POLICY STATEMENT

Recommendations for Prevention and Control of Influenza in Children, 2014–2015

COMMITEE ON INFECTIOUS DISEASES

KEY WORDS
influenza, immunization, live attenuated influenza vaccine, inactivated influenza vaccine, vaccine, children, pediatrics

ABBREVIATIONS
AAP—American Academy of Pediatrics
ccIV3—trivalent cell culture-based inactivated influenza vaccine
CDC—Centers for Disease Control and Prevention
FDA—US Food and Drug Administration
GRADE—Grading of Recommendations Assessment, Development, and Evaluation
HCP—health care personnel
ID—intradermal
IV—inactivated influenza vaccine
IV3—trivalent inactivated influenza vaccine
IV4—quadrivalent inactivated influenza vaccine
IM—intramuscular
LAIV—live attenuated influenza vaccine
LAIV4—quadrivalent live attenuated influenza vaccine
NAI—neuraminidase inhibitors
PCR—polymerase chain reaction
PCV13—13-valent pneumococcal conjugate vaccine
pH1N1—influenza A (H1N1) pandemic virus
RIVS—trivalent recombinant influenza vaccine

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The purpose of this statement is to update recommendations for routine use of seasonal influenza vaccine and antiviral medications for the prevention and treatment of influenza in children. The American Academy of Pediatrics recommends annual seasonal influenza immunization for all people 6 months and older, including all children and adolescents. Highlights for the upcoming 2014–2015 season include the following:

2. Both trivalent and quadrivalent influenza vaccines are available in the United States for the 2014–2015 season.
3. Annual universal influenza immunization is indicated with either a trivalent or quadrivalent vaccine (no preference).
4. Live attenuated influenza vaccine (LAIV) should be considered for healthy children 2 through 8 years of age who have no contraindications or precautions to the intranasal vaccine. If LAIV is not readily available, inactivated influenza vaccine (IIV) should be used; vaccination should not be delayed to obtain LAIV.
5. The dosing algorithm for administration of influenza vaccine to children 6 months through 8 years of age reflects that virus strains in the vaccine have not changed from last season.

As always, pediatricians, nurses, and all other health care personnel should be immunized themselves and should promote influenza vaccine use and infection control measures. In addition, pediatricians should promptly identify clinical influenza infections to enable rapid antiviral treatment, when indicated, to reduce morbidity and mortality.

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INTRODUCTION

The American Academy of Pediatrics (AAP) recommends annual seasonal influenza immunization for all people 6 months and older, including all children and adolescents, during the 2014–2015 influenza season. In addition, special effort should be made to vaccinate people in the following groups:
KEY POINTS RELEVANT FOR THE 2014–2015 INFLUENZA SEASON

1. Annual seasonal influenza vaccine is recommended for all people 6 months and older, including all children and adolescents, during the 2014–2015 influenza season. It is important that household contacts and out-of-home care providers of children younger than 5 years, especially infants younger than 6 months, and children of any age at high risk of complications from influenza (eg, children with chronic medical conditions, such as asthma, diabetes mellitus, hemodynamically significant cardiac disease, immunosuppression, or neurologic and neurodevelopmental disorders) receive annual influenza vaccine. In the United States, more than two-thirds of children younger than 6 years and almost all children 6 years and older spend significant time in child care or school settings outside the home. Exposure to groups of children increases the risk of contracting infectious diseases. Children younger than 2 years are at elevated risk of hospitalization and complications attributable to influenza. School-aged children bear a large influenza disease burden and have a significantly higher chance of seeking influenza-related medical care compared with healthy adults. Reducing influenza virus transmission (eg, appropriate hand hygiene, respiratory hygiene/cough etiquette) among children who attend out-of-home child care or school has been shown to decrease the burden of childhood influenza and transmission of influenza virus to household contacts and community members of all ages.

2. The percentage of outpatient visits for influenza-like illness, rates of hospitalization, and deaths attributed to pneumonia and influenza were lower during the 2013–2014 influenza season when compared with the previous season. As of August 23, 2014, 107 laboratory-confirmed influenza-associated pediatric deaths were reported to the Centers for Disease Control and Prevention (CDC) during the 2013–2014 influenza season. The 2009 influenza A (H1N1) pandemic (pH1N1) viruses predominated, but influenza A (H3N2) and influenza B viruses also were reported in the United States. Of the 107 deaths, 87 were associated with influenza A viruses, and 16 deaths were associated with influenza B viruses. Two deaths were associated with an undetermined type of influenza virus, and 2 deaths were associated with dual infection with both influenza A and B viruses. Although children with certain conditions are at higher risk of complications, 47% of the deaths occurred in children with no high-risk underlying medical condition. Among children hospitalized with influenza and for whom medical chart data were available, approximately 43% had no recorded underlying condition, whereas 26% had underlying asthma or reactive airway disease (Fig 1). A recent preliminary observation of the 2013–2014 influenza season noted a high number of healthy people (ranging from infants to older adults) who needed care in the ICU, 91% of whom were not previously vaccinated.

3. Both trivalent and quadrivalent influenza vaccines are available in the United States for the 2014–2015 season. Neither vaccine formulation is preferred over the other. Both vaccines contain an A/California/7/2009 (H1N1)–like virus, an A/Texas/50/2012 (H3N2) virus, and a B/Massachusetts/2/2012–like virus (B/Yamagata lineage). The quadrivalent influenza vaccines include an additional B virus (B/Brisbane/60/2008–like virus [B/Victoria lineage]). These strains are unchanged from those in the 2013–2014 seasonal influenza vaccines.

4. Optimal protection is achieved through annual immunization. Antibody titers wane to 50% of their original levels 6 to 12 months after vaccination. Although the vaccine strains for the 2014–2015 season are unchanged from last season, a repeat dose this season is critical for maintaining protection in all populations.

5. Using the Grading of Recommendations Assessment, Development,
and Evaluation (GRADE) framework, the CDC Advisory Committee on Immunization Practices (ACIP) systematically reviewed the evidence pertaining to the efficacy of live attenuated influenza vaccine (LAIV) and inactivated influenza vaccine (IIV) for healthy children. It concluded that there is greater relative efficacy of LAIV as compared with IIV against laboratory-confirmed influenza among younger children (based on 2 studies including children up to 6 years of age). The risk of adverse events after immunization, including fever, wheezing, and serious adverse events, appears to be similar for LAIV and IIV. Therefore, LAIV should be considered for healthy children 2 through 8 years of age who have no contraindications or precautions to the intranasal vaccine. If LAIV is not readily available, IIV should be used; vaccination should not be delayed to obtain LAIV. The age of 8 years is selected as the upper limit for this recommendation on the basis of demonstration of superior efficacy of LAIV (ages 2 through 6 years) and for programmatic consistency (8 years is the upper age limit for receipt of 2 doses of influenza vaccine in a previously unvaccinated child).

6. The number of seasonal influenza vaccine doses to be administered in the 2014–2015 influenza season depends on the child’s age at the time of the first administered dose and his or her vaccine history (Fig 2):
• Influenza vaccines are not licensed for administration to infants younger than 6 months.
• Children 9 years and older need only 1 dose.
• Children 6 months through 8 years of age receiving the seasonal influenza vaccine for the first time should receive a second dose this season at least 4 weeks after the first dose.
• Children 6 months through 8 years of age need only 1 dose.

