Use of a Low-Literacy Patient Education Tool to Enhance Pneumococcal Vaccination Rates: A Randomized Controlled Trial

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Use of a Low-Literacy Patient Education Tool to Enhance Pneumococcal Vaccination Rates
A Randomized Controlled Trial

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Pneumococcal disease is an important cause of morbidity and mortality in the United States and results in 40,000 deaths each year,1,2 more than all other vaccine-preventable diseases combined.4 Complicating matters is the prospect of penicillin-resistant *Streptococcus pneumoniae* strains, with more than 40% of respiratory isolates in the United States in 1997 not being fully susceptible to penicillin.5 The US Public Health Service has established as a sentinel objective that 60% of elderly patients should be immunized against pneumococcal disease.6 This target also applies to younger patients with chronic conditions, immunocompromised status, or lifestyles associated with increased risk of the disease or associated morbidity.7 However, recent data indicate that pneumococcal vaccination rates are estimated at 37%.1

One approach for enhancing delivery of preventive services is to educate patients on how to become more capable of discussing such services and requesting them from their physicians. For many patients, education is precluded by inadequate literacy status. An estimated 40 to 44 million Americans are functionally illiterate, and another 50 million have only marginal literacy skills.8,9 Low literacy is especially prevalent among the popula-
tion in greatest need of immunization against pneumococci: the elderly, nearly half of whom score in the lowest reading-skill level.8-10

The objective of this study was to assess the effect of a 1-page, low-literacy educational tool on administration of and patient-physician discussion about pneumococcal immunization.

METHODS

Under the auspices of the Pneumococcal Vaccine Intervention Project at Grady Health System, health educators developed a 1-page (approximately 100-word) educational tool written at below the fifth-grade reading level as assessed by the Flesch-Kincaid readability formula (Figure 1). Input in the development of this provisional tool was obtained by conducting patient focus groups, and the document was successfully pilot tested among a group of 30 patients.

The study was conducted at Grady Memorial Hospital (Atlanta, Ga) in the 2 largest sections of the ambulatory care clinic, which has more than 50 000 patient visits each year and serves an inner-citty, low socioeconomic status, predominantly African American population. Primary care providers included house officers (n = 148) from the Emory University School of Medicine and Grady Memorial Hospital physician assistants (n = 2) and nurse practitioners (n = 6). All of these clinicians are supervised by Emory University faculty who review all patient care. All clinicians may initiate orders for pneumococcal vaccine, and attending physicians cosign these orders. Prior literacy estimates in this clinic population revealed marginal or inadequate health literacy exceeding 80% in the elderly.10 In this clinic, the 4 most common vaccine indications are age of at least 65 years, diabetes, chronic heart disease, and chronic lung disease.

Medical clinic charts of patients who presented for routine primary care (eg, visits to follow management of hypertension, diabetes, heart failure, or other chronic medical problems) were audited—prior to their clinician visit—to assess for the presence of these 4 vaccine indications during a 2-week interval from May to June 1998. Patients not meeting these inclusion criteria, in addition to those with chart-documented receipt of the vaccine within the past 5 years, walk-in visits, first visits, medication-refill visits in which patients did not see their primary care providers, blind patients, patients with clinically documented dementia, and non-English-speaking patients were excluded. Patient identities (eg, date of birth, clinician name, and date of visit) were recorded in a ledger, the same log used for all other patients seen in the clinic.

The study design was approved by the Emory Institutional Review Board and patients provided verbal consent to be interviewed after their physician visit. Patients were informed that they would be asked questions about their office visit that day. They were not informed that they were part of a research study because we thought that would unduly affect their responses or outcomes. In addition, we believed that giving health education brochures prior to a patient's visit was part of usual clinical care. Patients were told that their participation to be interviewed was voluntary and that refusal would not jeopardize their care. Patients were specifically queried, “May we ask you a few questions about you and your doctor’s visit today?”

Patient charts were reviewed by a single study staff member during each clinic session prior to patient triage. Patients meeting the inclusion criteria were randomly assigned using block randomization (block size = 1) to either the intervention or control group. The first patient enrolled each morning in each clinic section was systematically assigned to the intervention group. The 1-page, low-literacy educational document was attached to charts of intervention group patients, whereas a comparably low-literacy 1-page educational document on nutrition (not pneumococcal vaccination) was attached to the charts of patients in the control group.

