Suboptimal Pneumococcal Pneumonia Vaccination Rates Among Patients at Risk in a Managed Care Organization in Israel

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ABSTRACT

OBJECTIVE: Pneumococcal pneumonia is a vaccine-preventable disease that poses a significant threat to immunocompromised patients. Vaccination rates tend to be low despite recommendations for vaccination in several groups of high-risk patients including any person aged 65 years or older. The purpose of this study was to (a) evaluate the vaccination rates among high-risk patients in a managed care setting in Israel and (b) gain a better understanding of the factors associated with suboptimal use of this vaccine.

METHODS: Data were extracted from the electronic medical records of the managed care organization for patients with dates of service from January 2000 to December 2004 for whom the vaccine is recommended. Patients were identified via diagnosis codes according to the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM). Vaccination rates were calculated for patients in each disease category. These high-risk patients were contacted to participate in a telephone survey to evaluate the variance in knowledge and awareness levels of the disease between the vaccinated and unvaccinated patients.

RESULTS: A total of 672 patients were identified by the ICD-9-CM codes; 140 (20.8%) had been vaccinated and 532 (79.2%) were unvaccinated. Vaccination rates were highest among patients with solid organ transplants (33.3%), followed by nephrotic syndrome (29.4%), bone marrow transplants (10.2%), and human immunodeficiency virus (HIV, 9%), for an overall rate of 20.8%. Of these patients, survey responses were obtained from 364 (54.2%). Respondents who were unvaccinated tended to be less well informed about which patient populations are at risk for the disease and the availability of the vaccine.

CONCLUSION: The pneumococcal vaccination rate among immunocompromised patients in this managed care organization was found to be inadequate, at just 20.8% of the target population. Approaches based on direct contact with the patient, such as by a case manager, may be more successful in the future.

KEYWORDS: Pneumococcal pneumonia vaccine, Vaccination rates, Managed care, Insular populations, Immunocompromised

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Pneumococcal disease, particularly pneumonia, bacteremia, and meningitis, is a vaccine-preventable disease that is an important cause of mortality and morbidity, especially in vulnerable groups such as the elderly, very young, patients with chronic disease, and the immunocompromised.¹ High-risk groups include persons with human immunodeficiency virus (HIV);² patients with chronic renal insufficiency, including nephrotic syndrome^{3,4}; individuals with anatomic asplenia^{5,6}; and solid organ transplant recipients being treated with immunosuppressive drugs.^{7,8} The vaccine has been recommended for anyone aged 65 years and older as well as patients aged 2 years and older who have the following high-risk medical conditions: chronic heart, kidney, or lung disease (except asthma); cirrhosis of the liver; alcoholism; diabetes mellitus; chronic cerebrospinal fluid leak; other diseases that suppress the immune system; and sickle cell disease.⁹

In the United States, pneumococcal disease has been estimated to account for 3,000 cases of meningitis, 50,000 cases of bacteremia, 500,000 cases of pneumonia, and 7 million cases of otitis media annually. Furthermore, it has been estimated that pneumococcal infection causes approximately 40,000 deaths annually in the United States, accounting for more deaths than any other vaccine-preventable bacterial disease.¹⁰

Efficacy rates of the vaccine in immunocompetent adults for the prevention of pneumococcal bacteremia and meningitis have been reported to be from 65% to 75%. However, despite this reported efficacy and although pneumococcal vaccination has been recommended for immunocompetent patients with indications for its administration,¹¹ vaccination rates in the United States among persons aged 18 to 64 years with one or more risk conditions in 2002 continued to be low (19.1%).¹² Furthermore, despite these recommendations, pneumococcal vaccination has only been included as a Health Plan Employer Data and Information Set (HEDIS) performance measure for patients aged >65 years.¹³⁻¹⁵ Consequently, managed care organizations (MCOs) are presently lacking a benchmark to monitor vaccine performance rates among patients in risk groups other than older age.

The present study was conducted in the Leumit Health Fund, one of the 4 MCOs in Israel, which provides the government-mandated national health package to approximately 650,000 members throughout the State of Israel, representing about 10% of the population. In addition to adopting the vaccination policy for pneumococcal vaccine common to other Western countries, Leumit management has targeted high-risk patient populations to receive the vaccine without having to pay

a copayment. These subpopulations include patients who have undergone solid organ transplants, bone marrow transplants, and splenectomy as well as patients diagnosed with HIV or nephrotic syndrome.

