

New Jersey Department of Health and Senior Services
Pediatric Influenza Surveillance
2005- 2006 Season Summary Statistics

Introduction

In the United States, epidemics of influenza typically occur during winter months and have been associated with approximately 36,000 deaths per year from 1990-1999 [1]. From 1999-2003, 70 influenza-associated deaths occurred in New Jersey residents [2]. Rates of infection are highest among children, but rates of serious illness and death are highest among persons ages ≥ 65 years, children < 2 years, and persons of any age who have medical conditions that place them at increased risk for complications from influenza.

During the 2003-2004 influenza season, there were increased reports of pediatric influenza-associated deaths. In response, the Centers for Disease Control and Prevention (CDC) requested that states begin collecting information regarding pediatric deaths associated with influenza. During the 2003-2004 influenza season the New Jersey Department and Health and Senior Services (NJDHSS) implemented passive surveillance to record pediatric (i.e., ≤ 18 years) mortality associated with influenza. In subsequent influenza seasons, morbidity associated with severe complications due to influenza was added to this passive surveillance system. Hospital infection control professionals are notified of the surveillance case definition via LINCIS at the beginning of each season.

Hospital infection control professionals who identify patients meeting the case definition are asked to report via a web-based form to NJDHSS. The following summary describes information collected during the 2005-2006 influenza season (October 2, 2005 to May 20, 2006) through this surveillance system.

Objectives of Pediatric Influenza Surveillance

- To identify clinical and epidemiologic characteristics associated with fatal and severe cases of influenza among children
- To increase provider awareness of deaths and severe illness among children ≤ 18 years that may be due to influenza illness
- To identify potentially missed opportunities for vaccination
- To provide data to guide future national influenza vaccine policy
- To rapidly recognize influenza seasons in which the impact of influenza appears to be unusually severe among children

Description of Methods

During October 2, 2005 to May 20, 2006, NJDHSS requested that providers report:

Pediatric patients (i.e., ≤ 18 years of age) with laboratory confirmed influenza (e.g., rapid enzyme immunoassay, viral culture, direct fluorescent antibody, polymerase chain reaction, immunohistochemistry, hemagglutination inhibition) meeting one of the following criteria:

- Influenza-related deaths (no period of complete recovery between the illness onset and death); OR
- Influenza encephalopathy (defined as altered mental status, or personality changes in patients lasting >24 hours and occurring within 5 days of the onset of an acute febrile respiratory illness); OR
- Severe illness (defined as admission to an intensive care unit for influenza-related illness in a previously healthy child).

Hospital infection control professionals were asked to complete a web-based form on any patient meeting the above criteria. Information regarding demographics, outcome, illness onset, laboratory diagnostics, medical care, treatments, pre-existing conditions, complications, and vaccination history was collected. NJDHSS received reports from the web-based system via spreadsheet on a weekly basis.

Results

NJDHSS received 62 reports of pediatric influenza cases during the surveillance period (October 2005 to May 2006). Of these 62 cases, 25 (40%) cases met the surveillance case definition. Cases excluded from the analysis fulfilled the laboratory criteria of the case definition but failed to meet the defined clinical criteria. The onset dates of the 25 cases ranged from December 7, 2005, to May 5, 2006 with the largest number of cases occurring in January (9) and March (8). Of these cases, only one death was reported. Demographic and clinical information regarding these cases are presented in Table 1.

Complications observed during a case patient's acute illness by vaccination status are shown in Table 2. Reported complications (in descending order of frequency) included no reported complication (9), radiographically confirmed pneumonia (6), other complication (5)[†], bronchiolitis (2), encephalopathy/encephalitis (2), shock (1), croup (1), and other viral co-infection (acute myositis of calf muscle)(1). Acute respiratory disease syndrome (ARDS), seizures, and Reye's Syndrome were not reported as complications in any case.

Pre-existing medical conditions by vaccination status are shown in Table 3. The pre-existing conditions (in descending order of frequency) include no existing condition reported (14), cardiac disease (3), moderate to severe developmental delay (2), seizure disorder (2), immunosuppressive condition (2), other pre-existing condition (Down's syndrome, Rett's syndrome) (2), hemaglobinopathy (i.e., sickle cell anemia) (1), and asthma/reactive airway disease (1). Diabetes, history of febrile seizures, cystic fibrosis, renal disease, chronic pulmonary disease, metabolic disorder, neuromuscular disorder, or pregnancy were not reported as a pre-existing condition in any case.

Therapies reported to have been administered to cases patients prior to illness onset by vaccination status are shown in Table 4. These therapies (in descending order of frequency) include: aspirin (2), steroids (1), and chemotherapy (1). Radiation and immunosuppressive therapies other than steroid and chemotherapy were not reported in any case.

[†]Other complications reported include systemic inflammatory response syndrome, apnea/bradycardia, dusky episode/tachycardia, aspergillosis, viral myocarditis, and upper respiratory infections.

