Improving Pneumococcal Vaccination Rates: A Three-Step Approach

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Background: Streptococcus pneumoniae is the cause of significant preventable morbidity and mortality each year, especially among the elderly. This study evaluated the effectiveness of a three-step strategy to improve pneumococcal vaccination rates in patients ages 65 and older. Methods: We obtained a baseline vaccination rate by chart review of a randomized list of patients ages 65 and older. Interventions that included physician education, a system of office prompts, and patient education were instituted for 1 year. We performed a second chart review to determine the success of the intervention. Results: Vaccination rates increased significantly from 56.7% to 75.8%. No significant difference in initial vaccination rates between men and women was found. Although rates improved for both men and women, only the increase in vaccination for men was significant. Conclusions: This study shows that an easy and inexpensive intervention can substantially impact pneumococcal vaccination rates. Specifically, a three-step approach that combines provider education, office prompts, and patient education has proven effective.

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Pneumococcal disease is a serious public health concern, particularly in the elderly. Each year in the United States, pneumococcal disease is responsible for approximately 500,000 cases of pneumonia, 50,000 cases of bacteremia, and 40,000 deaths. While empiric treatment with penicillin was once almost universally effective, resistance to penicillin and other antimicrobial agents has spread rapidly since the late 1980s. Investigations by an antimicrobial surveillance program have shown an overall percentage of intermediate- and high-level resistance to penicillin of 27.8% and 16%, respectively, in the United States.

Fortunately, a vaccine against the 23 most common serotypes of Streptococcus pneumoniae has been available since the early 1980s, and vaccination of high-risk individuals is associated with a significant reduction in invasive disease and mortality. A one-time dose of the vaccine is recommended for all persons ages 65 and older. In some circumstances, a second dose may be necessary, and recommendations have been issued by the Centers for Disease Control and Prevention (CDC) concerning these cases (Table 1). After initial vaccination, up to 50% of patients may have mild, local reactions. While revaccination 5 years after the first dose in those eligible for revaccination carries a higher risk for local reactions, the risk for serious adverse events appears to be low. Vaccination of patients ages 65 and older against pneumococcal pneumonia is one of the few preventive health measures that has been found to have both health benefits and medical cost savings. Whereas most preventive programs cost money per year of life saved (for example, $1,700 for a one-time screening for cervical cancer at age 65 and $35,000 for yearly fecal occult blood testing starting at age 65), a 1997 study showed that pneumococcal vaccination actually saves money. In fact, if the vaccine could be administered to the 23 million elderly patients who remained unvaccinated in 1993, one study estimated that about 78,000 years of healthy life and $194 million would be saved. The human costs of pneumococcal disease are an even more convincing argument for vaccination—40,000 deaths per year, mental and emotional distress for the families of these patients, time and quality of life lost for the survivors, and countless hours for physicians to care for these patients, both in the hospital and in the outpatient setting.

Given this evidence of the prevalence and severity of pneumococcal disease and the safety, efficacy, and cost-effectiveness of the vaccine, current vaccination rates are acceptably low; only 28.2% of persons ages ≥65 have been vaccinated. Attempts to increase

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immunization rates have generally fallen into three categories: physician education, a variety of physician office reminders,9 and patient education,10 often including public education campaigns.11 The most successful programs have included elements from each category.12

In this study, the improvement of pneumococcal vaccination rates in a family practice residency program was attempted. The study was designed to evaluate the effectiveness of a strategy combining provider education, physician prompts, and patient education.

Materials and Methods
Setting and Patient Population
The study site was a community hospital family practice residency continuity clinic, with 8 faculty and 31 residents. The patient population included 548 female and 309 male patients ages 65 and older (about 10% of the total patient population). No physical barriers to care were identified, and transportation was provided if needed. Seventy-five percent of the total patient population had some form of private insurance, 20% had Medicare or Medicaid coverage, and 5% had no insurance.

Patients were eligible for the study if they had been seen at least twice within the year. Patients with chronic health problems were defined as those patients with a medical condition with indications for revaccination according to the CDC. These conditions included chronic lung disease (except asthma), chronic heart disease, chronic liver disease, diabetes, alcoholism, cerebrospinal fluid leaks, immunocompromise, asplenia, and sickle cell disease.1

Study Design
A computer-generated randomized list of 100 names of family practice patients ages 65 and older was obtained in December 1997. Of these, 60 charts were found that met the inclusion criteria outlined above. These charts were reviewed to obtain the baseline percentage of patients ages ≥65 who had received at least one pneumococcal vaccination, as well as the percentage of patients with chronic health problems needing a second vaccination. Once the baseline numbers had been obtained, program-wide interventions were instituted. After excluding the original 100 names, a second randomized list of 100 names was obtained in December 1998. Of these, 66 charts met the inclusion criteria and were reviewed for the same information to determine whether the interventions had been successful.

Interventions
The study design incorporated all three of the previously mentioned strategies (provider education, office prompts, and patient education) to increase immunization rates.

First, a handout was designed to educate providers about pneumococcal disease and immunization, particularly in regard to the CDC recommendations for vaccination and revaccination. This handout was distributed to all resident and attending physicians, as well as the nursing staff. Additionally, copies were posted at both nursing stations.
Second, a provider reminder system was developed using a red stamp in the shape of a syringe. The nursing staff was responsible for using this stamp on every provider’s schedule next to the name of any patient with a birthday in 1933 or earlier. Providers were instructed to use the stamp to remind themselves to discuss the vaccine with their patients and to administer the vaccine to any eligible patient who agreed to receive it.

