Parental Perspectives on Influenza Vaccination Among Children with Asthma

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SYNOPSIS

Objectives. The objectives of this study were to: (1) identify modifiable factors influencing receipt of influenza vaccination among children with asthma, and (2) to evaluate the effect of heightened media attention on vaccination rates.

Methods. During November and December 2003, we interviewed parents of children with asthma about their experiences with and beliefs about influenza vaccination. We randomly selected 500 children from a study population of 2,140 children identified with asthma in a managed care organization in Massachusetts. We obtained data on influenza vaccination status from computerized medical records and determined significant factors influencing receipt of influenza vaccination.

Results. Children were more likely to be vaccinated if their parent recalled a physician recommendation (odds ratio [OR] 2.6; 95% confidence interval [CI] 1.5, 4.5), believed the vaccine worked well (OR 2.0; 95% CI 1.4, 2.8), or expressed little worry about vaccine adverse effects (OR 1.3; 95% CI 1.0, 1.6), or if the child was younger (OR 1.1 per year of age; 95% CI 1.0, 1.2).

During the study period, there was heightened media attention about influenza illness and the vaccine. The influenza vaccination rate for children with asthma was 43% in 2003–04 compared with 27% in 2002–03. Comparison of weekly influenza vaccination rates in 2003–04 and 2002–03 suggested that the media attention was associated with the increase in vaccination rates.

Conclusions. Physician recommendations and parental education about influenza vaccine availability, effectiveness, and adverse effects are potentially important influences on influenza vaccination. Our findings suggest that media coverage of the risks of influenza was associated with a significant increase in vaccination rates.

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The Advisory Committee on Immunization Practices (ACIP) and the American Academy of Pediatrics Committee on Infectious Diseases recommend influenza vaccination for children with asthma and other chronic conditions, who are at high risk of serious morbidity and hospitalization from this disease.¹⁻⁶ Despite these national recommendations, most children with asthma do not receive influenza vaccination. Reported influenza vaccination rates range from less than 10% to 30% among children with asthma.⁷⁻¹⁰ Studies have shown that reminders sent to parents of high-risk children do improve influenza vaccination rates. However, even with reminders, vaccination coverage remains below 50%.¹¹⁻¹⁵

Clinicians and policy makers need better information about what factors could be changed to increase influenza immunization rates beyond 50% among children with asthma. Yet few studies have identified modifiable barriers to influenza vaccination among high-risk children using parents' perspectives. A recent study was limited to hospitalized children, while an older study included relatively few parents.^{9,12}

This study was designed to address this critical gap in information. In addition, we had the opportunity to study weekly influenza vaccination rates during the 2003-04 influenza season, when there was a great deal of national media attention to influenza deaths among children, as well as a vaccine shortage. This study's aims were to: (1) identify modifiable barriers to influenza vaccination among children with asthma, and (2) describe the effect of media coverage of influenza adverse events in children on vaccination rates.

METHODS

In this study, children aged 5 to 18 years with asthma were randomly assigned to an interview group or comparison group. The primary outcome was receipt of influenza vaccination during the 2003-04 influenza season. We evaluated the effect of demographic factors, parental beliefs, and health system factors on receipt of influenza vaccination. In addition, we compared weekly vaccination rates during the 2003-04 influenza season to the 2002-03 influenza season.

Study population

The target population included children aged 5 to 18 years with asthma receiving care from Harvard Vanguard Medical Associates (HVMA), a large, nonprofit, multispecialty group practice serving approximately 300,000 individuals in Massachusetts. The inclusion criteria for asthma were: (1) Emergency Department

visit or hospitalization with ICD-9 code¹⁶ for asthma (493 to 493.9) during the 12 months before the index date, August 1, 2003; or (2) outpatient visit with ICD-9 code for asthma and use of any of the following medications during the 12 months before the index date: inhaled steroid, oral steroid, leukotriene antagonist, cromolyn/nedocromil, salmeterol, or theophylline. We identified 2,308 children with asthma based on HVMA computerized records and excluded 168 siblings, to yield a final sample of 2,140 children.