7. Pediatric offices may choose to serve as an alternative venue for providing influenza immunization for parents and other care providers of children if the practice is acceptable to both pediatricians and the adults who are to be vaccinated. There are important medical liability issues and medical record documentation requirements that must be addressed before a pediatrician begins administering adults (see details at www.aapredbook.org/implemention). Pediatricians are reminded to document the recommendation for adult immunization in the vulnerable child's medical record. In addition, adults should still be encouraged to have a medical home and communicate their immunization status to their primary care provider. Offering immunizations in the pediatric practice setting would not be intended to undermine the adult medical home model but could serve as an additional venue for parents and other care providers for children to receive vaccinations. Immunization of close contacts of children at high risk of influenza-related complications is intended to reduce their risk of contagion (ie, "cocooning"). The practice of cocooning may help protect infants younger than 6 months, because they are too young to be immunized with influenza vaccine. Infants younger than 6 months also can be protected through vaccination of their mothers during pregnancy, with resulting transplacental transfer of antibodies. The risk of influenza-associated hospitalization in healthy children younger than 24 months has been shown to be greater than the risk of hospitalization in previously recognized high-risk groups, such as older adults, during influenza season. Children 24 through 59 months of age have shown higher rates of outpatient visits and antimicrobial use associated with influenza-like illnesses than older children.

8. As soon as the seasonal influenza vaccine is available locally, pediatricians or vaccine administrators should immunize HCP, notify parents and caregivers of vaccine availability and the importance of annual vaccination, and immunize children 6 months and older per recommendations, especially those at high risk of complications from influenza. Health care provider endorsement plays a major role in vaccine uptake. A strong correlation exists between health care provider endorsement of influenza vaccine and patient acceptance. Prompt initiation of influenza immunization and continuance of immunization throughout the influenza season, whether or not influenza is circulating (or has circulated) in the community, are critical components of an effective immunization strategy. Administering the vaccine early during the influenza season is not believed to pose a significant risk that immunity might wane before the end of the season. The seasonal vaccine is not 100% effective, but it still is the best strategy available for preventing illness from influenza. It is moderately effective in reducing the risk for outpatient medical visits caused by circulating influenza viruses by approximately one-half to three-quarters in most people. Even during seasons when the vaccine is only moderately effective, influenza vaccine has been shown to reduce illness, antibiotic use, doctor visits, time lost from work, hospitalizations, and deaths.

9. Providers should continue to offer vaccine until the vaccine expiration
Number of 2014–2015 Seasonal Influenza Vaccine Doses for Children 6 Months Through 8 Years of Age

<table>
<thead>
<tr>
<th>Did child receive ≥1 dose of influenza vaccine last flu season (2013–14)?</th>
</tr>
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<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Has child received ≥2 total doses of any seasonal vaccine since July 1, 2010?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 Doses (Interval is 4 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
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</table>

**FIGURE 2**
Number of 2014–2015 seasonal influenza vaccine doses for children 6 months through 8 years of age. For simplicity, this algorithm takes into consideration only doses of seasonal influenza vaccine received since July 1, 2010. As an alternative approach in settings where vaccination history from before July 1, 2010 is available, if a child aged 6 months through 8 years is known to have received 2 or more doses of seasonal influenza vaccine from any previous season and at least 1 clearly documented dose of a pH1N1-containing vaccine (ie, any seasonal vaccine since July 1, 2010 or a monovalent pH1N1 vaccine during the 2009–2010 season), then the child needs only 1 dose for 2014–2015.

Date (June 30, marking the end of the influenza season), because influenza is unpredictable. Protective immune responses persist throughout the influenza season, which can have >1 disease peak and may extend into March or later. Although the peak of influenza activity in the United States tends to occur in January through March, influenza activity can occur in early fall (ie, October and November) or late spring (eg, influenza circulated through the end of May during the 2013–2014 season). This approach also provides ample opportunity to administer a second dose of vaccine when indicated, as detailed in Key Point 6 above. In addition, international travel may result in potential exposure to influenza throughout the year.

10. HCP, influenza campaign organizers, and public health agencies should collaborate to develop improved strategies for planning, communication, and administration of vaccines.

- Plan to make seasonal influenza vaccine easily accessible for all children. Examples include alerts to families that vaccine is available (eg, e-mails, texts, and patient portals); creating walk-in influenza clinics; extending hours beyond routine times during peak vaccination periods; administering influenza vaccine during both well and sick visits; considering how to immunize parents, adult caregivers, and siblings at the same time in the same office setting as children; and working with other institutions (eg, schools, child care programs, and religious organizations) or alternate care sites, such as emergency departments, to expand venues for administering vaccine. If a child or adult receives influenza vaccine outside his or her medical home, such as at a pharmacy, retail-based clinic, or another practice, appropriate documentation of immunization should be provided to the patient for his or her medical home and entered into the state immunization registry where possible.

- Concerted efforts among the aforementioned groups, plus vaccine manufacturers, distributors, and payers, also are necessary to prioritize distribution appropriately to the primary care office setting and patient-centered medical home before other venues, especially when vaccine supplies are delayed or limited.

- Vaccine safety, effectiveness, and indications must be communicated properly to the public. Pediatricians and office staff should explain the importance of annual influenza vaccination for children and emphasize when a second dose of vaccine is indicated. HCP should act as role models by receiving influenza immunization annually and recommending annual immunizations to both colleagues and patients. Influenza immunization programs for HCP benefit the health of employees, their patients, and members of the community.

11. Antiviral medications also are important in the control of influenza but are not a substitute for influenza immunization. The neuraminidase inhibitors (NAIs) oral oseltamivir (Tamiflu; Roche Laboratories, Nutley, NJ) and inhaled

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zanamivir (Relenza; GlaxoSmithKline, Research Triangle Park, NC) are the only antiviral medications recommended for chemoprophylaxis or treatment of influenza during the 2014–2015 season. Intravenous preparations of oseltamivir, zanamivir, and peramivir are not approved by the US Food and Drug Administration (FDA). However, in consultation with infectious diseases specialists, investigational intravenous zanamivir should be considered for critically ill children, especially those who are immunocompromised or cannot tolerate or absorb oral or enterically administered oseltamivir. Recent viral surveillance and resistance data indicate that the majority of currently circulating influenza viruses likely to cause 2014–2015 seasonal influenza in North America continue to be sensitive to oseltamivir and zanamivir. In contrast, amantadine and rimantadine should not be used, because circulating influenza A viruses currently have levels of resistance to these drugs, and they are not effective against influenza B viruses. Because resistance characteristics can change rapidly, pediatricians should verify susceptibility data at the start of the influenza season and monitor them throughout the season. Up-to-date information can be found on the AAP Web site (www.aap.org or www.aapredbook.org/flu), through state-specific AAP chapter Web sites, or on the CDC Web site (www.cdc.gov/flu/index.htm).

