Evolution of the Pediatric Influenza Vaccination Program in the United States

AUTHORS: Kathleen M. Neuzil, MD, MPH,a,b Anthony E. Fiore, MD, c and Richard A. Schieber, MD, MPHd

aPATH and University of Washington School of Medicine, Seattle, Washington; and bPast Chair, Advisory Committee on Immunization Practices Influenza Work Group, cInfluenza Division, National Center for Immunization and Respiratory Diseases, and dEpidemiology and Analysis Program Office, Office of Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention, Atlanta, Georgia

ABBREVIATIONS
ACIP—Advisory Committee on Immunization Practices
CDC—Centers for Disease Control and Prevention
SLV—school-located mass vaccination
TIV—trivalent influenza vaccine

The 3 authors made substantive intellectual contributions to this published study and met the following criteria: (1) made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; (2) drafted the article or revising it critically for important intellectual content; and (3) approved its final version to be published.

doi:10.1542/peds.2011-0737B

Accepted for publication Nov 29, 2011

Address correspondence to Richard Schieber, MD, MPH, Epidemiology and Analysis Program Office, Office of Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, MS E33, Atlanta, GA 30333. E-mail: rschieber@cdc.gov

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).
Copyright © 2012 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

For many years, the Advisory Committee on Immunization Practices (ACIP) for the Centers for Disease Control and Prevention (CDC) focused its vaccination policy on persons at higher risk for influenza complications (eg, older adults, children and adults with certain high-risk conditions, pregnant women) and their contacts (eg, household contacts, health care personnel). Unfortunately, although vaccination coverage rates varied, they remained low for most adult and pediatric high-risk groups, other than persons aged ≥65 years.1 In conjunction with the recognition that influenza vaccination recommendations for high-risk target populations were not being optimally implemented, the adverse effects of influenza illness on all children was increasingly recognized. This led to the expansion of vaccination recommendations for children, beginning in 2002, when influenza vaccination was “encouraged” for children aged 6 through 23 months, and in 2004, when a full recommendation was issued for this age group.2,3 That recommendation was based largely on studies documenting that these young children had influenza-related hospitalization rates that were comparable to hospitalization rates in older persons with underlying risk conditions who were targeted to receive influenza vaccine.4–6 Full recommendation was added for other groups who are at risk, such as adults and children with neuromuscular and other conditions that can compromise respiratory function or the handling of respiratory secretions, as data became available.7

The gradual, incremental, group-by-group expansion of influenza recommendations to additional age and risk groups was challenging for providers and the public. In the ensuing years, immunization experts, professional organizations, and other stakeholders debated the advantages and challenges of expanding routine influenza vaccination to all persons in the United States.8–10 At a meeting of immunization and public health experts in October 2005, participants reviewed data on vaccine safety and effectiveness, burden of illness, cost-effectiveness, the potential for indirect protection, and feasibility.11 Although most meeting attendees supported the concept of universal vaccination, they still favored an incremental approach, beginning first with expansion among children. They reasoned that vaccination of children would yield direct benefits in the reduction of disease burden among vaccinees, given the high influenza attack rates among this age group and the demonstrated efficacy of the vaccine. In addition, the potential for decreased transmission and disease reduction in contacts of children and the broader community was cited. Implementation concerns were acknowledged, including concerns about potentially insufficient vaccine supply.11

In February 2006, the ACIP expanded its influenza vaccination recommendations to include all children aged 2 years through 4 years...
(24 months through 59 months), on the basis of accumulating evidence that children in this age group also had substantial morbidity from influenza. Although hospitalization rates among toddlers and preschool children were lower than rates among younger infants and children, rates of emergency department visits, outpatient visits, and antibiotic use in this age bracket were still higher than that of older children and were viewed as a substantial vaccine-preventable illness burden.

Even as these new recommendations were being implemented, some experts were considering the advantages and disadvantages of a universal pediatric influenza vaccination recommendation for children aged ≥6 months or older. A consultation jointly sponsored by the CDC and the Council of State and Territorial Epidemiologists was held in 2007. The meeting reviewed updated information on safety and effectiveness of the vaccine, cost-effectiveness, program implementation, and vaccine supply. The experience from several large influenza vaccination campaigns among this age group in several US states, as well as the experience with the universal campaign in the Ontario province of Canada, were reported and discussed. Although most attendees favored an expansion of influenza vaccination recommendations to older children, they acknowledged the daunting logistical challenges.

In 2008, after discussion at several public meetings and hearing the summary of the 2007 consultation, ACIP members voted unanimously that all children aged ≥6 months should receive influenza vaccine annually. With these recommendations, the United States become the first country in the world to endorse a universal pediatric influenza vaccination policy. The American Academy of Pediatrics and the American Academy of Family Physicians also have endorsed a universal pediatric influenza vaccination policy.