In October 2003, HVMA mailed the families of all children in the study population a brochure that encouraged influenza vaccination. This mailed brochure was part of routine care in this health system and targeted high-risk groups among children and adults. This study population would have also received the mailed brochure in 2002-03.

Telephone interview group

We randomly selected 500 parents of children for interviews. Trained research assistants conducted the interviews in English and provided a telephone reminder, which included a recommendation for the influenza vaccine for children with asthma and the telephone number for the pediatric department at their preferred HVMA site. If possible, parents who declined participation in the interview were still given the telephone reminder. The study protocol was approved by the Institutional Review Board at the study site.

The telephone interviews occurred from November 12, 2003, to December 15, 2003. The interviews averaged 10 minutes and included both open-ended and closed-ended items. Each interview included questions (based on the health belief model¹⁷) about parents' beliefs and knowledge about the vaccine, including perceived susceptibility and perceived severity and barriers to obtaining the vaccine. To determine intent to vaccinate, parents were asked whether they thought their child would receive the vaccine this year. The interview also included questions about demographic characteristics, except for the child's age and gender, which were obtained from the computerized medical records.

Comparison group

The 1,640 children with asthma who were not selected to receive an offer to participate in the interview served as a comparison group. By comparing influenza vaccination rates in this group to the interview group, we evaluated the possible effect of the interview and reminder for the vaccine on vaccination rates.

Outcome measure

The primary outcome measure was receipt of the influenza vaccine for the 2003–04 influenza season. This data was obtained in February 2004 from computerized HVMA medical records. Data on receipt of influenza vaccination for the 2002–03 influenza season was also obtained.

Heightened media attention and follow-up interview

During the study period, there was heightened media attention about influenza illness severity, particularly serious adverse effects among children and the vaccine shortage. To further investigate the extent of increased media attention, we searched Lexis-Nexis to determine the number of newspaper articles related to influenza severity, including parental worry about influenza illness in children and the vaccine shortage that arose during our study period—November 12, 2003, to December 15, 2003. We focused on the Boston Herald, the Boston Globe, and the New York Times, which are the major newspapers serving residents of Eastern Massachusetts. We found a total of 17 citations in the three newspapers during our study period, compared to none for the same time period in the previous year.

In March 2004, we conducted brief follow-up telephone interviews among a subsample of interview participants about the media attention to serious pediatric influenza complications and the influenza vaccine shortage during the 2003–04 influenza season. We targeted interview participants who, according to HVMA records, did not receive the influenza vaccine but had expressed intent to have their child vaccinated according to their interview responses, and those who did receive the vaccine, but had not expressed intent to vaccinate. We focused on these interview participants because they seemed more likely to have been affected by the media attention and/or vaccine shortage.

Statistical methods

Bivariate analyses were conducted using chi-square analyses or Fisher's exact test for categorical variables and logistic regression for ordinal or continuous variables. Variables significant at $p \leq 0.20$ in the bivariate analyses were included in the multivariate logistic regression. An iterative, forced-entry model based on the framework outlined by Aday and Andersen¹⁸ was built with the candidate variables identified in the bivariate analyses to identify significant correlates of influenza vaccination. Variables significant at $p \leq 0.10$ were retained in the multivariate logistic model.

We compared influenza vaccination rates among the interview and comparison groups using chi-square

analyses. We also compared weekly influenza vaccination rates among this study population ($n=2,140$) during the 2003–04 season and the 2002–03 season. Weekly vaccination rates represented the percentage of children with asthma vaccinated in the study population during that week.

The interviews occurred during the influenza vaccine season and during the heightened media attention. Therefore, we stratified the data into before and after media events, specifically reports of pediatric deaths in Colorado on November 27, 2003,¹⁹ and reports of the vaccine shortage being critical on December 5, 2003.²⁰ Variables indicating when the interview occurred with respect to these media events were included in the final model to test for any effect of the media events on significant factors influencing vaccination rates.