SEASONAL INFLUENZA VACCINES

Before the 2013–2014 influenza season, only trivalent influenza vaccines that included a single influenza B strain were available. However, since 1985, 2 antigenically distinct lineages (ie, Victoria or Yamagata) of influenza B viruses have circulated globally. Vaccination against 1 B viral lineage confers little cross-protection against the other B viral lineage. Thus, trivalent vaccines offer limited immunity against circulating influenza B strains of the lineage not present in the vaccine. Furthermore, in recent years it has proven difficult to predict consistently which B lineage will predominate during a given influenza season. Therefore, a quadrivalent influenza vaccine with influenza B strains of both lineages should offer greater protection. Postmarketing safety and vaccine effectiveness data are not yet available, precluding a full risk–benefit analysis of newer versus previously available products.

For the 2014–2015 season, IIVs will be available for intramuscular (IM) injection in both trivalent (IIV3) and quadrivalent (IIV4) formulations. The intranasally administered LAIV will be available only in a quadrivalent formulation (LAIV4). All quadrivalent vaccines will contain the identical influenza strains anticipated to circulate during the 2014–2015 influenza season. IIVs contain no live virus. IIV3 formulations are available for IM and intradermal (ID) use. The IM formulation of IIV3 is licensed and recommended for children 6 months and older and adults, including people with and without chronic medical conditions. The most common adverse events after IIV administration are local injection site pain and tenderness. Fever may occur within 24 hours after immunization in approximately 10% to 35% of children younger than 2 years but rarely in older children and adults. Mild systemic symptoms, such as nausea, lethargy, headache, muscle aches, and chills, may occur after administration of IIV3.

An ID formulation of IIV3 is licensed for use in people 18 through 64 years of age. ID vaccine administration involves a microinjection with a shorter needle than needles used for IM administration. The most common adverse events are redness, induration, swelling, pain, and itching, which occur at the site of administration; although all adverse events occur at a slightly higher rate with the IM formulation of IIV3, the rate of pain was similar between ID and IM. Headache, myalgia, and malaise may occur and tend to occur at the same rate as that with the IM formulation of IIV3. There is no preference for IM or ID immunization with IIV3 in people 18 years or older. Therefore, pediatricians may choose to use either the IM or ID product for their young adult patients and for any adults they are vaccinating (ie, as part of a cocooning strategy).

IIV4 is available in IM but not ID formulations. One formulation of IIV4 is licensed for use in children as young as 6 months of age. In children, the most common injection site adverse reactions were pain, redness, and swelling. The most common systemic adverse events were drowsiness, irritability, loss of appetite, fatigue, muscle aches, headache, arthralgia, and gastrointestinal tract symptoms. These events were reported with comparable frequency among participants receiving the licensed comparator trivalent vaccines. IIV4 is an acceptable vaccine for people 6 months or older when otherwise appropriate and may offer broader protection than IIV3. The relative quantity of doses of IIV4 that will be available is not certain and likely to be limited.

During the 2 influenza seasons spanning 2010–2012, there were increased reports of febrile seizures in the United States in young children who received IIV and the 13-valent pneumococcal conjugate vaccine (PCV13) concomitantly, but this has not been observed in more recent seasons. Simultaneous administration of IIV and
PCV13 for the 2014–2015 influenza season continues to be recommended when both vaccines are indicated.

LAIV4 is a quadrivalent live attenuated influenza vaccine that is administered intranasally. It is licensed by the FDA for previously healthy people 2 through 49 years of age. The most commonly reported reactions in children were runny nose or nasal congestion, headache, decreased activity or lethargy, and sore throat. LAIV4 should not be administered to people with notable nasal congestion that would impede vaccine delivery. The safety of LAIV in people with a history of asthma, diabetes mellitus, or other high-risk medical conditions associated with an elevated risk of complications from influenza (see Contraindications and Precautions) has not been established. In a postlicensure surveillance of LAIV over 7 seasons, the Vaccine Adverse Event Reporting System (VAERS), jointly sponsored by the FDA and CDC, did not identify any new or unexpected safety concerns, although there were reports of use of LAIV in people with a contraindication or precaution. The use of LAIV in young children with chronic medical conditions, including asthma, has been implemented outside the United States, but the vaccine is not licensed for these indications in the United States.

Two trivalent influenza vaccines manufactured using technologies that do not use eggs will also be available for people 18 years or older during the 2014–2015 season: cell culture–based inactivated influenza vaccine (ccIIV3) and recombinant influenza vaccine (RIV3). These manufacturing methods would probably permit a more rapid scale-up of vaccine production when needed, such as during a pandemic. ccIIV3 is a trivalent cell culture–based inactivated influenza vaccine indicated for people 18 years or older, administered as an IM injection. ccIIV3 has comparable immunogenicity to US-licensed IIV3 comparator vaccines. Although ccIIV3 is manufactured from virus propagated in Madin Darby canine kidney cells rather than embryonated eggs, before production, seed virus is created from the World Health Organization reference virus strains, which have been passaged in eggs. However, egg protein is not detectable in the final vaccine, and egg allergy is not mentioned as a contraindication in the package insert. Other contraindications to vaccine delivery are similar to those for other IIVs. The most common solicited adverse reactions included injection site pain, erythema at the injection site, headache, fatigue, myalgia, and malaise. RIV3 is a recombinant baculovirus–expressed hemagglutinin vaccine produced in cell culture. It is indicated for people 18 through 49 years of age and is administered via IM injection. The most frequently reported adverse events were pain, headache, myalgia, and fatigue. There are no egg proteins in this version of influenza vaccine.

Tables 1 and 2 summarize information on the types of 2014–2015 seasonal influenza vaccines licensed for immunization of children and adults. It is likely that more than 1 type or brand of vaccine may be appropriate for vaccine recipients. However, vaccination should not be delayed to obtain a specific product.

A large body of scientific evidence demonstrates that thimerosal-containing vaccines are not associated with elevated risk of autism spectrum disorders in children. Therefore, the AAP extends its strongest support to the recent World Health Organization recommendations to retain the use of thimerosal in the global vaccine supply. Some people may still raise concerns about the minute amounts of thimerosal in IIV vaccines, and in some states there is a legislated restriction on the use of thimerosal-containing vaccines. The benefits of protecting children against the known risks of influenza are clear. Therefore, children should receive any available formulation of IIV rather than delaying immunization while waiting for reduced thimerosal-content or thimerosal-free vaccines. Although some formulations of IIV contain only a trace amount of thimerosal, certain types can be obtained thimerosal free. LAIV4 does not contain thimerosal. Vaccine manufacturers are delivering increasing amounts of thimerosal-free influenza vaccine each year.

**INFLUENZA VACCINES AND EGG ALLERGY**

Although most IIV and LAIV vaccines are produced in eggs and contain measurable amounts of egg protein, recent data have shown that IIV administered in a single, age-appropriate dose is well tolerated by most recipients with a history of egg allergy. More conservative approaches in children with a history of egg allergy, such as skin testing or a 2-step graded challenge, no longer are recommended. No data have been published on the safety of administering LAIV to egg-allergic recipients.

