

# BRIEF REPORT: Risk Factors for Pneumococcal Vaccine Refusal in Adults

## A Case-Control Study

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**BACKGROUND:** Invasive pneumococcal disease is a significant cause of morbidity and mortality in the United States. Despite availability of an effective vaccine, many patients refuse vaccination.

**OBJECTIVE:** To investigate patient characteristics and features of the patient-provider relationship associated with pneumococcal vaccine refusal.

**DESIGN:** Case-control study using chart review.

**PATIENTS:** Five hundred adults from the medical clinics of a 1,000-bed inner-city teaching hospital.

**MEASUREMENTS AND MAIN RESULTS:** Independent risk factors for pneumococcal vaccine refusal included patient-provider gender discordance (odds ratio (OR)=2.09, 95% confidence interval (CI) 1.07 to 4.09); a visit to a not-usual provider at the time of vaccine offering (OR=2.26, 95% CI 1.13 to 4.49); never having received influenza vaccination (OR=7.44, 95% CI 3.76 to 14.76); prior pneumococcal vaccine refusals (OR=3.45, 95% CI 1.60 to 7.43); and a history of ever having refused health maintenance tests (OR=2.86, 95% CI 1.40 to 5.84).

**CONCLUSIONS:** We have identified both patient factors and factors related to the patient-provider relationship that are risk factors for pneumococcal vaccine refusal. By identifying patients at risk for pneumococcal vaccine refusal, efforts to increase vaccination rates can be better targeted.

**KEY WORDS:** vaccinations; invasive pneumococcal disease; patient preferences; health behavior; preventive care.

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Invasive pneumococcal disease is an important cause of morbidity and mortality in the United States.<sup>1</sup> A safe and effective pneumococcal polysaccharide vaccine is available, but underused.<sup>2</sup> Objectives for pneumococcal vaccination aim for a  $\geq 90\%$  vaccination rate among at-risk populations.<sup>3</sup> Despite these recommendations, pneumococcal vaccination rates are estimated at 65% for patients aged  $\geq 65$  years. There are also racial disparities in vaccine use, and pneumococcal vaccination rates for non-Hispanic blacks were estimated at 45% in 2002.<sup>4</sup>

Both physician and patient factors contribute to this suboptimal vaccination rate. While physicians often miss opportunities to vaccinate patients,<sup>5-7</sup> patients also refuse vaccination. Vaccine refusers have not been targeted for study in the past.

We sought to investigate the characteristics of pneumococcal vaccine refusers and of their relationships with provid-

ers. We hypothesized that patient-provider race discordance might contribute to vaccine refusal, as patients in our medical clinic have a 30% rate of pneumococcal vaccine refusal,<sup>8</sup> and our institution has mostly racially discordant patient-provider dyads. We hypothesized that patient-provider gender discordance might also contribute to vaccine refusal. We performed a case-control study to investigate patient characteristics and features of the patient-provider relationship associated with pneumococcal vaccine refusal. We specifically examined whether patient-provider race and gender discordance were risk factors for pneumococcal vaccine refusal.

## METHODS

Investigators selected records from two general medical clinics at Grady Memorial Hospital in Atlanta, Ga. The clinics provide greater than 50,000 continuity care visits per year to a low socioeconomic status, predominantly African-American population. Providers in the clinics include Emory University house staff, faculty, nurse practitioners, and physician assistants. The study was approved by the Emory University Institutional Review Board.

We defined cases (refusers) as individuals with vaccine indications whose charts documented that the pneumococcal vaccine had been offered and refused. We defined controls (acceptors) as individuals with vaccine indications whose charts documented that the vaccine had been offered and accepted. Indications for pneumococcal vaccination used are outlined in Centers for Disease Control and Prevention (CDC) guidelines.<sup>9</sup>

We obtained cases and controls through two methods. The records of 60 vaccine refusers identified during previous studies<sup>8</sup> were reviewed to determine whether these patients had since been vaccinated. Patients who still refused vaccination were included as cases. Those who had been vaccinated were included as controls. We also obtained a convenience sample of charts by reviewing the first approximately 60 charts from each letter of the alphabet and identifying cases and controls. We excluded charts with no documentation of pneumococcal vaccination. Our objective was to obtain at least 100 cases and four times as many controls.

Patient data and provider identification were abstracted from the chart. Provider demographics were obtained from the Office of Graduate Medical Education and from clinic records. We used one reference date (date of refusal or acceptance of the vaccine) in abstracting data.

Data were entered in Epi Info software, version 6 (CDC, Atlanta, Ga). Data management and statistical analysis were performed using SAS software, version 8.2 (SAS Institute Inc., Cary, NC). The patients' and providers' demographics,

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Table 1. Patients' Health Conditions and Vaccine Indications

Risk Factor	Cases (n=100)	Controls (n=386)	Total (n=486)	OR	95% CI	P Value
Total number of vaccine indications, mean, range	1.52 (1 to 4)	1.59 (1 to 4)	1.57 (1 to 4)	0.84*	0.61 to 1.16	.30
Had additional chronic health problems <sup>†</sup>	87 (87.0)	338 (87.6)	425 (87.5)	0.95	0.49 to 1.83	.88
Total number of additional chronic health problems <sup>‡</sup> , mean, range	1.05 (0 to 3)	1.05 (0 to 3)	1.05 (0 to 3)	0.99 <sup>‡</sup>	0.67 to 1.45	.95
Smoking, any in past year vs none in past year (39 <sup>§</sup> /138 <sup>  </sup> )	27 (69.2)	89 (60.5)	116 (65.5)	1.24	0.58 to 2.66	.58

Data are no. (%) with indicated risk factor, if not stated otherwise.