RESULTS

Population characteristics

Of the 500 assigned to the interview group, 295 interviews were completed, for an interview response rate of 59%. The gender distribution (59% male, 41% female) did not differ among the interview and control groups. The mean age of children (standard deviation [SD]) in years was 11.4 (3.6) in the total study sample and also did not vary significantly between the groups. Among the interview participants, the majority of parents were from 40 to 49 years of age (52%), with either a college or post-graduate education (65%) and household income $> \$60,000$ (56%).

Reported attitudes regarding influenza vaccination

Only 55% of parents interviewed reported that their child's doctor had recommended the flu vaccine this year. The most important reasons cited by parents for their child receiving the influenza vaccination were that it would help their child's asthma (53%) or prevent the flu (40%). The most important reasons for not receiving the vaccine were perceived lack of need (26%) and parental concern about adverse effects (16%).

Less than half of all parents said they thought influenza vaccination would be extremely or very helpful for their child's health (41%) or that the influenza vaccine worked extremely or very well to prevent influenza (44%). Parents were generally less worried about adverse effects, with 70% of parents reporting that they were either not worried or a little worried about adverse effects of the influenza vaccine. Around 10% of parents thought that the vaccine might trigger an asthma attack.

Table 1. Significant correlates of influenza vaccination in bivariate analyses, children with asthma, Harvard Vanguard Medical Associates, 2003–04

Correlates	Percent of parents with correlate	Percent of vaccination rate with correlate	Percent of vaccination rate without correlate	p-value
Parental beliefs				
Worried about the flu ^a	45	62	50	0.05
Believes flu very likely to trigger an asthma attack ^b	56	61	48	0.01
Believes vaccine works very well ^b	48	75	39	<0.001
Not worried about adverse effects ^c	71	64	36	<0.001
Not worried about getting the flu from the flu vaccine ^c	75	61	40	<0.001
Health care system factors				
Received a physician recommendation	55	70	38	<0.001
Rated access to vaccination as easy	85	59	45	0.04
Knowledge about evening or weekend clinics	83	59	41	0.02
Demographic variables				
Race/ethnicity				0.03
White	68	60	—	
African American	18	41	—	
Other	14	45	—	
Household Income				0.03
<\$30K	14	46	—	
\$30K–\$60K	22	46	—	
>\$60K	65	59	—	
Single adult household	13	41	57	0.05

^aWith correlate included responses of “extremely,” “very,” or “moderately.” Without correlate included responses of “a little” and “not.”

^bWith correlate included responses of “extremely” or “very.” Without correlate included responses of “moderately,” “a little,” and “not.” (This division was used because at least 48% of interview participants responded “extremely” or “very.”)

^cWith correlate included responses of “a little” and “not.” Without correlate included responses of “extremely,” “very,” or “moderately.”

We asked parents where they would prefer to get the vaccine for their child and how they felt about the intranasal vaccine. Most parents (79%) preferred the doctor’s office, while 20% preferred the school. Parents were fairly evenly split on whether they would be more likely to have their child receive influenza vaccination if it were offered as a nasal spray: 43% said they would, 45% said they would not, and 11% did not know.

Correlates of influenza vaccination

Significant bivariate correlates of influenza vaccination are depicted in Table 1. Among demographic factors, being African American or other non-white race/ethnicity, having lower household income, or having a single adult household were associated with higher risk of not receiving influenza vaccination. Younger children were more likely to be vaccinated (OR 1.1 per year of age; 95% CI 1.0, 1.1). Parents who believed that the flu would be more likely to trigger an asthma attack in their child were more likely to have their child vaccinated (61% vs. 48%; $p=0.01$). Parental recall of a recommendation from their child’s physician during the past year for influenza vaccination was associated with higher influenza vaccination rates

(70% vs. 38%; $p<0.0001$). Parents who believed the vaccine worked well were more likely to have their child vaccinated (75% vs. 39%; $p<0.0001$). Lack of parental worry about adverse effects was associated with their child receiving influenza vaccination (64% vs. 36%; $p<0.0001$). Parents were asked if “knowledge about evening or weekend clinic availability was a problem for obtaining the vaccine.” Those who did report it was a problem were at higher risk of not receiving influenza vaccination (41% vs. 59%; $p=0.02$).