Discussion

Mortality

The one reported death occurred in March in a previously healthy unvaccinated 13 year-old white, non-hispanic female with an illness onset of March 6, 2006. The case-patient was initially evaluated in the emergency room, admitted to an inpatient room and then transferred to an intensive care unit and placed on ventilator assistance. The case-patient did not have any documented pre-existing conditions but developed several complications, including pneumonia and encephalitis during the course of her illness. This patient developed a seizure disorder four days after symptom onset, and influenza A was confirmed via rapid antigen test. The patient was believed to have meningoencephalitis secondary to influenza A. No autopsy was performed.

Vaccination

During the 2005-2006 influenza season, the Advisory Committee on Immunization Practices (ACIP) recommended vaccination for children aged 6-23 months and children who had underlying chronic medical conditions (e.g., asthma, diabetes, seizure disorders) [3]. Seven (54%) of cases eligible to receive the influenza vaccine (i.e., >6 months of age) were not vaccinated and in two (15%) cases vaccination status was unknown. Twenty-nine percent of unvaccinated cases who were eligible to receive the vaccine had one or more pre-existing conditions. Seventy-one percent of unvaccinated cases who were eligible to receive the vaccine developed one or more complications as a result of their illness. Only one child in the 6-23 month age group was not vaccinated. This may be an indication that health care providers adhere to recommendations for age-related categories better than recommendations related to underlying medical conditions.

Demographics

Sixty-four percent of cases were male, and 56% of cases were white (Table 1). Children less than 6 months of age accounted for 48% percent of the cases reported. This age group is not eligible for vaccination and is at the greatest risk for influenza-related complications making it an important group to evaluate [3]. The 2-5 year age group had the fewest reported cases. Severe illness and complications in this age group are important to monitor since these children are at increased risk for influenza-related clinic and emergency department visits. This age group has recently been incorporated into the 2006-2007 ACIP recommendations [4].

Clinical

Two (8%) case patients, both of whom were unvaccinated, required mechanical ventilation as a result of the illness (Table 1). Twenty-four (96%) patients were admitted to the intensive care unit (ICU). All cases less than 6 months were admitted to the ICU as part of their medical care as compared to other age groups (86%). Admittance to the ICU is one of the major case defining criteria so this finding is not likely noteworthy.

Complications

Thirty-six percent of reported cases did not develop complications during the acute phase of the illness (Table 2). One or more complications occurred in 56% of cases with pneumonia being the most common reported complication (24%). One vaccinated case with pre-existing medical conditions developed only one complication. Cases with two or more complications (2) were only observed in the unvaccinated group.

Pre-existing conditions

Fifty-six percent of case patients did not have pre-existing conditions (Table 3). Five (29%) unvaccinated case patients had pre-existing conditions including sickle cell disease, asthma/reactive airway disease, cardiac and seizure disorders. Based on pre-existing conditions reported, vaccination would have been recommended for all of these case patients per ACIP guidelines. Four (80%) of these unvaccinated case patients developed one or more complications during their acute illness including bronchiolitis, croup, encephalopathy/encephalitis, pneumonia, and seizures. This finding suggests missed opportunities for vaccination of high risk individuals and the potential to prevent significant complications due to influenza.

Therapies

During the 2005-2006 influenza season, ACIP recommended vaccination for children receiving long-term aspirin therapy. Two (8%) cases were on aspirin therapy. Both cases had pre-existing cardiac conditions and only one of these cases was greater than 6 months of age and received the influenza vaccine. Two additional cases reported having chemotherapy or steroid treatments prior to illness. One of these cases was vaccinated and vaccination status of the other case patients was unknown. Both cases had pre-existing conditions (i.e., aspergilliosis, leukemia) and both developed one complication during the acute illness (Table 4).

Conclusion

Seventy-five percent of the reported case-patients aged 6-23 months, a age group part of ACIP recommendation, were vaccinated. National Immunization Survey data indicate that ACIP recommendations have a positive impact vaccination rates [5]. These data could be indications that age group recommendation are more effective than clinical status recommendations. ACIP have recommended a broader age group recommendation (i.e., 6-59 months) in the 2006-2007 influenza season. Additional research is required to determine what if any impact extending the age group recommendation will have on the overall incidence of severe pediatric illness and death.

The data indicated that more than half of the reported NJ severe pediatric influenza cases meeting the age based eligibility requirement (i.e., >6 months) to receive vaccine were not vaccinated. Research has identified several challenges to complying with existing vaccine recommendations. Lack of understanding of the risk for influenza complication in children and the lack of knowledge of annual immunization's efficacy in primary prevention are two primary obstacles. From the data, it appears that the risk of complications for children eligible to receive

vaccination is great. However, providers may not fully understand how relevant these data are for their pediatric population. Studies suggest that children are more likely to be vaccinated if the providers are aware of the risk of complication and recommend the vaccination to parents [6].