As a precaution, pediatricians should continue to determine whether the presumed egg allergy is based on a mild (ie, hives alone) or severe reaction (ie, anaphylaxis involving cardiovascular changes, respiratory or gastrointestinal tract symptoms, or reactions that necessitate the use of epinephrine). Pediatricians should consult with an allergist for children with a history of severe reaction. Most vaccine administration to patients with egg allergy can occur without the need for referral. Data indicate that only approximately 1% of children have immunoglobulin E–mediated sensitivity to egg, and of those, a rare minority have a severe allergy. The Joint Task Force on Practice Parameters,
representing the American Academy of Allergy, Asthma & Immunology (AAAAI) and the American College of Allergy, Asthma & Immunology (ACAAI), recently published an updated recommendation that special precautions regarding medical setting and waiting periods after administration of IIV to egg-allergic recipients beyond those recommended for any vaccine are not warranted. This concept has not been universally accepted by all allergists, so the AAP recommendation has not changed.

Standard immunization practice should include the ability to respond to acute hypersensitivity reactions. Therefore, influenza vaccine should be given to children with egg allergy with the following preconditions (Fig 3):

- Appropriate resuscitative equipment must be readily available.3
- The vaccine recipient should be observed in the office for 30 minutes after immunization, the usual observation time for receiving immunotherapy.

Providers may consider use of cclIV3 or RIV3 vaccines produced via non-egg-based technologies for patients 18 years or older with egg allergy in settings in which these vaccines are available and otherwise age appropriate. cclIV3, which does contain trace amounts of ovalbumin, should be administered according to the guidance for other IIVs (Fig 3). RIV3, which contains no ovalbumin, may be administered to people with egg allergy of any severity who are 18 through 49 years of age and do not have other contraindications. However, vaccination of patients with mild egg allergy should not be delayed if RIV3 or cclIV3 is not available. Instead, any licensed, age-appropriate IIV should be used.

VACCINE STORAGE AND ADMINISTRATION

The AAP Storage and Handling Tip Sheet provides resources for practices to develop comprehensive vaccine management protocols to keep the temperature for vaccine storage constant during a power failure or other disaster (www2.aap.org/immunization/pediatricians/pdf/DisasterPlanning.pdf).

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TABLE 1 Recommended Seasonal Influenza Vaccines for Different Age Groups: United States, 2014–2015 Influenza Season

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Trade Name</th>
<th>Manufacturer</th>
<th>Presentation</th>
<th>Thimerosal Mercury Content (μg of Hg per 0.5-mL dose)</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inactivated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IIV3</td>
<td>Fluzone</td>
<td>Sanofi Pasteur</td>
<td>0.25-mL prefilled syringe</td>
<td>0</td>
<td>6–35 mo</td>
</tr>
<tr>
<td>IIV3</td>
<td>Fluzone Intradermal</td>
<td>Sanofi Pasteur</td>
<td>0.1-mL prefilled microinjection</td>
<td>0</td>
<td>18–64 y</td>
</tr>
<tr>
<td>IIV3</td>
<td>Fluzone HD</td>
<td>Sanofi Pasteur</td>
<td>0.5-mL prefilled syringe</td>
<td>0</td>
<td>≥65 y</td>
</tr>
<tr>
<td>IIV3</td>
<td>Fluvirin</td>
<td>Novartis</td>
<td>0.5-mL prefilled syringe</td>
<td>≤1.0</td>
<td>≥4 y</td>
</tr>
<tr>
<td>IIV3</td>
<td>Fluarix</td>
<td>GlaxoSmithKline</td>
<td>0.5-mL prefilled syringe</td>
<td>0</td>
<td>≥36 mo</td>
</tr>
<tr>
<td>IIV3</td>
<td>FluLaval</td>
<td>ID Biomedical Corporation of Quebec (distributed by GlaxoSmithKline)</td>
<td>5.0-mL multidose vial</td>
<td>25</td>
<td>≥36 mo</td>
</tr>
<tr>
<td>IIV3</td>
<td>Affuria</td>
<td>bioCSL</td>
<td>0.5-mL prefilled syringe</td>
<td>0</td>
<td>≥9 y</td>
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<tr>
<td>IIV3</td>
<td>cclIV3</td>
<td>Fluclavel</td>
<td>Novartis Vaccines</td>
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<td>IIV4</td>
<td>Fluzone Quadrivalent</td>
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<td>IIV4</td>
<td>FluLaval Quadrivalent</td>
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<td>0.5-mL prefilled syringe</td>
<td>0</td>
<td>≥36 mo</td>
</tr>
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<td>IIV4</td>
<td>Fluarix Quadrivalent</td>
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<td>0.5-mL prefilled syringe</td>
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<td>≥36 mo</td>
</tr>
<tr>
<td>IIV4</td>
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<td>5.0-mL multidose vial</td>
<td>25</td>
<td>≥36 mo</td>
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* Age indication per package insert is ≥2 y; however, the Advisory Committee on Immunization Practices recommends Affuria not be used in children 6 mo through 8 y of age because of febrile reactions reported in this age group. If no other age-appropriate, licensed inactivated seasonal influenza vaccine is available for a child 5 through 8 y of age who has a medical condition that increases the child’s risk of influenza complications, Affuria can be used; however, pediatricians should discuss with the parents or caregiv ers the benefits and risks of influenza vaccination with Affuria before administering this vaccine.

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Downloaded from http://pediatrics.aappublications.org/ by guest on October 24, 2017
Any of the influenza vaccines can be administered at the same visit with all other recommended routine vaccines.

**Intramuscular Vaccine**

The IM formulation of IIV is shipped and stored at 2°C to 8°C (35°F–46°F). It is administered intramuscularly into the anterolateral thigh of infants and young children and into the deltoid muscle of older children and adults. The volume of vaccine is age dependent; infants and toddlers 6 months through 35 months of age should receive a dose of 0.25 mL, and all people 3 years (36 months) and older should receive 0.5 mL/dose.

**Intradermal Vaccine**

The ID formulation of IIV is shipped and stored at 2°C to 8°C (35°F–46°F). It is administered intradermally only to people 18 through 64 years of age, preferably over the deltoid muscle and only using the device included in the vaccine package. Vaccine is supplied in a single-dose, prefilled microinjection system (0.1 mL) for adults. The package insert should be reviewed for full administration details of this product.

**Live Attenuated (Intranasal) Vaccine**

The cold-adapted, temperature-sensitive LAIV4 formulation currently licensed in the United States must be shipped and stored at 2°C to 8°C (35°F–46°F) and administered intranasally in a prefilled, single-use sprayer containing 0.2 mL of vaccine. A removable dose divider clip is attached to the sprayer to administer 0.1 mL separately into each nostril. After administration of any live virus vaccine, at least 4 weeks should pass before another live virus vaccine is administered.

**CURRENT RECOMMENDATIONS**

Seasonal influenza immunization is recommended for all children 6 months and older. LAIV should be considered for healthy children 2 through 8 years of age who have no contraindications or precautions to the intranasal vaccine. This is based on a GRADE analysis done by the CDC, which concluded that there is greater relative efficacy of LAIV as compared with IIV against laboratory-confirmed influenza among younger children. If LAIV is not readily available, IIV should be used; vaccination should not be delayed to obtain LAIV. Particular focus should be on the administration of IIV for all children and adolescents with underlying medical conditions associated with an elevated risk of complications from influenza, including the following:

- Asthma or other chronic pulmonary diseases, including cystic fibrosis.