Throughout the years 2000-2004, postcards in Hebrew were sent to all Leumit Health Fund members for whom the vaccine is recommended, who are eligible to receive the vaccine free of charge, and who had not been vaccinated in the previous 5 years. The postcard informed these members that they were eligible to receive the vaccine free of charge at any of the MCO's approximately 300 clinic sites. The purpose of this study was to evaluate the actual vaccination rates among these patients and to gain a better understanding of the factors associated with the suspected suboptimal utilization of this vaccine.

Methods

Data were extracted from the electronic patient records of the Leumit Health Fund of Israel. All patient records were identified with one or more of the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnosis codes for a condition for which the vaccine is recommended (Table 1). The vaccination rates were calculated for patients in each disease category. Asplenic patients were not included in the study since this group includes patients who underwent emergency splenectomy and were then vaccinated in the hospital.

A telephone survey was conducted among these patients, both vaccinated and unvaccinated, to evaluate the variances in knowledge and awareness levels of the disease between the vaccinated and unvaccinated groups. The telephone survey was conducted during the month of February 2005. Survey questions (Table 2) included the identification of risk factors and access to the vaccine. Since this group of patients includes large subpopulations of recent immigrants from Ethiopia and the former Soviet Union, interviewers (employees of a commercial survey firm) fluent in Russian or Amharic in addition to Hebrew conducted the survey. In their opening remarks to the patients, the interviewers stated that the survey was being conducted by the Leumit Health Fund among its patients.

Results

A total of 672 patients were identified (532 unvaccinated and 140 vaccinated). Vaccination rates were highest among patients who had undergone solid organ transplants (33.3%), followed by nephrotic syndrome (29.4%), bone marrow transplants (10.2%), and HIV (9%), for an overall rate 20.8% (Table 3).

The interviewers attempted to contact the households or place of work of these patients (21 patients did not have telephones or the telephone number on file was incorrect). Of these, 364 (54.2%) agreed to participate, 87 (12.9%) refused to participate, and 221 (32.9%) were not available. The disease distribution and vaccination rates among the surveyed population appear in Table 4. The overall vaccination rate was observed to

TABLE 1 ICD-9-CM Diagnosis Codes Used to Identify High-Risk Patients

ICD-9-CM Code	Description
042	HIV disease, AIDS
33.6	Combined heart-lung transplantation
37.5	Heart transplantation
41.0	Bone marrow or hematopoietic stem cell transplant
41.00	Bone marrow transplant, not otherwise specified
41.01	Autologous bone marrow transplant without purging
41.02	Allogeneic bone marrow transplantation with purging
41.03	Allogeneic bone marrow transplantation without purging
41.04	Autologous hematopoietic stem cell transplant without purging
41.05	Allogeneic hematopoietic stem cell transplant without purging
41.08	Allogeneic hematopoietic stem cell transplant with purging
41.09	Autologous bone marrow transplant with purging
50.5	Liver transplant
52.8	Transplantation of pancreas
55.6	Kidney transplantation
581	Nephrotic syndrome
581.0	Nephrotic syndrome with lesion of proliferative glomerulonephritis
581.1	Nephrotic syndrome with lesion of membranous glomerulonephritis
581.2	Nephrotic syndrome with lesion of membranoproliferative glomerulonephritis
581.3	Nephrotic syndrome with lesion of minimal change glomerulonephritis
581.8	Nephrotic syndrome with other specified pathological lesion in kidney
581.81	Nephrotic syndrome in diseases classified elsewhere
581.9	Nephrotic syndrome with unspecified pathological lesion in kidney
V08	Asymptomatic HIV infection status
V42	Kidney replaced by transplant
V42.01	Pancreas replaced by transplant
V42.1	Heart replaced by transplant
V42.6	Lung replaced by transplant
V42.7	Liver replaced by transplant

HIV=human immunodeficiency virus; ICD-9-CM=International Classification of Diseases, Ninth Revision, Clinical Modification.

be higher among the surveyed population than in the target population (26.1% vs. 20.8%). However, this difference was not statistically significant because of the small sample size.