Ultimately, ACIP’s decision to expand the recommendation to all children was based primarily on the expected direct benefits to the vaccinees. For school-age children and their contacts, influenza illness has substantial adverse health effects and impact on the family, including increased antibiotic use, medical care visits, school absenteeism, and parental work loss. At the same time, the influenza vaccine was recognized to be effective and safe for school-age children. Additional impetus for the recommendation was the expectation that a simple age-based influenza vaccination recommendation would improve the existing low vaccine coverage levels among the ~50% of school-age children who already had a risk- or parent-based indication for annual influenza vaccination. The potential reduction of influenza among household contacts of vaccinated children and the potential reduced disease rate within the broader community were discussed by the ACIP, but were considered to be less important than the direct benefit to the vaccinated child when considering a new vaccination recommendation.

The main obstacle to the ACIP making a universal pediatric recommendation was whether a yearly vaccination for all children was feasible. The supply of influenza vaccine had been steadily increasing in the United States during the years before this recommendation, but concerns about local distribution issues were acknowledged. Vaccinating children would be particularly challenging, given that two doses are recommended for children aged <9 years the first year they are vaccinated. However, the ACIP concluded that, in the end, comprehensive efforts to vaccinate all children were not likely to be made until a recommendation was made.

School-located vaccination (SLV) clinics are mass vaccination immunization clinics held on a preestablished day at a designated school for children who have prior informed consent signed by a parent or guardian. Before the 2009 H1N1 influenza pandemic, such programs had been developed in relatively few counties and school districts around the country. SLV clinics have recently been suggested as a promising mechanism of addressing the challenges of delivering vaccine to a large number of children over the course of a few months on an annual basis.

This special supplement of Pediatrics was developed to provide a single source of information on the many facets of an SLV program. Articles included in this supplement discuss the following topics: current published data concerning influenza, influenza vaccine, and vaccination of children; the feasibility of such programs and the wide range of vaccination coverage rates achieved at different sites; methods of planning, clinic management, and responses to difficulties encountered; attitudes of general practitioners toward SLVs; the potential role of volunteers at clinics; debates by experts concerning the advantages and challenges of SLVs; and proposed research to determine the impact of vaccinating school children.

Implementing the universal pediatric recommendation has faced challenges. In addition to the anticipated difficulties discussed earlier, the 2009 influenza A (H1N1) pandemic occurred in the same year as the first year of full implementation of the universal recommendation for annual influenza vaccination of children. Children were among the 5 initial target groups for 2009 H1N1 influenza monovalent vaccination efforts, and practitioners were faced with the daunting task of delivering 2 influenza vaccines—the trivalent seasonal and the influenza A (H1N1) 2009 monovalent
Among children aged 6 months through 17 years, national seasonal influenza vaccination coverage during 2009–2010 was higher than the previous year, and both the seasonal and monovalent pandemic vaccination coverage were higher than coverage for adults aged ≥18 years. Finding resources will be necessary to continue to ensure that influenza vaccination coverage levels can be improved and sustained. Using lessons learned from the pandemic experience will be important in shaping future pediatric vaccination programs.

REFERENCES

# Evolution of the Pediatric Influenza Vaccination Program in the United States

Kathleen M. Neuzil, Anthony E. Fiore and Richard A. Schieber

*Pediatrics* 2012;129;S51

DOI: 10.1542/peds.2011-0737B

<table>
<thead>
<tr>
<th>Updated Information &amp; Services</th>
<th>including high resolution figures, can be found at: <a href="http://pediatrics.aappublications.org/content/129/Supplement_2/S51">http://pediatrics.aappublications.org/content/129/Supplement_2/S51</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>References</td>
<td>This article cites 14 articles, 1 of which you can access for free at: <a href="http://pediatrics.aappublications.org/content/129/Supplement_2/S51.full#ref-list-1">http://pediatrics.aappublications.org/content/129/Supplement_2/S51.full#ref-list-1</a></td>
</tr>
</tbody>
</table>
| Subspecialty Collections | This article, along with others on similar topics, appears in the following collection(s):  
**Medical Education** [http://classic.pediatrics.aappublications.org/cgi/collection/medical_education_sub](http://classic.pediatrics.aappublications.org/cgi/collection/medical_education_sub)  
**Infectious Disease** [http://classic.pediatrics.aappublications.org/cgi/collection/infectious_diseases_sub](http://classic.pediatrics.aappublications.org/cgi/collection/infectious_diseases_sub)  
**Influenza** [http://classic.pediatrics.aappublications.org/cgi/collection/influenza_sub](http://classic.pediatrics.aappublications.org/cgi/collection/influenza_sub) |
| Permissions & Licensing | Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: [https://shop.aap.org/licensing-permissions/](https://shop.aap.org/licensing-permissions/) |
| Reprints | Information about ordering reprints can be found online: [http://classic.pediatrics.aappublications.org/content/reprints](http://classic.pediatrics.aappublications.org/content/reprints) |
Evolution of the Pediatric Influenza Vaccination Program in the United States
Kathleen M. Neuzil, Anthony E. Fiore and Richard A. Schieber

Pediatrics 2012;129:S51
DOI: 10.1542/peds.2011-0737B

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://pediatrics.aappublications.org/content/129/Supplement_2/S51