

Maintenance of Increased Childhood Influenza Vaccination Rates 1 Year After an Intervention in Primary Care Practices

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ABSTRACT

OBJECTIVE: Influenza vaccination rates among some groups of children remain below the Healthy People 2020 goal of 70%. Multistrategy interventions to increase childhood influenza vaccination have not been evaluated recently.

METHODS: Twenty pediatric and family medicine practices were randomly assigned to receive the intervention in either year 1 or year 2. This study focuses on influenza vaccine uptake in the 10 year 1 intervention sites during intervention and the following maintenance year. The intervention included the 4 Pillars Immunization Toolkit—a practice improvement toolkit, early delivery of donated vaccine for disadvantaged children, staff education, and feedback on progress. During the maintenance year, practices were not assisted or contacted, except to complete follow-up surveys. Student's *t* tests assessed vaccine uptake of children aged 6 months to 18 years, and multilevel regression modeling in repeated measures determined variables related to the likelihood of vaccination.

RESULTS: Influenza vaccine uptake increased 12.4 percentage points (PP; $P < .01$) during active intervention and uptake was

sustained (+0.4 PP; $P > .05$) during maintenance, for an average change of 12.7 PP over all sites, increasing from 42.2% at baseline to 54.9% ($P < .001$) during maintenance. In regression modeling that controlled for age, race, and insurance, likelihood of vaccination was greater during intervention than baseline (odds ratio 1.47; 95% confidence interval 1.44–1.50; $P < .001$) and greater during maintenance than baseline (odds ratio 1.50; 95% confidence interval 1.47–1.54; $P < .001$).

CONCLUSIONS: In primary care practices, a multistrategy intervention that included the 4 Pillars Immunization Toolkit, early delivery of vaccine, and feedback was associated with significant improvements in childhood influenza vaccination rates that were maintained 1 year after active intervention.

KEYWORDS: children; immunization; influenza; pediatric influenza vaccination; vaccination

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WHAT'S NEW

A multistrategy intervention including a practice improvement toolkit, provider education, early delivery of donated vaccines, and feedback on progress was successful for increasing and maintaining childhood influenza vaccination rates over 2 years in primary care practices.

THE NATIONAL CHILDHOOD influenza vaccination rate has increased significantly since the recommendation for universal childhood vaccination in 2008.¹ Among all children 6 months to 17 years of age, the percentage vaccinated

was 24% in 2008–2009²; 44% in 2009–2010³; 43% in 2010–2011⁴; 52% in 2011–2012⁵; and 57% in 2012–2013.⁶ Although vaccination rates among children aged 6 to 23 months have exceeded⁵ the Healthy People 2020 goal of 70%,⁷ secular trends indicate an overall slowing in the rate of increase. Moreover, rates among children aged 13 to 17 years remain below 50%^{5,8} and rates reported from individual practices and regional studies are well below goals for certain demographic groups, including older children, racial minorities, and those without health insurance.^{9,10} These disparities suggest a need for interventions that raise rates among all groups of children.

Few studies have been published about interventions that were specifically designed to increase childhood influenza vaccination following the recommendation for universal influenza vaccination for children aged ≥ 6 months. Of 4 studies identified, 3 were limited to specific demographic groups (low-income^{11,12} or high-risk children¹³) and limited the type of intervention strategy being tested (community-centered education,¹¹ mailed reminders,¹³ and text message reminders¹²). Only our study was a multistrategy intervention among children across the socioeconomic and age spectrum; year 1 results of this study have been published.¹⁰ Each of these studies reported significant increases in influenza vaccination rates as a result of the intervention or interventions; however, none has measured whether the rates were maintained after the intervention period ended.

The present study evaluated the effect of a single-season, multistrategy intervention program to raise influenza vaccination rates among children aged 6 months to 18 years in primary care practices and maintain them over an additional year. This report describes the 2-year experience of the practices randomized to the year 1 intervention.