The results of the survey appear in Table 2. Among the non-immunized patients, 45% of the respondents replied that they did not know what groups of people are at risk of developing pneumonia; 29.9% of those who were immunized ($P = 0.06$) responded similarly. Only 15.7% of the immunized patients claimed that they themselves are not at risk compared with 39.8% among the nonimmunized respondents ($P < 0.001$). Concerning awareness of the availability of the vaccine, 59.5% of the immunized patients responded that they were aware of its availability compared with 26.9% of the nonimmunized ($P < 0.001$). A total of 57.6% of the immunized patients knew

TABLE 2 Patient Questionnaire
(Values Represent % of Respondents, n=364)

	Immunized	
	No	Yes
1. What groups of people do you think are at higher risk of developing pneumonia?		
a. Don't know	45.0	29.9
b. Elderly	14.8	18.4
c. Asthmatics	3.3	4.6
d. Infants	2.5	1.3
e. Immunodeficients	26.2	33.3
f. Heart disease	0.0	2.3
g. Other	8.2	10.2
Total (P=0.06)*	100	100
2. To what degree do you believe that you are at higher risk?		
a. Highest	28.5	28.9
b. Very high	7.8	13.3
c. Medium	7.4	10.8
d. Slightly	3.9	20.5
e. Not at all	39.8	15.7
f. Other	12.6	10.8
Total (P<0.001)*	100	100
3. Do you know of any measures that can be taken to reduce the risk of pneumonia?		
a. Vaccination	22.4	47.3
b. Drug	9.2	2.2
c. Other	8.4	7.7
d. Don't know	60.0	42.8
Total (P<0.001)*	100	100
4. Are you aware that there is a vaccine for pneumonia?		
a. Yes	26.9	59.5
b. No	65.2	36.0
c. Don't know/not sure	7.9	4.5
Total (P<0.001)*	100	100
5. Were you recommended to receive this vaccine?		
a. Yes	23.8	57.0
b. No	76.2	43.0
Total (P<0.001)*	100	100
6. Are you aware that you can receive the vaccine free of charge at your MCO clinic?		
a. Yes	24.7	57.6
b. No	61.5	31.5
c. Not sure	13.8	10.9
Total (P<0.001)*	100	100
	Nonimmunized†	
7. Why did you not receive the vaccine?		
a. Unaware of availability	76.5	
b. I am not in a risk group	5.2	
c. Lack of time	1.4	
d. No need due to medical care	7.5	
e. Don't believe in effectiveness of vaccines	4.7	
f. I scheduled an appointment for next month	0.9	
g. Other	3.8	
Total (P<0.001)*	100	

* P values were calculated using the chi-square statistical test.

† n=269.

MCO=managed care organization.

that the vaccine is available free of charge compared with 24.7% of those not immunized ($P < 0.01$), and 57.0% of the immunized patients claimed that they were recommended to receive the vaccine compared with 23.8% among the nonimmunized ($P < 0.001$).

Discussion

The day after the survey began in February 2005, patients started to appear in Leumit clinics requesting to be immunized. Unfortunately, at that time, stock levels of the vaccine in Israel had been depleted. On the third day of the survey, the public health nurse in charge of the HIV outpatient clinic of one of the country's major medical centers contacted us, stating that, during the past few days, many of the center's Ethiopian immigrant HIV patients had come to the center to tell him that an Amharic-speaking woman had called them and asked "all kinds of questions." These patients turned to the health nurse in search of an explanation for what they perceived to be a very unusual and mysterious incident.

We explained the purpose of the study to the nurse and elaborated on the challenges involved in reaching out to this particular group. The nurse suggested that, since these patients come to his clinic on a monthly basis to receive their antiretroviral medications, he could vaccinate the necessary patients if we supplied him with a list of eligible patients and the quantity of vaccines needed. When the vaccine later became available, this procedure was adopted in HIV outpatient clinics throughout Israel. Thus, although this survey was not intended to be a quality improvement intervention per se, it did, in fact, yield favorable QI results.

This study suggests that this MCO must pursue alternative methods for the dissemination of information regarding pneumococcal vaccination that may be vital to the health of particularly vulnerable patients. This point is underscored by the observation of low vaccination rates coupled with the approximately 78% rate of unvaccinated patients who were unaware of the existence of the vaccine. The serendipitous outcome reported here in which evaluative research generated interest both among patients to receive the vaccine and ancillary care givers to pursue administrative solutions is therefore interesting. These results may indicate that future programs to improve vaccination rates may, in fact, emanate from the awareness created by the initiation of benchmarking and performance measure evaluations in particular patient groups.