The final logistic regression model (Table 2) included child age, parental belief that the vaccine works well, lack of parental worry about adverse effects, parental recall of a physician recommendation for the vaccine, and parental knowledge about evening or weekend clinic availability as independent factors influencing influenza vaccination among children with asthma. However, parental knowledge about evening or weekend clinic availability was statistically significant only at $p=0.10$.

Vaccination rates by study group and year

The vaccination rate for the study population was 43%. The vaccination rate for the interview group was 44%, and for the comparison group, 43%. The interview

Table 2. Correlates of influenza vaccination in multivariate model, children with asthma, Harvard Vanguard Medical Associates, 2003–04^a

Correlates	OR (95% CI)	p-value
Younger child age	1.1 (1.0, 1.2)	0.04
Vaccine works very well	2.0 (1.4, 2.8)	<0.001
Not worried about adverse effects	1.3 (1.0, 1.6)	0.03
Physician recommendation	2.6 (1.5, 4.5)	0.001
Knowledge about evening or weekend clinic availability	1.8 (0.9, 3.7)	0.10

^aAll the variables depicted in Table 1 were entered into the model, but were retained only if $p \leq 0.10$. Other variables that were entered into the model but not shown in Table 1 are age, parental education level, and whether or not getting an appointment was a problem.

OR = odds ratio

CI = confidence interval

group includes all 500 parents who were randomly selected to participate in the telephone interview. Of the 295 parents who completed the interview, 164 children, or 56%, were vaccinated. Of the 205 parents who did not participate in the interview, 58 children, or 28%, were vaccinated (Table 3).

The vaccination rate for all children with asthma in 2002–03 was 27%, compared to 43% in 2003–04. The Figure depicts weekly influenza vaccination rates in the study population, comparing influenza seasons 2003–04 and 2002–03. The weekly influenza vaccination rate in each year peaked in early November. The clear second peak in December during the 2003–04 season was likely a response to the significant media attention on influenza deaths in children and the influenza vaccine shortage that year.

Effects of media reports

We stratified the data depending on the date of the interview relative to certain media reports. Of the 295 participants interviewed, 138 were interviewed before

the media reports of pediatric deaths in Colorado on November 27, 2003,¹⁹ and 157 were interviewed after. Parents were more likely to report being extremely or very worried about influenza illness if they were interviewed after the media reports (22% vs. 9%; $p < 0.001$). There were 217 participants interviewed before the media reports of a critical vaccine shortage on December 5, 2003,²⁰ and 78 interviewed after. Parents who were interviewed after were less likely to report that the vaccine works extremely or very well (36% vs. 53%; $p = 0.02$). There was no increase in parents reporting that the vaccine would be helpful for their child's health or that they intended to get the vaccine for their child after hearing the media reports.

We included variables in the final model to control for when the interview occurred relative to the media reports. The inclusion of these variables had no effect on the final results.

Follow-up interview

We interviewed 40 parents out of 57 eligible parents for a response rate of 70%. Of the 32 parents of children whose medical record did not show influenza vaccination, two (6%) reported that they had received it in another setting, including the workplace and a community hospital. Of the 40 parents who were interviewed, 83% had heard news reports about serious complications among children from influenza, with 52% reporting being influenced by the news reports. Approximately 93% reported hearing about the vaccine shortage, with 49% affected by the shortage.

DISCUSSION

Major findings

Children were more likely to receive influenza vaccination if their parents recalled the physician making a recommendation, said the vaccine was effective, were not worried about adverse effects, or knew the availability of evening and weekend clinic hours. Media coverage of fatal influenza cases during the 2003–04 influenza season was associated with an increase in vaccination rates compared to the previous season.

These findings suggest that physicians may be able to improve influenza vaccination rates among children with asthma by more consistently delivering recommendations for the vaccine. Efforts to better educate parents about vaccine effectiveness, adverse effects, and evening and weekend clinic availability might also increase the use of influenza vaccine among children with asthma. Providers may also improve vaccination rates by further targeting older children, who were less likely to be vaccinated.