In the triage room preceding the visit, a clinic technician who assessed a patient’s vital signs distributed the appropriate brochure to patients in the intervention and control groups and instructed patients to “please read this before you see your doctor today,” but did not provide further information concerning the vaccine or the study. By protocol, the technicians were not permitted to assist patients in understanding the document. Any patient with questions about the document was instructed by the technicians to discuss the issues with his or her physician.

After patients had seen their clinicians, they were asked by a second study staff member (different from the staff who reviewed for enrollment criteria) to respond to a brief (≤3 minutes) volun-

Figure 1. Patient Education Brochure

If you are 65 or older,
-OR-
If you have...
- heart problems
- lung problems
- diabetes

Ask your doctor about the pneumonia shot TODAY!

Why get the pneumonia shot?
- It can help you stay healthy!
- The shot is safe.
- It does NOT make you sick.
- And Medicare/Medicaid pays for the shot!

If you want to get more information about the pneumonia shot:
1. Give this card to your doctor.
2. Ask about the pneumonia shot today.

I want to give good health a shot!

I have read that the pneumonia shot can help me stay healthy, I want to get more information about the shot from my doctor TODAY!
The study was 80% powered to detect a 10% difference in vaccination rates between the intervention and control groups, assuming a baseline vaccination rate of 5%. Data were analyzed as intent-to-treat, and for patients who did not complete an interview, the brochure was assumed to have had no effectiveness. Statistical significance was defined a priori at the \( P < .05 \) level. Descriptive statistics and univariate associations were computed using Epi Info software (Atlanta, Ga.). Categorical independent variables were compared using the Mantel-Haenszel \( \chi^2 \) test. The \( t \) test was used to compare continuous variables. Logistic regression models to estimate adjusted \( P \) values were performed using SAS 6.12 (SAS statistical software, Cary, NC). Collinearity and interactions were assessed and found to be nonsignificant.

**RESULTS**

Of 922 patients with eligible clinic appointments and having designated vaccine indications, 487 (52.8%) had been previously vaccinated (FIGURE 2). Of 433 remaining patients, 221 (51.0%) were randomly assigned to the intervention group and 212 (49.0%) to the control group. Fifty-eight of 221 patients in the intervention group and 57 of 212 patients in the control group had protocol violations or incomplete data collection. Protocol violations included failure to distribute a brochure to the patient, detect visual or language impairments, or identify prior pneumococcal vaccination (42 in the intervention group and 37 in the control group). Failure to identify prior pneumococcal vaccination for 27 patients was due to unrecorded vaccines that were received at other institutions and discovered during a postclinic interview (n = 23) or inaccurate initial chart review (n = 4).

The 2 groups were well balanced in terms of baseline demographic characteristics (TABLE 1). Overall, the patient population was elderly (mean age, 63 years), African American (92.6%), female (69.3%), had a low level of education (64.7% had less than a high school education), and a significant proportion (25%) were uninsured. There was imbalance between the groups in patients aged 65 years or older (120/221 [54.3%] in the intervention group vs 88/212 [41.5%] in the control group, \( P < .008 \)) and the proportion without insurance (46/221 [20.8%] in the intervention group vs 62/212 [29.2%] in the control group, \( P = .04 \)).

Patients in the intervention group were more than 5 times likely to receive the pneumococcal vaccine than were patients in the control group (\( P < .001 \) (TABLE 2). Discussion of the vaccine was nearly 4 times more likely among patients in the intervention group compared with those in the control group (\( P < .001 \)). Other elements of the patient-clinician encounter in the intervention and control groups are shown in Table 2. Less than half of patients who discussed the vaccine with their primary care provider received it (Table 2). Further analysis revealed that 62 patients who discussed the vaccine did not receive it, and 6 patients received the vaccine with no primary care
provider discussion. Of the 62 patients who discussed the vaccine but did not receive it, 21 (33.8%) refused vaccination, 24 practitioners (38.7%) failed to order it (21 for unclear reasons, 2 due to acute medical problems, and 1 who did not think the patient had any indications for it), and 17 (27.4%) were due to protocol violations in that the patient had either previously received the vaccine (n = 16) or had no designated vaccine indication (n = 1).

Multivariate analyses controlling for patient race, sex, age, education, health status, insurance status, level of clinician training, and vaccine indication demonstrated that the intervention group was more likely than the control group to receive the pneumococcal vaccine or discuss it with their practitioners (P < .001 for both comparisons). A predictor multivariate analysis demonstrated that men were more likely than women to be vaccinated (P = .01). In a subgroup analysis of the data on postgraduate training status, there was a minor inverse trend between clinician level of training and frequencies of their patients receiving the vaccine. In the intervention group, 26.2% of first-year residents’ patients were immunized, compared with 18.2% for second-year residents, 12.5% for third-year residents (P = .04), and 17.4% for nurse practitioners and physician assistants (P = .12).