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**TABLE 2 LAIV4 Compared With IIV3 and IIV4**

<table>
<thead>
<tr>
<th>Vaccine Characteristic</th>
<th>LAIV4</th>
<th>IIV3</th>
<th>IIV4</th>
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<tbody>
<tr>
<td><strong>Route of administration</strong></td>
<td>Intranasal spray</td>
<td>Intramuscular or intradermal injection&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Intramuscular injection&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Live virus</td>
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<tr>
<td><strong>Product</strong></td>
<td></td>
<td></td>
<td>Inactivated subvirus or surface antigen</td>
</tr>
<tr>
<td><strong>No. of included virus strains</strong></td>
<td>4 (2 influenza A, 2 influenza B)</td>
<td>3 (2 influenza A, 1 influenza B)</td>
<td>4 (2 influenza A, 2 influenza B)</td>
</tr>
<tr>
<td><strong>Vaccine virus strains updated</strong></td>
<td>Annually</td>
<td>Annually</td>
<td>Annually</td>
</tr>
<tr>
<td><strong>Frequency of administration</strong></td>
<td>Annually</td>
<td>Annually</td>
<td>Annually</td>
</tr>
<tr>
<td><strong>Approved age groups</strong></td>
<td>All healthy people aged 2–49 y</td>
<td>All people aged ≥2 mo (ID 18–84 y)</td>
<td>All people aged ≥6 mo</td>
</tr>
<tr>
<td><strong>Interval between 2 doses in children</strong></td>
<td>4 wk</td>
<td>4 wk</td>
<td>4 wk</td>
</tr>
<tr>
<td><strong>Can be given to people with medical risk factors for influenza-related complications?</strong></td>
<td>No&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Can be given to children with asthma or children aged 2–4 y with wheezing in the previous year?</strong></td>
<td>Yes&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Yes&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Yes&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>If not simultaneously administered, can be administered within 4 wk of another live vaccine?</strong></td>
<td>No, recommended to space 4 wk apart</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Can be administered within 4 wk of an inactivated vaccine?</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<sup>a</sup> The preferred site of IIV intramuscular injection for infants and young children is the anterolateral aspect of the thigh.  
<sup>b</sup> See Fig 2 for decision algorithm to determine number of doses of seasonal influenza vaccine recommended for children during the 2014–2015 influenza season.  
<sup>c</sup> LAIV4 is not recommended for children with a history of asthma. In the 2- through 4-y age group, there are children who have a history of wheezing with respiratory illnesses in whom reactive airway disease is diagnosed and in whom asthma may later be diagnosed. Therefore, because of the potential for increased wheezing after immunization, children 2 through 4 y of age with recurrent wheezing or a wheezing episode in the previous 12 mo should not receive LAIV4. When offering LAIV4 to children in this age group, a pediatrician should screen those who might be at higher risk of asthma by asking the parents or guardians of 2-, 3-, and 4-y-olds (24- through 59-mo-olds) the question, “In the previous 12 months, has a health care professional ever told you that your child had wheezing?” If the parents answer “yes” to this question, LAIV4 is not recommended for these children.  
<sup>d</sup> LAIV coadministration has been evaluated systematically only among children 12–15 mo of age with measles–mumps–rubella and varicella vaccines. IIV coadministration has been evaluated systematically only among adults with pneumococcal polysaccharide and zoster vaccines.
Hemodynamically significant cardiac disease
- Immunosuppressive disorders or therapy
- HIV infection
- Sickle cell anemia and other hemoglobinopathies
- Diseases that necessitate long-term aspirin therapy, including juvenile idiopathic arthritis or Kawasaki disease
- Chronic renal dysfunction
- Chronic metabolic disease, including diabetes mellitus
- Any condition that can compromise respiratory function or handling of secretions or can increase the risk of aspiration, such as neurodevelopmental disorders, spinal cord injuries, seizure disorders, or neuromuscular abnormalities

Although universal immunization for all people 6 months and older is recommended for the 2014–2015 influenza season, particular immunization efforts with either IIV or LAIV should be made for the following groups to prevent transmission of influenza to those at risk, unless contraindicated:
- Household contacts and out-of-home care providers of children younger than 5 years and at-risk children of all ages (healthy contacts 2 through 49 years of age can receive either IIV or LAIV).
- Any woman who is pregnant or considering pregnancy (IIV only), is in the postpartum period, or is breastfeeding during the influenza season. Studies have shown that infants born to immunized women have better influenza-related health outcomes. However, according to Internet panel surveys conducted by the CDC, only 51% of pregnant women reported receiving an influenza vaccine during the 2012–2013 season, even though both pregnant women and their infants are at higher risk of complications. In addition, data from some studies suggest that influenza vaccination in pregnancy may decrease the risk of preterm birth and of giving birth to infants who are small for gestational age. Pregnant women can receive the

FIGURE 3
Precautions for administering IIV to presumed egg-allergic children.
influenza vaccine safely during any trimester.

- Children and adolescents of American Indian or Alaska Native heritage.

- HCP or health care volunteers. Despite the AAP recommendation for mandatory influenza immunization for all HCP, many remain unvaccinated. As of November 2013, the CDC estimated that only 62.9% of HCP received the seasonal influenza vaccine. The AAP recommends mandatory vaccination of HCP, because HCP frequently come into contact with patients at high risk of influenza illness in their clinical settings.

- Close contacts of immunosuppressed people.

**CONTRAINDICATIONS AND PRECAUTIONS**

Minor illnesses, with or without fever, are not contraindications to the use of influenza vaccines, particularly among children with mild upper respiratory infection symptoms or allergic rhinitis.

**Children Who Should Not Be Vaccinated With IIV**

- Infants younger than 6 months.

- Children who have a moderate to severe febrile illness, on the basis of clinical judgment of the clinician.

**Children Who Should Not Be Vaccinated With LAIV**

- Children younger than 2 years.

- Children who have a moderate to severe febrile illness.

- Children with an amount of nasal congestion that would notably impede vaccine delivery.

- Children 2 through 4 years of age with a history of recurrent wheezing or a medically attended wheezing episode in the previous 12 months because of the potential for increased wheezing after immunization. In this age range, many children have a history of wheezing with respiratory tract illnesses and are eventually diagnosed with asthma. Therefore, when offering LAIV to children 24 through 59 months of age, the pediatrician should screen them by asking the parent or guardian, “In the previous 12 months, has a health care professional ever told you that your child had wheezing?” If a parent answers “yes” to this question, LAIV is not recommended for the child. IIV would be recommended for the child to whom LAIV is not given.

- Children with the diagnosis of asthma.

- Children with a history of egg allergy.

- Children who have received other live virus vaccines within the last 4 weeks; however, other live virus vaccines can be given on the same day as LAIV.

- Children who have known or suspected immunodeficiency disease or who are receiving immunosuppressive or immunomodulatory therapies.

- Children who are receiving aspirin or other salicylates.

- Any woman who is pregnant or considering pregnancy.

- Children with any condition that can compromise respiratory function or handling of secretions or can increase the risk for aspiration, such as neurodevelopmental disorders, spinal cord injuries, seizure disorders, or neuromuscular abnormalities.

- Children taking an influenza antiviral medication should not receive LAIV until 48 hours after stopping the influenza antiviral therapy. If a child recently received LAIV but has an influenza illness for which antiviral agents are appropriate, the antiviral agents should be given. Reimmunization may be indicated because of the potential effects of antiviral medications on LAIV replication and immunogenicity.