It has been suggested that the suboptimal adult immunization rates in the United States may not be attributable to lack of interest among primary care physicians and that most physicians would indeed adopt evidence-based strategies to improve immunization delivery.¹⁶ Additionally, it has been established that physician-practice environments that are conducive to patient education and immunization-promotion activity do achieve higher vaccination rates.¹⁷ Accordingly, improved vaccination rates may be achieved

in the future through multifaceted programs composed of evidence-based delivery strategies implemented in conjunction with organizational changes that create practice environments more suitable for promotion of vaccination. Similarly, administrative and/or financial support may be necessary in some settings to change current policy environments.¹⁸ Likewise, the recent failure of a media campaign in the United States to promote pneumococcal vaccination¹⁹ reinforces this premise that future efforts should be targeted to the clinical practice setting. The results presented here suggest additional approaches to inducing compliance with vaccination programs.

The present study raises the issue of expanding the HEDIS performance measures to include vaccination rates among immunocompromised patients. Such a measure could constitute a benchmark that MCOs could use to improve pneumococcal vaccination rates among this vulnerable population. The general paucity of studies evaluating factors associated with suboptimal vaccination rates in this population may have contributed to the lack of attention paid by policy makers to this issue. Alternatively, financial considerations or a belief that a vaccine policy would be too difficult to administer may have impeded the inclusion of relevant performance measures. In this context, HEDIS performance measures could be utilized in the future as evaluation tools of processes in which evidence-based guideline formulation and propagation and environmental changes coalesce into an integrative QI program.

The success of the survey itself in generating interest in the community among individual patients and then, consequentially, among other health care providers may provide insight into potential avenues with which to approach this challenge. The postcards sent to high-risk health plan members had small apparent impact on the pneumococcal vaccination rates among high-risk patients. Direct contact with the patients, with or without a survey, appears to be necessary, particularly among more insular immigrant populations from the developing world, such as the Ethiopians in this study, who must cope with the complexities of modern Western medical care that are non-existent in their country of origin.²⁰

In addition to telephone contact, case managers may need to assume responsibility for pneumococcal vaccination of high-risk patients. Since many of these patients receive chronic care in non-MCO facilities, there will be challenges in coordinating care among a multitude of providers, making intervention by the case manager particularly important. Lastly, we learned from the public health nurse that some solutions might be easily implemented through cooperation with junior-level staff of non-MCO facilities.

Conclusion

The pneumococcal vaccination rates among immunocompromised patients in this MCO in 2005 were found to be inadequate. A more effective approach, such as direct contact with the

TABLE 3 Study Population (n=672)

Diagnosis	No. of Patients (%)		Total (%)
	Nonimmunized	Immunized	
Bone marrow transplant	62 (89.9)	7 (10.2)	69 (10.3)
HIV	242 (91.0)	24 (9.0)	266 (39.6)
Nephrotic syndrome	60 (70.6)	25 (29.4)	85 (12.6)
Solid organ transplant	168 (66.7)	84 (33.3)	252 (37.5)
Total	532 (79.2)	140 (20.8)	672 (100)

HIV=human immunodeficiency virus.

TABLE 4 Disease Distribution and Rate of Pneumococcal Immunization of Surveyed Population (n=364)

Diagnosis	No. of Patients (%)		Total (%)
	Nonimmunized	Immunized [95% CI]	
Bone marrow transplant	31 (88.6)	4 (11.4) [0.3-22.5]	35 (9.6)
HIV	99 (86.8)	15 (13.2) [6.9-19.5]	114 (31.3)
Nephrotic syndrome	40 (71.4)	16 (28.6) [16.4-40.8]	56 (15.4)
Solid organ transplant	99 (62.3)	60 (37.7) [30.1-45.3]	159 (43.7)
Total/average	269 (73.9)	95 (26.1) [21.7-30.6]	364 (100)

CI=confidence interval; HIV=human immunodeficiency virus.

patient through a case manager, is necessary to increase vaccination rates. It will be necessary to pay particular attention to insular immigrant populations, especially among those who are unfamiliar with Western medical care. Evaluation of vaccination programs based on member surveys has emerged as a potentially effective tool in this respect, which may be considered by health plans in other countries such as the United States.

DISCLOSURES

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