. *MMWR Recomm Rep.* 2006;55(RR-10):1–42.

and Fluvirin (Novartis Vaccines, Emeryville, CA), but the latter is not licensed for children younger than 4 years.

LAIV is a live-attenuated vaccine that is administered intranasally and is licensed by the Food and Drug Administration for healthy individuals 5 through 49 years of age. LAIV has the potential to produce mild signs or symptoms related to influenza virus infection. The cold-adapted formulation that is licensed in the United States must be stored at -15°C or colder. LAIV may be stored in frost-free freezers without using a freezer box. When the vaccine is warmed to room temperature for intended use, it must be used within 30 minutes. It should not be refrozen after thawing because of decreased vaccine potency.

CURRENT RECOMMENDATIONS

Immunization with TIV is recommended for the following groups (Fig 1):

- Healthy children 6 through 59 months of age
- High-risk children 6 months and older and adolescents with underlying medical conditions, including:
 - Asthma or other chronic pulmonary diseases such as cystic fibrosis
 - Hemodynamically significant cardiac disease
 - Immunosuppressive disorders or therapy
 - HIV infection
 - Sickle cell anemia and other hemoglobinopathies

TABLE 2 LAIV Compared With TIV

Characteristic	LAIV	TIV
Route of administration	Intranasal spray	Intramuscular injection
Type of vaccine	Live virus	Killed virus
Number of included virus strains	3 (2 influenza A, 1 influenza B)	3 (2 influenza A, 1 influenza B)
Vaccine virus strains updated	Annually	Annually
Frequency of administration	Annually	Annually
Approved age and risk groups	Healthy people 5–49 y of age	Persons ≥6 mo of age
Interval between 2 doses in children	6–10 wk	4 wk
Can be simultaneously administered with other vaccines	Yes ^a	Yes ^b
If not simultaneously administered,		
Can be administered within 4 wk of another live vaccine	No, prudent to space a minimum of 4 wk apart	Yes
Can be administered within 4 wk of an inactivated vaccine	Yes	Yes

^a No data are available regarding the effect on safety or efficacy.

^b TIV coadministration has been evaluated systematically only among adults with pneumococcal polysaccharide vaccine.

Adapted from Centers for Disease Control and Prevention. *MMWR Recomm Rep.* 2006;55(RR-10):1–42.

- Diseases requiring long-term salicylate therapy, such as rheumatoid arthritis or Kawasaki disease
- Chronic renal dysfunction
- Chronic metabolic disease such as diabetes mellitus
- Any condition that can compromise respiratory function or handling of secretions or can increase the risk of aspiration, such as cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders
- Any female who will be pregnant during influenza season

To prevent additional cases of influenza and transmission from these patients to at-risk individuals, influenza immunization with TIV or LAIV is recommended for the following persons, unless contraindicated:

- Healthy household contacts and out-of-home caregivers of either high-risk children and adolescents or children younger than 5 years; immunization of close contacts of children younger than 6 months is especially important, because influenza vaccine is not licensed for use in these infants
- Healthy contacts and caregivers of other children or adults at high risk of complications from influenza infection
- Close contacts of immunosuppressed people
- Health care professionals or volunteers in hospitals or medical offices

Children or adolescents should not receive TIV if they

- Had a severe allergic reaction to a previous dose or vaccine component, including eggs
- Are younger than 6 months
- Have a moderate-to-severe febrile illness (minor illnesses, with or without fever, do not contraindicate

use of TIV, particularly among children with mild upper respiratory tract symptoms or allergic rhinitis)

- Had Guillain-Barré syndrome within 6 weeks after a previous dose of influenza vaccine

Children or adolescents should not receive LAIV if they

- Are younger than 5 years
- Have a moderate-to-severe febrile illness
- Received other live-antigen vaccine(s) within the last 4 weeks
- Had a severe allergic reaction to a previous dose or vaccine component, including eggs
- Are receiving salicylates
- Have a known or suspected immunodeficiency
- Have a history of Guillain-Barré syndrome
- Have asthma or reactive airways disease
- Have other conditions traditionally considered to place them at high risk of severe influenza (chronic pulmonary or cardiac disorders, pregnancy, chronic metabolic disease, renal dysfunction, hemoglobinopathies, or immunosuppressive therapy)

PRECAUTIONS

Consideration of the potential risks and benefits of administering influenza vaccine to any child with known or suspected immunodeficiency is discussed in the *Red Book: 2006 Report of the Committee on Infectious Diseases*.

Precaution also should be taken when considering LAIV administration to persons with minor acute illness such as a mild upper respiratory tract infection with or without fever. Although the vaccine can most likely be given in this case, LAIV should be temporarily deferred if nasal congestion will impede the delivery of the vaccine to the nasopharyngeal mucosa until the congestion-inducing illness is resolved.

LAIV or TIV can be used to prevent influenza in those

who are in close contact with most immunosuppressed individuals. People who are in contact with severely immunosuppressed individuals, such as those being cared for in a protective environment after hematopoietic stem cell transplantation, should not receive LAIV. For such individuals, TIV is recommended.

COMMITTEE ON INFECTIOUS DISEASES, 2006–2007

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Larry K. Pickering, MD
Red Book Editor

CONSULTANT

Edgar O. Ledbetter, MD

CONTRIBUTORS

J. Dennis O'Dell, MD
Medical Home Expert
Stuart T. Weinberg, MD
Partnership for Policy Implementation (PPI)

STAFF

Alison Siwek, MPH

IMPORTANT RESOURCES

Please refer to the *Red Book: 2006 Report of the Committee on Infectious Diseases* from the American Academy of Pediatrics and *Recommendations and Reports: Morbidity and Mortality Weekly Report* from the Centers for Disease Control and Prevention for additional details about influenza:

American Academy of Pediatrics. Influenza. In: Pickering LK, Baker CJ, Long SS, McMillan JA, eds. *Red Book: 2006 Report of the Committee on Infectious Diseases*. 27th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2006:401–411

Centers for Disease Control and Prevention. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP) [published correction appears in *MMWR Morb Mortal Wkly Rep*. 2006;55:800]. *MMWR Recomm Rep*. 2006;55(RR-10):1–42