With regard to vaccine efficacy, protective antibody levels after influenza vaccination have developed in 77-91% of children as young as 6 months of age, although fewer younger infants seroconvert, and some high-risk children may have a lower antibody response. Childhood vaccinations fail to be beneficial when the efficacy falls to <25%, levels that have never been reported in younger or high-risk children [4]. Although mild local and systemic reactions to the vaccine may occur more frequently in persons who have never been exposed to viral antigens it contains (i.e., children), the currently licensed parenteral vaccines are generally safe and well tolerated [4].

These data may suggest missed vaccine opportunities are occurring in New Jersey. Providers should be aware of ACIP recommendations regarding influenza vaccine and become familiar with complications which may result in unvaccinated pediatric patients. Providers, especially those caring for high-risk pediatric populations, should encourage vaccination of these patients based on ACIP guidelines.

Table 1
Demographic Characteristics of Children Meeting Case Definition
New Jersey 2005-2006 Influenza Season
(n=25)

Characteristics	Vaccinated (n=4)	Unvaccinated (n=17)		Unknown (n=4)		Total (n=25)
		< 6 mo.* (n=10)	6 mo. to 17 yrs. (n=7)	< 6 mo.* (n=2)	6 mo. to 17 yrs. (n=2)	
Age						
<6 months*	0	10(59%)		2(50%)		12(48%)
6-23 months	3(75%)	1(5.5%)		0		4(16%)
2-5 years	0	1(5.5%)		0		1(4%)
6-10 years	0	2(12%) ^D		1(25%)		3(12)
11-17 years	1(25%)	3(18%)		1(25%)		5(20%)
Gender						
Male	3 (75%)	7 (70%)	4(57%)	1(50%)	1(50%)	16(64%)
Female	1(25%)	3(30%)	3(43%) ^D	1(50%)	1(50%)	9(36%)
Ethnicity						
Hispanic or Latino	0	2(20%)	0	0	0	2(8%)
Not Hispanic or Latino	1(25%)	1(10%)	5(71%) ^D	0	0	7(28%)
Unknown/Missing	3(75%)	7(70%)	2(29%)	2(100%)	2(100%)	16(64%)
Race						
White	0	6(60%)	5(72%) ^D	1(50%)	2(100%)	14(56)
Black	2(50%)	3(30%)	1(14)	1(50%)	0	7(28)
Asian	0	0	0	0	0	0
Native Hawaiian or other Pacific Islander	0	0	0	0	0	0
American Indian or Alaska Native	0	1(10%)	0	0	0	1(4%)
Unknown/missing	2(50%)	0	1(14%)	0	0	3(12%)

Clinical Status	Vaccinated	Unvaccinated		Unknown		Total
		< 6 mo.* (n=10)	6 mo. to 17 yrs. (n=7)	< 6 mo.* (n=2)	6 mo. to 17 yrs. (n=2)	
ER	1(25%)	4 (40%)	5(71%) ^D	0	1(50%)	11(44%)
Inpatient	3(75%)	4(40%)	6(86%) ^D	0	1(50%)	14(56%)
ICU	4(100%)	10(100%)	6(86%) ^D	2(100%)	2(100%)	24(96%)
Vent	0	1(10%)	1(14%) ^D	0	0	2(8%)

* = Influenza vaccine is not recommended for children less than 6 months of age.

D = Denotes demographics and clinical information of deceased case.

Table 2
Complications by Vaccination Status
New Jersey 2005-2006 Influenza Season

Number of Complications	Vaccinated (n=4)	Unvaccinated (n=17)	Missing (n=4)	Total (n=25)
0	2 (50%)	5(30%)	2(50%)	9(36%)
1	1(25%)	6(35%)	2(50%)	9(36%)
≥2	0	5(30%) ^D	0	5(20%)
Missing	1(25%)	1(5%)	0	2(8%)

D = Denotes clinical information of deceased case.

Table 3
Pre-existing Conditions by Vaccination Status
New Jersey 2005-2006 Influenza Season

Number of Pre-existing Medical Conditions	Vaccinated (n=4)	Unvaccinated (n=17)	Missing (n=4)	Total (n=25)
0	2(50%)	11(65%) ^D	1(25%)	14(56%)
1	2(50%)	3(17%)	1(25%)	6(24%)
≥2	0	2(12%)	1(25%)	3(12%)
Missing	0	1(6%)	1(25%)	2(8%)

D = Denotes demographics and clinical information of deceased case.

Table 4
Pediatric Influenza Surveillance 2005-2006 Season
Therapies

Therapy	Vaccinated (n=4)	Unvaccinated (n=17)	Missing (n=4)	Total (n=25)
Aspirin	1(25%)	1(6%)	0	2(8%)
Steroids	1(25%)	0	0	1(4%)
Chemotherapy	0	0	1(25%)	1(4%)

References

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