Third, a patient education handout was obtained from the CDC National Immunization Program Web site. Physicians and nurses were encouraged to distribute copies to eligible patients.

Data Analysis
After calculating the percentage of patients who had received the vaccine both before and after the intervention, the chi-square test was used to determine statistical significance of any change in the vaccination rate. The chi-square test was also used to calculate the significance of any change in vaccination rates for men, women, and patients with chronic health problems.

Results
Of the 60 patients whose charts were reviewed before the beginning of the intervention, 34 (56.7%) had received the vaccine. After the intervention, 50 (75.8%) of the 66 patients were appropriately vaccinated (Table 2).

Within the study sample prior to the intervention, 42 patients (70%) were female, while 18 (30%) were male. Of those included in the sample after the intervention, 46 patients (70%) were female, and 20 (30%) were male. These numbers are similar to the overall clinic population of patients ages 65 and older: 548 females (64%) and 309 males (36%).

There was no significant difference in initial vaccination rates between men and women. Before the intervention, 25 women (59.5%) had received the vaccine. Afterward, 32 (69.6%) had been vaccinated; this difference was not statistically significant (P = .325). Of the men included in this study, nine (50%) had been vaccinated prior to the intervention. Afterward, 18 (90%) had received the vaccine (P = .007).

For patients with chronic health problems who needed a second dose of the pneumococcal vaccine, only one of nine (11.1%) had received it prior to the intervention. Afterward, four of eight (50%) had been vaccinated (P = .079).

Discussion
This study shows a substantial benefit, using a relatively easy and inexpensive intervention to improve pneumococcal vaccination rates, particularly in male patients. The provider education handout was adapted from CDC literature, and the patient education handout was obtained from the Internet, both at no charge. The provider reminder system used an inexpensive red stamp and required only minutes of time from the nursing staff each day. In addition, the fact that this intervention was effective in a setting with 39 different physicians proves its versatility. These cost-effective results, combined with earlier evidence of the burden of pneumococcal disease on the patient and the physician, provide a compelling case for physicians to implement a similar system in their own practices.

The initial vaccination rate for this patient population prior to any intervention was 56.7%, about twice the national rate of 28.2% published by the CDC. While the reason for this difference is unknown, there are several possible explanations. First, it is possible that the national immunization rate has risen since the 1993 data from the CDC. Multiple public health campaigns with the goal of increased patient awareness of the vaccine make this likely. Second, the difference in vaccination rates may indicate an increased emphasis by family practice residency programs on preventive health care. Third, only patients with two visits to the clinic within the year were eligible for inclusion, which may have inflated vaccination rates by excluding patients who were not receiving regular medical care.

The fact that no significant difference was found in initial vaccination rates between men and women is consistent with earlier studies. While rates increased for both sexes with the intervention, the greatest improvement (and, indeed, the only statistically significant improvement) occurred for men. The reason for this difference is uncertain. It is possible that providers found it easier to fit a discussion of the pneumococcal vaccination into an office visit with a male patient, considering the greater number of health maintenance topics to be addressed with women (ie, Pap smears, mammograms, hormone replacement therapy, etc). It is also possible that women may have a different awareness of the vaccine, or different willingness to receive it, but we have no data to support these possibilities. We must also consider the possibility that the disparity

<table>
<thead>
<tr>
<th>Received at least one vaccination</th>
<th>No</th>
<th>Yes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before intervention</td>
<td>26 (43.3)</td>
<td>34 (56.7)</td>
<td>60</td>
</tr>
<tr>
<td>After intervention</td>
<td>16 (24.2)</td>
<td>50 (75.8)</td>
<td>66</td>
</tr>
</tbody>
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Chi-square P value = .023
is due to an insufficient number of subjects to permit detection of significant differences. A trend was seen in the increase in receipt of a second vaccination in appropriate patients, from 11.1% to 50%. These numbers are not significant, chiefly because of the small sample size. Further studies with larger sample sizes may demonstrate significance.

Limitations

This study had several limitations. Although the sample size was large enough for statistically significant increases in two areas (overall vaccination and vaccination in men), further studies with larger sample sizes are indicated, particularly to investigate the effect of this intervention on receipt of a second dose in eligible patients. Also, the system of office prompts covered only those patients ages 65 and over. Younger patients with chronic health problems qualifying them for pneumococcal vaccination were not included in the study. Another limitation was the classification of patients into two categories: receipt or nonreceipt of the vaccine. No information was obtained on patient awareness of the vaccine, patient refusal of the vaccine, or reasons for the decision to be vaccinated (or to refuse vaccination).

Perhaps the largest limitation of this study, however, is the lack of a control group. Because most patients at the clinic see more than one physician (since their own physician may not be available for acute visits), it was impossible to use one group of physicians and their patients as a control group. While the lack of a control group does preclude a definitive statement that the increase in vaccination rates was entirely due to the interventions described, it is unlikely to be attributable to other factors, since no other programs to promote vaccination were carried out during the time frame of this project.

Conclusions

The effect of pneumococcal disease in the elderly is significant, causing a great burden in terms of health care dollars, patient morbidity and mortality, and physician time and effort. The safety, efficacy, and cost-effectiveness of the pneumococcal vaccine have been proven. To reach the Healthy People 2010 objectives for vaccine administration, effective physician education and a reminder system for busy practicing clinicians is essential. A simple, inexpensive tool for patient education is also important. In this study, an inexpensive strategy combining provider education, physician prompts, and patient education was proven effective in increasing vaccination rates.

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REFERENCES