**Children for Whom IIV Is Preferred**

- Children with chronic underlying medical conditions, including metabolic disease, diabetes mellitus, other chronic disorders of the pulmonary or cardiovascular systems, renal dysfunction, or hemoglobinopathies. The safety of LAIV in these populations has not been established. These conditions are not contraindications but are listed under the “Warnings and Precautions” section of the LAIV package insert. A precaution is a condition in a recipient that might increase the risk or seriousness of an adverse reaction or complicate making another diagnosis because of a possible vaccine-related reaction. A precaution also may exist for conditions that might compromise the ability of the vaccine to produce immunity. Vaccination may be recommended in the presence of a precaution if the benefit of protection from the vaccine outweighs any risk.

IIV is the vaccine of choice for anyone in close contact with a subset of severely immunocompromised people (ie, those in a protected environment). IIV is preferred over LAIV for contacts of severely immunocompromised people because of the theoretical risk of infection attributable to LAIV strain in an immunocompromised contact of an LAIV-immunized person. Available data indicate a very low risk of transmission of the virus in both children and adults vaccinated with LAIV. HCP immunized with LAIV may continue to work in most units of a hospital, including the NICU and general oncology wards, using
SURVEILLANCE

Information about influenza surveillance is available through the CDC Voice Information System (flu update, 888-232-3228) or at www.cdc.gov/flu/index.htm. Although current influenza season data on circulating strains do not necessarily predict which and in what proportion strains will circulate in the subsequent season, it is instructive to be aware of 2013–2014 influenza surveillance data and use them as a guide to empirical therapy until current seasonal data are available from the CDC. Information is posted weekly on the CDC Web site (www.cdc.gov/flu/weekly/fluactivity.htm).

VACCINE IMPLEMENTATION

These updated recommendations for prevention and control of influenza in children will have operational and fiscal effects on pediatric practice. Therefore, the AAP has developed implementation guidance on supply, payment, coding, and liability issues; these documents can be found at www.aapredbook.org/implementation. In addition, the AAP’s Partnership for Policy Implementation has developed a series of definitions using accepted health information technology standards to assist in the implementation of this guideline in computer systems and quality measurement efforts. This document is available at www2.aap.org/informatics/PPI.html.

USE OF ANTIVIRAL MEDICATIONS

Oral oseltamirv remains the antiviral drug of choice for the management of influenza infections. Inhaled zanamivir is an equally acceptable alternative but is more difficult to administer. Antiviral resistance can emerge quickly between seasons. If local or national influenza surveillance data indicate a predominance of a particular influenza strain with a known antiviral susceptibility profile, then empirical treatment can be directed toward that strain. For example, all the influenza A (H3N2) and influenza B viruses tested since October 1, 2013 were sensitive to oseltamivir and zanamivir during the 2013–2014 influenza season. Among the pH1N1 viruses tested for resistance, only 1.2% were found to be resistant to oseltamivir; and none were found to be resistant to zanamivir. In contrast, high levels of resistance to amantadine and rimantadine exist, so these drugs should not be used in the upcoming season unless resistance patterns change significantly.

- Current treatment guidelines for antiviral medications (Table 3) are applicable to both infants and children with suspected influenza when known virus strains are circulating in the community or when infants or children are confirmed to have seasonal influenza.
- Oseltamivir is available in capsule and oral suspension formulations. The commercially manufactured liquid formulation has a concentration of 6 mg/mL. If the commercially manufactured oral suspension is not available, the capsule may be opened and the contents mixed with simple syrup or Oral-Sweet SF (sugar-free) by retail pharmacies to a final concentration of 6 mg/mL (Table 3).
- Continuous monitoring of the epidemiology, change in severity, and resistance patterns of influenza strains may lead to new guidance. Treatment should be offered for:
  - Any child hospitalized with presumed influenza or with severe, complicated, or progressive illness attributable to influenza, regardless of influenza immunization status or whether onset of illness occurred >48 hours before admission.
  - Influenza infection of any severity in children at high risk of complications of influenza infection (Table 4), such as children younger than 2 years.

Treatment should be considered for:

- Any otherwise healthy child with influenza infection for whom a decrease in duration of clinical symptoms is felt to be warranted by his or her pediatrician. The greatest impact on outcome will occur if treatment can be initiated within 48 hours of illness onset but still should be considered if later in the course of illness.

Reviews of available studies by the CDC, the World Health Organization, and independent investigators have consistently found that timely oseltamivir treatment can reduce the risks of complications, including those resulting in hospitalization and death. Although a 2012 Cochrane review of studies primarily in outpatient settings suggested that oseltamivir may not be effective in preventing complications or hospitalizations from influenza, its authors correctly pointed out that the data reviewed were not always complete, were analyzed in a variety of treated populations, and used a number of clinical trial designs. In addition, a recently revised 2014 Cochrane review...
review of NAIs for influenza further evaluated published and previously unpublished data from randomized clinical trials largely in healthy outpatients with mild illness. Unlike other analyses of the efficacy of antiviral drugs, this Cochrane analysis included both influenza virus–infected and noninfected people with influenza-like illness. Given the specific antiviral activity of NAIs against influenza viruses, this analytic approach underestimates the treatment efficacy of NAIs and their valuable role in helping to lessen complications in those at high risk for them, including hospitalized patients. Furthermore, this review of outpatients was not designed to assess the effect on severe outcomes such as hospitalizations or deaths.

Importantly, treatment with oseltamivir for children with presumed serious, complicated, or progressive disease, irrespective of influenza immunization status or even whether illness began greater than 48 hours before admission, continues to be recommended by the AAP, CDC, and Infectious Diseases Society of America (IDSA) (http://www.idsociety.org/Influenza_Statement.aspx). Earlier treatment provides better clinical responses. However, treatment after 48 hours of symptoms in adults and children with moderate to severe disease or with progressive disease has been shown to provide some benefit and should be strongly considered. In previous years, the use of double-dose oseltamivir, particularly for those hospitalized with severe illness caused by pH1N1, was believed to provide better outcomes. However, recently published data from a randomized, prospective trial with 75% of subjects younger than 15 years documented no benefit of double-dose therapy over standard-dose therapy.

Dosages for antiviral agents for both treatment and chemoprophylaxis in children can be found in Table 3 and on the CDC Web site (http://www.cdc.gov/flu/professionals/antivirals/index.htm). Children younger than 2 years of age (≤2 kg) 1.0 mg/kg per dose, orally, twice daily, for those <40 weeks postmenstrual age. For extremely premature infants (<24 weeks postmenstrual age; 1.5 mg/kg per dose, orally, twice daily, for those 38 through 40 weeks postmenstrual age; 3.0 mg/kg per dose, orally, twice daily, for those >40 weeks postmenstrual age. For extremely premature infants (<<28 weeks postmenstrual age), consult a pediatric infectious disease physician.

Zanamivir is administered by inhalation using a proprietary "Diskhaler" device distributed together with the medication. Zanamivir is a dry powder, not an aerosol, and should not be administered with nebulizers, ventilators, or other devices typically used to administer medications in aerosolized solutions. Zanamivir is not recommended for people with chronic respiratory diseases, such as asthma or chronic obstructive pulmonary disease, which increase the risk of bronchospasm.