METHODS

This trial covered 3 influenza seasons; 2010–2011 was the baseline year, 2011–2012 (year 1) was the active intervention year, and 2012–2013 (year 2) was the maintenance year, in a repeated-measures design. The study was approved by the University of Pittsburgh institutional review board. The Clinical Trial Registry Name/Number are “From Innovation to Solutions: Childhood Influenza”/NCT01664793.

SAMPLE SIZE CALCULATION AND SITE SELECTION

Optimal Design software, version 1.77 (University of Michigan, 2006) was used to calculate the sample size for a cluster randomized trial seeking a 10% to 15% absolute increase in vaccination rate and a minimum practice size of 100 to 200 pediatric patients. Twenty clusters¹⁴ were necessary to achieve 80% power with an alpha of 0.05. To be eligible, each site must have had a patient population of at least 200 children aged 6 months through 18 years, access to vaccination data via an electronic medical record (EMR), and willingness to implement the intervention. Primary care pediatric and family medicine practices from 2 University of Pittsburgh practice-based research networks (<http://www.pedsnet.pitt.edu/>; <http://www.familymedicine.pitt.edu/content.asp?id=2353>) and 1 clinical network were solicited until 20 sites agreed to participate.

Participating sites were stratified by location—inner city (urban practices with primarily disadvantaged children), urban, suburban, and rural—and by discipline (pediatrics vs family medicine), then randomized into the year 1 or year 2 intervention. All consort criteria for a randomized cluster trial¹⁴ were met.¹⁰

INTERVENTIONS

The intervention was designed using the Diffusion of Innovations theory¹⁵ and included the 4 Pillars Immunization

Toolkit (<http://www.pittvax.pitt.edu/child-flu-toolkit>), provider education, feedback on influenza vaccines provided, and early delivery of donated vaccines for disadvantaged children to ensure that vaccine was available contemporaneously for commercially insured and Vaccines for Children–supported children. The intervention has been described in detail,¹⁰ as have the results for the first year of intervention. Briefly, the 4 Pillars Immunization Toolkit includes background on the importance of protecting children against influenza, barriers to increasing influenza vaccination from both provider and parent/patient perspectives, and strategies to eliminate those barriers. Practices were expected to implement strategies from each of the 4 pillars, which were developed from 4 key evidence-based^{16,17} strategies: pillar 1—convenient vaccination services; pillar 2—notification of patients about the importance of immunization and the availability of vaccines; pillar 3—enhanced office systems to facilitate immunization; and pillar 4—motivation through an office immunization champion. A summary of the intervention strategies, including the 4 Pillars, is included in [Online Appendix Table 1](#). Intervention sites were not assisted or contacted during year 2 except to complete a follow-up survey.

DATA COLLECTION

Demographic, office visit, and influenza vaccination data were derived from EMR data extractions 3 months after each influenza season. The Center for Assistance in Research Using the Electronic Record (CARE) served as the honest broker to retrieve deidentified data from the EMR. Office visit codes were those that would capture preventive visits, counseling visits, and consult visits that took place between July 1, 2010 and February 28, 2011; July 1, 2011 and February 29, 2012; and July 1, 2012 and February 28, 2013. Influenza vaccination procedure codes for the same time periods were used. Data for children from participating practices also included race, sex, age 6 months to 18 years, and insurance type. A child was considered to be an active patient of the practice and was included in the data set if he or she had a visit between July 1 and February 28/29 for each year of the study, chosen to coincide with each year’s influenza vaccination season because the vast majority of influenza vaccines are provided during these months. Each year, the denominator included all active patients aged 6 months to 18 years, and the numerator was the number of those children who had received at least 1 dose of influenza vaccine.

To measure the degree of implementation¹⁸ and maintenance of strategies, 2 individuals from each site (the lead physician and nurse) were asked to complete a survey that assessed strategy use at the end of each intervention year (1 = yes, 0 = no). For each strategy listed, the responses from each site were averaged and summed across all strategies and divided by 19 in year 1 and 17 in year 2, to provide a percentage. (Early delivery of donated vaccines and provider education did not occur in the maintenance year.)

STATISTICAL ANALYSES

Data from the EMR extraction were validated by verifying that data were within the requested parameters for

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