### Table 2. Outcomes of the Patient-Clinician Encounter and Potential Variables Influencing Clinician Discussion and Administration of Pneumococcal Vaccine

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intervention Group, No. (%)</th>
<th>Control Group, No. (%)</th>
<th>Total, No. (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major study outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinician discussed vaccine with patient</td>
<td>87 (39.4)</td>
<td>21 (9.9)</td>
<td>108 (24.9)</td>
<td></td>
</tr>
<tr>
<td>Patient received vaccine</td>
<td>44 (19.9)</td>
<td>8 (3.8)</td>
<td>52 (12.3)</td>
<td>6.0</td>
</tr>
<tr>
<td>Secondary outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient read brochure</td>
<td>162 (73.3)</td>
<td>144 (67.9)</td>
<td>306 (70.7)</td>
<td>.22</td>
</tr>
<tr>
<td>Patient showed brochure to physician</td>
<td>82 (37.1)</td>
<td>37 (17.4)</td>
<td>119 (27.5)</td>
<td></td>
</tr>
<tr>
<td>Clinician recommended vaccine</td>
<td>60 (27.1)</td>
<td>13 (6.1)</td>
<td>73 (16.9)</td>
<td></td>
</tr>
</tbody>
</table>

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cant decline in hemoglobin A1c levels and improved patients' abilities to elicit information from their physicians. On the other hand, Davis et al13 showed that a low-literacy, culturally appropriate educational brochure alone was insufficient in increasing screening mammography rates more than a verbal recommendation alone in a public hospital. Further, in a study involving 1224 male outpatients, Belcher14 showed that attendance only at a health-promotion clinic, not a simple informative “mailer” advising them to request preventive services from physicians, significantly increased prevention rates. In another study, Davis et al13 reported that use of a simplified, easy-to-read (sixth-grade level), illustrated polio vaccination brochure was associated with greater parent appeal even at lower reading and income levels. However, these investigators also observed that a substantial number of parents were unable to reiterate certain facts about polio immunization after reading the simplified pamphlet.15

Our study has several limitations, including its relatively small size (N = 433), potential bias due to protocol violations and loss to follow-up, reliance on patient self-report to document communication with physicians, and failure to interview clinicians to assess the impact of the study on perceived efficiency of care. Other limitations include a slight imbalance in randomization between the 2 groups and nonbinding of study interviewers. However, we believe it is unlikely that chart documentation of vaccine receipt may have been biased due to the nonblinded study design.

Although there was a difference in age and insurance status between the intervention and control groups, multivariate analysis revealed that this imbalance did not account for the increased vaccination rates and the increased patient-physician discussions of the vaccine.

The importance of the content of patient-physician communication in receiving the vaccine cannot be emphasized enough. Only about half of the patients who discussed the vaccine with their clinician in either the intervention or control groups received the vaccine. Clearly, improved communication could enhance the vaccination rate and represents an area for further study. Even in this highly vaccinated clinic population (>50% baseline prevalence) our educational tool proved to be an effective prompt for increasing vaccination rates. We speculate that even greater effectiveness would be achieved in a population with low vaccine prevalence.

Given the relatively low prevalence of pneumococcal vaccination rates compared with that specified in Healthy People 2000,6 we advocate a collaborative or team approach to improve vaccination rates. Through chart review, nurses or allied health care personnel can communicate the need for vaccinations with patients or physicians. However, the message also should be reinforced through dialogue between the physician and an empowered patient who might be interested in other preventive services as well.

In conclusion, this study demonstrated that in an inner-city, low socioeconomic status, low-literacy, elderly, predominantly African American population at high risk for pneumococcal infection, a simple, 1-page, low-literacy educational tool improved pneumococcal vaccination rates and increased patient-physician communication about the vaccine. Moreover, our study suggests that educational materials need not be complex, elaborate, or “high-tech” to affect the foregoing favorable outcomes. Further research into improving and studying literacy and different health education techniques on patient outcomes is required.

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Additional Information: The color low-literacy pneumococcal brochure is available for a $5 administrative and handling fee to the Office of Health Promotion by contacting Felicia Morton, MPH, Director, Patient Education, PO Box 26101, Grady Health Systems, 80 Butler St, Atlanta, GA 30335 (e-mail: fmorton@sph.emory.edu).

REFERENCES