**TABLE 3** Recommended Dosage and Schedule of Influenza Antiviral Medications for Treatment and Chemoprophylaxis for the 2014–2015 Influenza Season: United States

<table>
<thead>
<tr>
<th>Medication</th>
<th>Treatment (5 d)</th>
<th>Chemoprophylaxis (10 d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oseltamivir&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>75 mg twice daily</td>
<td>75 mg once daily</td>
</tr>
<tr>
<td>Children ≥12 mo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body wt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤15 kg (≤33 lb)</td>
<td>30 mg twice daily</td>
<td>30 mg once daily</td>
</tr>
<tr>
<td>&gt;15–23 kg (35–51 lb)</td>
<td>45 mg twice daily</td>
<td>45 mg once daily</td>
</tr>
<tr>
<td>&gt;23–40 kg (51–88 lb)</td>
<td>60 mg twice daily</td>
<td>60 mg once daily</td>
</tr>
<tr>
<td>&gt;40 kg (≥88 lb)</td>
<td>75 mg twice daily</td>
<td>75 mg once daily</td>
</tr>
<tr>
<td>Infants 9–11 mo&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.5 mg/kg per dose twice daily</td>
<td>3.5 mg/kg per dose once daily</td>
</tr>
<tr>
<td>Term infants 0–8 mo&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3 mg/kg per dose twice daily</td>
<td>3 mg/kg per dose once daily for infants 3–8 mo; not recommended for infants &lt;3 mo, unless situation judged critical, because of limited safety and efficacy data in this age group</td>
</tr>
<tr>
<td>Preterm infants</td>
<td>See details in footnote&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Zanamivir&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children ≥7 y for treatment, ≥3 y for chemoprophylaxis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 mg (two 5-mg inhalations) twice daily</td>
<td>10 mg (two 5-mg inhalations) once daily</td>
</tr>
<tr>
<td></td>
<td>10 mg (two 5-mg inhalations) twice daily</td>
<td>10 mg (two 5-mg inhalations) once daily</td>
</tr>
</tbody>
</table>


<sup>a</sup> Oseltamivir is administered orally without regard to meals, although administration with meals may improve gastrointestinal tolerability. Oseltamivir is available as Tamiflu in 50-mg, 45-mg, and 75-mg capsules and as a powder for oral suspension that is reconstituted to provide a final concentration of 6 mg/mL. For the 6-mg/mL suspension, a 30-mg dose is given with 5 mL of oral suspension, a 45-mg dose is given with 7.5 mL oral suspension, and a 75-mg dose is given with 12.5 mL oral suspension. If the commercially manufactured oral suspension is not available, a suspension can be compounded by retail pharmacies (final concentration also 6 mg/mL), based on instructions that are present on the package label. In patients with renal insufficiency, the dose should be adjusted on the basis of creatinine clearance. For treatment of patients with creatinine clearance 10–30 mL/min, administer 75 mg, once daily, for 5 d. For chemoprophylaxis of patients with creatinine clearance 10–30 mL/min, administer 30 mg, once daily, for 10 d after exposure or 75 mg, once every other day, for 10 d after exposure (5 doses). See http://www.cdc.gov/flu/professionals/antivirals/antiviral-drug-resistance.htm.

<sup>b</sup> Oseltamivir dosing for preterm infants. The weight-based dosing recommendation for preterm infants is lower than for term infants. Preterm infants may have lower clearance of oseltamivir because of immature renal function, and doses recommended for full-term infants may lead to very high drug concentrations in this age group. Limited data from the National Institute of Allergy and Infectious Diseases Collaborative Antiviral Study Group provide the basis for dosing preterm infants using their postmenstrual age (gestational age + chronologic age): 1.0 mg/kg per dose, orally, twice daily, for those <38 wk postmenstrual age; 1.5 mg/kg per dose, orally, twice daily, for those 38 through 40 wk postmenstrual age; 3.0 mg/kg per dose, orally, twice daily, for those >40 wk postmenstrual age. For extremely premature infants (<<28 weeks postmenstrual age), consult a pediatric infectious disease physician.

<sup>c</sup> Zanamivir is administered by inhalation using a proprietary "Diskhaler" device distributed together with the medication. Zanamivir is a dry powder, not an aerosol, and should not be administered with nebulizers, ventilators, or other devices typically used to administer medications in aerosolized solutions. Zanamivir is not recommended for people with chronic respiratory diseases, such as asthma or chronic obstructive pulmonary disease, which increase the risk of bronchospasm.
TABLE 4 People at Higher Risk of Influenza Complications Recommended for Antiviral Treatment of Suspected or Confirmed Influenza

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt;2 y</td>
<td>People with chronic pulmonary (including asthma), cardiovascular (except hypertension alone), renal, hepatic, hematologic (including sickle cell disease), or metabolic disorders (including diabetes mellitus) or neurologic and neurodevelopmental conditions (including disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy [seizure disorders], stroke, intellectual disability [mental retardation], moderate to severe developmental delay, muscular dystrophy, or spinal cord injury)</td>
</tr>
<tr>
<td>Adults ≥18 y</td>
<td>People with immunosuppression, including that caused by medications or by HIV infection</td>
</tr>
<tr>
<td></td>
<td>Women who are pregnant or postpartum (within 2 wk after delivery)</td>
</tr>
<tr>
<td></td>
<td>American Indian or Alaska Native people</td>
</tr>
<tr>
<td></td>
<td>People who are morbidly obese (ie, BMI ≥40)</td>
</tr>
<tr>
<td></td>
<td>Residents of nursing homes and other chronic care facilities</td>
</tr>
</tbody>
</table>


are at elevated risk of hospitalization and complications attributable to influenza. The FDA has licensed oseltamivir for children as young as 2 weeks of age. Given preliminary pharmacokinetic data and limited safety data, oseltamivir can be used to treat influenza in both term and preterm infants from birth because benefits of therapy are likely to outweigh possible risks of treatment.

Clinical judgment (on the basis of underlying conditions, disease severity, time since symptom onset, and local influenza activity) is an important factor in treatment decisions for pediatric patients who present with influenza-like illness. Antiviral treatment should be started as soon as possible after illness onset and should not be delayed while waiting for a definitive influenza test result because early therapy provides the best outcomes. Recently available rapid antigen tests have moderate sensitivity, even for the pH1N1 virus strain, but are not as sensitive as nucleic acid–based molecular diagnostic techniques (eg, polymerase chain reaction [PCR] assay). Decisions on treatment and infection control can be made based on positive rapid antigen tests. However, if rapid test results are negative, PCR techniques should be considered, because they have greater sensitivity for influenza infection than antigen tests. Positive results are helpful, because they may reduce additional testing to identify the cause of the child’s influenza-like illness. Treatment should not be withheld in high-risk patients awaiting PCR results.

