Impact of a Pharmacy Student-Based Inpatient Pneumococcal Vaccination Program

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Pneumococcal disease remains a significant cause of morbidity and mortality in the adult, at-risk population. Even with the availability of a safe and effective vaccine and well-defined guidelines for its administration, less than half of eligible individuals have been vaccinated. Vaccination programs conducted by pharmacists have been proposed and proven effective in helping to expand vaccine coverage. We conducted an inpatient pneumococcal vaccination program that was carried out by Doctor of Pharmacy candidates completing Internal Medicine rotations. Twenty-eight students screened 785 patients at four different medical centers throughout North Carolina. As a result of the student screening process 134 patients received the pneumococcal vaccine, increasing our vaccination rate from 38 percent on admission to 57 percent at the time of hospital discharge. This benefit was seen with little resource commitment from the faculty and institutions involved. Pharmacy students can be a valuable resource in improving vaccination rates on an inpatient basis, benefiting student, institution and patients.

INTRODUCTION

Pneumococcal disease accounts for nearly 40,000 deaths annually(I). Despite the availability of a safe and effective vaccine to prevent these infections, vaccination rates remain below 75 percent of the at-risk adult population(2). People at-risk for pneumococcal disease include the elderly and patients with suppressed immunity against encapsulated organisms such as diabetic and asplenic patients as well as those with chronic cardiovascular and pulmonary diseases. The public health initiative Healthy People 2010 calls for an increase in the number of eligible patients receiving pneumococcal vaccine over the next decade, with particular focus on currently underserved patient populations(3). In order to attain this goal, the Centers for Disease Control and Prevention (CDC) have advocated nontraditional programs conducted by nonphysician health care professionals(4). Their program highlights pharmacists among others as a group of professionals poised to implement and conduct vaccination programs.

Pharmacy students are also becoming involved in vaccine initiatives. For example, the student group associated with the American Pharmaceutical Association, Academy of Students of Pharmacy (APhA-ASP), conducts an annual program providing influenza vaccine throughout the community. In order to provide these services in the future, pharmacy schools nationwide are including vaccination training as part of required or elective curricula.

Pharmacist managed vaccination programs have traditionally targeted the outpatient population. Although, more recently, a group of hospital pharmacists demonstrated the ability to increase vaccination rates by screening patients admitted to the hospital for vaccine eligibility(5). We report the results of a similar initiative conducted by Doctor of Pharmacy students completing adult internal medicine rotations.

METHODS

The program was conducted by fourth-year Doctor of Pharmacy candidates completing required adult internal medicine experiential rotations from three different schools of pharmacy (Campbell University School of Pharmacy, The University of North Carolina School of Pharmacy, and Idaho State University School of Pharmacy). Faculty preceptors for the program were from the two schools of pharmacy located in North Carolina with practice sites at four different institutions throughout the

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Table I. Reasons for not vaccinating eligible patients (N=284)∗

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient discharged prior to student recommendation</td>
<td>37</td>
</tr>
<tr>
<td>Life expectancy &lt; 6 months</td>
<td>35</td>
</tr>
<tr>
<td>Patient or family refused</td>
<td>34</td>
</tr>
<tr>
<td>Physician desire to immunize as an outpatient</td>
<td>23</td>
</tr>
<tr>
<td>Physician forgot to write order</td>
<td>22</td>
</tr>
<tr>
<td>Physician refused</td>
<td>21</td>
</tr>
<tr>
<td>Could not determine vaccine status</td>
<td>20</td>
</tr>
<tr>
<td>Patient was febrile or unstable</td>
<td>18</td>
</tr>
<tr>
<td>Patient actively infected</td>
<td>11</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>8</td>
</tr>
<tr>
<td>Patient expired</td>
<td>6</td>
</tr>
<tr>
<td>Acutely immunocompromised</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>Not provided</td>
<td>63</td>
</tr>
</tbody>
</table>

∗Eight patients had > 1 reason for not receiving vaccination reported.

The study was conducted between October 1999 and April 2000. A total of 28 students representing 48 rotation-months participated in the program. The majority (71 percent) of the students were from Campbell University where two months of internal medicine are required. The remainder of students completed one-month rotations and were from the University of North Carolina at Chapel Hill with the exception of one external Doctor of Pharmacy candidate from Idaho State University.

Seven hundred eighty-five patients (785) were screened for vaccination as a result of the study. Patients greater than 65 years of age made up 40 percent of the screened population, with a male to female ratio of 1.5:1. Nearly half of the screened patients had at least one risk factor other than age.

Of the patients screened, 640 (82 percent) met criteria for pneumococcal vaccination. Of these, 38 percent (n=222) had received vaccination prior to hospital admission. Of the 418 patients unvaccinated vaccine-eligible patients, 134 (32 percent) received the pneumococcal vaccine based on student recommendations. This increased the overall vaccination rate at discharge in those eligible from 38 to 57 percent. Baseline and discharge vaccination rates for eligible patients for each institution are provided in Figure 1. Reasons for not vaccinating the remaining 284 eligible patients are displayed in Table I.

An additional 33 screenings were conducted in patients that were admitted more than once during the study period. Only one of these patients received vaccination during their first admission. However, five of the patients who received vaccination as a result of the program were vaccinated on a subsequent admission.