Table 3. Vaccination rates by study group, children with asthma, Harvard Vanguard Medical Associates, 2003–04

Study group	Sample size	Number vaccinated	Vaccination rate (percent)
Interview	500	222	44
Participants	295	164	56
Nonparticipants	205	58	28
Control	1,640	697	43
Total	2,140	919	43

Figure. Weekly influenza vaccination rates for influenza seasons 2002–03 and 2003–04, children with asthma, Harvard Vanguard Medical Associates

Comparisons with previous studies

This is one of the largest studies to evaluate the role of parental beliefs on influenza vaccination rates among children with asthma. These findings are in accord with a previous study of hospitalized children that identified physician recommendations as an independent predictor of influenza vaccination.⁹ Our results also agree with a 1992 study that interviewed 43 mothers of children with asthma and found that parental worry about asthma and parental worry about vaccine adverse effects were significantly associated with vaccination status.¹² Studies among healthy children younger than 2 years of age have found that a physician recommendation, parental beliefs about adverse effects, parental perceptions of their child's influenza susceptibility, and vaccine beliefs within their social network were associated with influenza vaccination.^{21,22}

This study is unique in that widespread media attention to influenza deaths in children during our study period gave us the opportunity to evaluate the effect of the media on influenza vaccination rates.^{19,20,23–27} The influenza vaccination rate in our study population during the 2003–04 influenza season was 43%, compared to 27% during the previous season. This increase appeared primarily due to media coverage of serious complications of influenza among children during the 2003–04 season, suggesting that public health messages that emphasize the risks of influenza among children, especially those with chronic condi-

tions, may provide an effective means of promoting vaccination in this high-risk group.

Past studies have shown that the media can influence health care behavior and utilization.^{28–30} For example, during the 1980s, media reports about the risk of Reye's Syndrome led to a decline in the use of aspirin for fever in children.²⁸ The study's authors concluded that this media campaign was successful because it delivered a relatively simple message that could prevent severe consequences in a vulnerable population.²⁸ The media attention to influenza deaths in children during the 2003–04 season may have had similar effects.

Limitations

The study was conducted during influenza vaccination season as well as during the heightened media attention and vaccine shortage. This study was originally designed to also assess the effect of a telephone reminder on vaccination rates, but because of the vaccine shortage, we were unable to fully assess the effect of the telephone reminders. Because 34% of families interviewed had received the influenza vaccine prior to the interview, the factors we have identified as associated with influenza vaccination are not necessarily predictors of vaccination.

Based on the initial interview responses, parents interviewed after the media events were not more likely to report that the influenza vaccine would be helpful

for their child's health or that they intended to vaccinate their child. It is possible that interview participants, who had a higher vaccination rate than non-participants, may have had a positive bias toward influenza vaccination and were less likely to be influenced by media events. However, based on the follow-up interview responses and the distribution of weekly influenza vaccination rates among the study population during the 2003–04 season, the media attention seemed to have an influence on influenza vaccination rates.

In addition, we were not able to study factors associated with nonreceipt of influenza vaccination among those families who declined to participate in interviews. These families represented approximately 40% of the interview group and they had far lower influenza vaccination rates than those who participated in the interview. Compared to interview participants, who all received a reminder for influenza vaccination, only 25% of interview nonparticipants received the reminder.

This research was conducted in the population of a highly integrated provider group. The study population was English speaking, relatively well educated, and had high household incomes. Thus, while the modifiable factors we identified suggest the next steps in improving influenza vaccine delivery, they may not be generalizable to all populations, especially those with barriers to primary care access, low socioeconomic status, or to non-English speaking populations.

Our data on influenza vaccination status was based on computerized medical records. We did not have data on receipt of the influenza vaccination at sites other than HVMA. Based on responses to the follow-up interview, approximately 6% of those without records of having the influenza vaccination had received it at another site.

Policy implications

Improving influenza vaccination rates among children with asthma will require intervention by physicians as well as the health care system. Physician recommendations and parental education about influenza vaccine availability, effectiveness, and adverse effects are potentially important influences. The media had a significant influence on vaccination rates in this study, and should be considered a possible avenue in future campaigns to improve influenza vaccination rates among high-risk children.

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