People with suspected influenza who present with an uncomplicated febrile illness typically do not need treatment with antiviral medications unless they are at higher risk of influenza complications (eg, children with chronic medical conditions such as asthma, diabetes mellitus, hemodynamically significant cardiac disease, immunosuppression, or neurologic and neurodevelopmental disorders), especially in situations with limited antiviral medication availability. Antiviral treatment also should be considered for symptomatic siblings of children younger than 6 months or with underlying medical conditions that predispose them to complications of influenza. If there is a shortage of antiviral medications, local public health authorities should provide additional guidance about testing and treatment. In past years, local shortages have occurred based on uneven drug distribution, but national shortages have not occurred. Randomized placebo-controlled studies showed that oseltamivir and zanamivir were efficacious when administered as chemoprophylaxis to household contacts after a family member had laboratory-confirmed influenza. During the 2009 pandemic, the emergence of oseltamivir resistance was observed among people receiving postexposure prophylaxis. Decisions on whether to administer antiviral chemoprophylaxis should take into account the exposed person’s risk of influenza complications, vaccination status, the type and duration of contact, recommendations from local or public health authorities, and clinical judgment. Optimally, postexposure chemoprophylaxis should only be used when antiviral agents can be started within 48 hours of exposure. Early treatment of high-risk patients without waiting for laboratory confirmation is an alternative strategy.

Although immunization is the preferred approach to infection prevention, chemoprophylaxis during an influenza outbreak, as defined by the CDC, is recommended:

- For children at high risk of complications from influenza for whom influenza vaccine is contraindicated
- For children at high risk during the 2 weeks after influenza immunization
- For family members or HCP who are unimmunized and are likely to have ongoing, close exposure to
  - Unimmunized children at high risk
  - Unimmunized infants and toddlers who are younger than 24 months
- For control of influenza outbreaks for unimmunized staff and children in a closed institutional setting with children at high risk (eg, extended-care facilities)
- As a supplement to immunization among children at high risk, including children who are immunocompromised and may not respond to vaccine
Oseltamivir use is not a contraindication to immunization with IV (unlike LAIV). For recommendations about treatment and chemoprophylaxis against influenza, see Table 3. Among some high-risk people, both vaccination and antiviral chemoprophylaxis may be considered. Updates will be available at www.aapredbook.org/flu and www.cdc.gov/flu/professionals/antivirals/index.htm.

**FUTURE NEEDS**

For the 2014–2015 season, the AAP does not have a preferential recommendation for any type or brand of influenza vaccine over another. This is partly because the supply and distribution of newer vaccines may be limited during the 2014–2015 season. Moreover, post-marketing safety and vaccine effectiveness data are limited, precluding a full risk–benefit analysis of newer versus previously available products. However, such analyses will be performed as data become available, and in the future specific vaccines may be preferentially recommended for particular groups.

A large body of evidence indicates that even children with severe (anaphylactic) allergic reactions to the ingestion of eggs tolerate IIV in a single, age-appropriate dose. If, as expected, safety monitoring continues to show no elevated risk for anaphylactic reactions in egg-allergic recipients of IIV, special precautions regarding allergy consultation and waiting periods after administration to egg-allergic recipients beyond those recommended for any vaccine may no longer be recommended. Studies examining the safety of LAIV in egg-allergic recipients also are ongoing.

Efforts should be made to create adequate outreach and infrastructure to facilitate the optimal distribution of vaccine so that more people are immunized. Pediatricians also should become more involved in pandemic preparedness or disaster planning efforts. A bidirectional partner dialogue between pediatricians and public health decision makers assists efforts to address children's issues during the initial state, regional, and local plan development stages. Additional information about disaster preparedness can be found at www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/children-and-disasters/Pages/Pediatric-Preparedness-Resource-Kit.aspx.

Health care for children is best provided in the medical home, which may have limited capacity to accommodate all patients (and their families) seeking influenza immunization. With the greater demand for immunization during each influenza season, the AAP and the CDC recommend vaccine administration at any visit to the medical home during influenza season when it is not contraindicated, at specially arranged vaccine-only sessions, and through cooperation with community sites, schools, and child care centers to provide influenza vaccine. If alternative venues, including pharmacies and other retail-based clinics, are used for immunization, a system of patient record transfer is beneficial in maintaining the accuracy of immunization records. Immunization information systems should be used whenever available. Two-dimensional barcodes have been used to facilitate more efficient and accurate documentation of vaccine administration, with limited experience to date. Multiple barriers appear to affect influenza vaccination coverage for children in foster care, refugee and immigrant children, and homeless children. Access to care issues, lack of immunization records, and questions about who can provide consent may be addressed by linking children with a medical home, using all health care encounters as vaccination opportunities, and more consistently using immunization registry data.

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**Chemoprophylaxis Should Not Be Considered a Substitute for Immunization**

Influenza vaccine should always be offered when not contraindicated; even after influenza virus has been circulating in the community. Antiviral medications currently licensed are important adjuncts to influenza immunization for control and prevention of influenza disease; toxicities associated with antiviral agents or indiscriminate use might limit availability. Pediatricians should inform recipients of antiviral chemoprophylaxis that risk of influenza is lowered but still remains while they are taking the medication, and susceptibility to influenza returns when medication is discontinued.
Cost-effectiveness and logistic feasibility of vaccinating everyone continue to be concerns. With universal immunization, particular attention is being paid to vaccine supply, distribution, implementation, and financing. Potential benefits of more widespread childhood immunization among recipients, their contacts, and the community include fewer influenza cases, fewer outpatient visits and hospitalizations for influenza infection, and a decrease in the use of antimicrobial agents, absenteeism from school, and lost parent work time. To administer antiviral therapy optimally in hospitalized patients with influenza who cannot tolerate oral or inhaled antiviral agents, FDA-approved intravenous NAIs for children also are needed. Continued evaluation of the safety, immunogenicity, and effectiveness of influenza vaccine, especially for children younger than 2 years, is important. The potential role of previous influenza vaccination on overall vaccine effectiveness by virus strain and subject age in preventing outpatient medical visits, hospitalizations, and deaths continues to be evaluated. Continued assessment of the safety of LAIV is warranted as more children receive the vaccine annually. In addition, the routine use of LAIV in children with certain respiratory and nonrespiratory chronic medical conditions warrants additional consideration. There is also a need for more systematic health service research on influenza vaccine uptake and refusal as well as identification of methods to increase uptake. In addition, development of a safe, immunogenic vaccine for infants younger than 6 months is essential. Until such a vaccine is available for infants younger than 6 months, vaccination of their mothers during pregnancy is the best way to protect these infants. Breastfeeding also is recommended to protect against influenza viruses by activating innate antiviral mechanisms, specifically type 1 interferons. Mandatory annual influenza immunization of all HCP has been implemented successfully at an increasing number of pediatric institutions. Future efforts should include broader implementation of mandatory immunization programs. Optimal prevention of influenza in the health care setting depends on the vaccination of at least 90% of HCP. Additional studies are needed to investigate the extent of offering to immunize parents and adult child care providers in the pediatric office setting; the level of family contact satisfaction with this practice; how practices handle the logistic, liability, legal, and financial barriers that limit or complicate this service; and, most importantly, how this practice will affect disease rates in children and adults. In addition, adjuvants have been shown to increase immune responses to influenza vaccines, but certain adjuvants have been associated with the development of narcolepsy in some studies. Additional studies on the effectiveness and safety of influenza vaccines containing adjuvants are needed. Finally, efforts to improve the vaccine development process to allow a shorter interval between identification of vaccine strains and vaccine production continue.

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