Students documented the time required to complete patient screening and determine vaccine eligibility and provide intervention for each patient. On average, it took five minutes to complete the entire process with a range of one to 30 minutes depending on the completeness and availability of medical records.

Students followed all patients for adverse events from the time the patient received vaccine until discharge. No significant events were noted.

**DISCUSSION**

Estimated costs of treating pneumococcal disease exceeds $4 billion annually(1). Increasing the number of at-risk individuals receiving pneumococcal vaccination could eliminate nearly half of these cases(I). Through the Healthy People initiative the pneumococcal vaccination rate has increased from <20 percent to 46 percent in the 1990s, however this still remains suboptimal(3). Health care officials are now seeking alternative methods to physician vaccination programs in order to reach currently underserved populations that are less likely to have received vaccination(4). Pharmacists and pharmacy students alike are rapidly becoming involved in these efforts. In fact, the only training program currently endorsed by the Centers for Disease Control and Prevention (CDC) is run by the American Pharmaceutical Association (APhA). This program, like most pharmacy-based vaccination initiatives is directed toward the outpatient population.

Our program demonstrated that pharmacy students can effectively increase the number of inpatients receiving pneumococcal vaccination rates for eligible patients for each institution are provided in Figure 1. Reasons for not vaccinating the remaining 284 eligible patients are displayed in Table I.
This student run program was able to increase discharge vaccination rates by 19 percent to nearly 60 percent, the goal prescribed by Healthy People 2000(6). These results are slightly higher than findings from a similar program conducted by clinical pharmacists(5). Of note, these efforts are in addition to the routine vaccination screening being conducted by medical staff at the participating medical centers.

Institutions have become increasingly aware of the costs resulting from providing experiential training for future pharmacy practitioners(7). Previous reports have suggested benefit to the institution through student interventions with positive effects(8-11). Vaccination programs such as the one described here are another way for institutions to benefit from providing these rotations for pharmacy students. An advantage of our program was its ability to provide substantial benefit with minimal commitment of preceptor time.

One disadvantage to using students to conduct such a program is a lack of program continuity over the weekends when students are not in-house. However, screening all patients admitted over the weekend that were still hospitalized on Monday minimized the number of missed patients.

Due to incomplete or unavailable medical records, our protocol relied extensively on patient recall in order to determine vaccination history. We found this to be a major limitation to identifying candidates as many patients were poor historians or were confused between pneumococcal and influenza vaccines. Although we started our program after the influenza vaccination season ended for 1999-2000, a program targeting both immunizations may be an effective strategy for future efforts.

Because of student assignment, a large proportion of our patients was screened at the VA medical center. This may help to explain why we screened more men than women during the study. In contrast to other institutions, computerized patient charts at the VA hospital contained a detailed vaccination history and greatly facilitated determination of vaccination status. Furthermore, these patients were more likely to have received vaccination prior to admission. Health care systems should attempt to emulate these efforts in the VA medical system to attain maximal vaccination rates.

An additional 22 patients would have received vaccination as a result of student recommendations if orders had been written at the time the recommendation was made. Based on student input, a verbal order program was added to increase likelihood of patients receiving vaccination while an inpatient. This increased our vaccination rates in the second half of the data collection period.

Now that immunizations have become a Joint Commission on the Accreditation of Health Care Organizations target area, institutions will be striving to improve vaccination rates. Our results indicate that pharmacy students can play an important role in realizing vaccination goals in the adult, inpatient population and should be considered a valuable resource in these efforts. Pharmacy student-based vaccination protocols can benefit patient, student, and institution alike with minimal commitment of faculty and institutional resources.

Acknowledgement. The authors would like to thank the students who participated in the study.

References

APPENDIX. DATA COLLECTION FORM

Pharmacy Student Based Pneumococcal Vaccination Protocol

<table>
<thead>
<tr>
<th>Patient ID#</th>
<th>Sex: M or F</th>
<th>Age: ________</th>
<th>Allergies: ____________________________</th>
</tr>
</thead>
</table>

Criteria for vaccination (or revaccination) (Check all that apply):
- ≥ 65 years old without vaccination in the past 5 years
- < 65 years old with 1 or more of the following:
  - HIV + patients
  - Chronic cardiovascular disease (including congestive heart failure and cardiomyopathies)
  - Chronic pulmonary disease (including COPD and emphysema)
  - Diabetes mellitus
  - Alcoholism
  - Chronic liver disease (including cirrhosis)
  - Functional or anatomic asplenia (including sickle cell disease and splenectomy)
  - Persons living in special environments or social settings (including Alaskan Natives and certain American Indian populations)

* = If patient received vaccine ≥ 5 years ago when < 65 years old then revaccinate

OR: ________ Did not meet criteria for vaccination (Patient already vaccinated? Y or N)

Vaccination administered: Y or N (if Yes, document method, if No, why not)

<table>
<thead>
<tr>
<th>Directly observed</th>
<th>Verbal verification*</th>
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</thead>
<tbody>
<tr>
<td>MAR documentation</td>
<td></td>
</tr>
</tbody>
</table>

*From Whom?

Time required to complete: ____________________________