\*OR per indication.

<sup>†</sup>Additional chronic health problems included psychiatric problems, obesity, hypertension, autoimmune disease, non-ETOH substance abuse, and cancers other than indications for vaccination.

<sup>‡</sup>OR per additional chronic health problem.

<sup>§</sup>Number of cases for whom risk factor data were available.

<sup>||</sup>Number of controls for whom risk factor data were available.

OR, odds ratio; CI, confidence interval.

patients' health conditions, and details of the patient-provider relationship were initially assessed in univariate analysis. Variables significantly associated with pneumococcal vaccine refusal in univariate analysis were included in the multivariate model. A multivariate analysis was performed using an unconditional logistic regression model. A *P* value of  $\leq .05$  was defined as statistically significant.

## RESULTS

We identified a total of 100 refusers and 400 acceptors. The records of 14 controls were excluded because patients were offered the pneumococcal vaccine but did not have indications, leaving a total of 100 cases and 386 controls. The 486 patient charts reviewed represented a total of 214 providers (median 1 patient per provider, mean 2.3). Only 2 providers cared for more than 10 patients in the study. The majority of patients were female (68%), while the majority of providers were male (60%). African Americans comprised 91% of patients and only 8% of providers. The majority of patients had public insurance (81%).

The mean age of pneumococcal vaccine refusers was 68 years, while that of acceptors was 65 years (*P* value = .035). Cases were more frequently female compared with controls (odds ratio (OR) = 2.07, 95% confidence interval (CI) 1.23 to 3.50). Cases and controls were similar in race and insurance type. Providers of cases and controls had similar demographic characteristics. Patients' health conditions and vaccine indications are shown in Table 1. Having age as the sole vaccine indication was a significant risk factor for vaccine refusal in univariate analysis (OR = 1.94, 95% CI 1.22 to 3.11). Patients who had psychiatric disease less often refused pneumococcal vaccine (OR = 0.19, 95% CI 0.05 to 0.81). Patients with more chronic health problems also tended to refuse vaccination less often (OR = 0.81 per health problem, 95% CI 0.67 to 0.98).

Additional factors that influenced pneumococcal vaccine refusal in univariate analysis included the patient being current on fecal occult blood testing (OR = 2.39, 95% CI 1.48 to 3.86); history of never receiving an influenza vaccination (OR = 10.89, 95% CI 6.32 to 18.77); prior pneumococcal vaccine refusals (OR = 7.55, 95% CI 4.34 to 13.12); a visit to a not-usual provider at the time of vaccine offering (OR = 1.71, 95% CI 1.08 to 2.68); a history of ever refusing health maintenance treatment within the past 5 years, including influenza vaccination (OR = 9.23, 95% CI 5.30 to 16.06); and attendance at clinic longer than 1 year (OR = 1.93, 95% CI 1.15 to 3.24). Patient-provider gender discordance was also a significant risk factor for vaccine refusal (OR = 1.80, 95% CI 1.10 to 2.93).

Independent risk factors for pneumococcal vaccine refusal identified in multivariate analysis are shown in Table 2.

## DISCUSSION

We have identified several independent risk factors for pneumococcal vaccine refusal. Our finding that patient-provider gender discordance was a risk factor for pneumococcal vaccine refusal is in contrast to two recent studies that found that gender congruency did not increase uptake of preventive services.<sup>10,11</sup> One explanation for our findings is that patients who are more interested in receiving preventive services, in particular female patients, might seek out a gender-concordant provider.<sup>10</sup> Our refusers might have had inherently less interest in preventive care and thus did not seek out a gender-concordant provider.

We could not demonstrate that patient-provider race discordance affected patients' willingness to accept pneumococcal vaccination. Based on prior studies, we hypothesized that discordance of patient-provider race would be a significant risk factor for vaccine refusal. Studies have shown that African-American patients were more satisfied with the care they received and were more likely to report receiving preventive care from race-concordant physicians, and that patients in

Table 2. Multivariate Analysis of Risk Factors for Pneumococcal Vaccine Refusal in Adults

Risk Factor	OR	95% CI	P Value
Patient-provider gender discordance	2.09	1.07 to 4.09	.03
Visit to not-usual provider at the time of vaccine refusal/acceptance	2.26	1.13 to 4.49	.02
Never received an influenza vaccine	7.44	3.76 to 14.76	<.001
Prior pneumococcal vaccine refusals	3.45	1.60 to 7.43	.002
Ever refused health maintenance treatment within past 5 years (including influenza vaccine)	2.86	1.40 to 5.84	.004

OR, odds ratio; CI, confidence interval.

race-concordant relationships with their physicians had more participatory visits than those in race-discordant relationships.<sup>12,13</sup> It is not certain why discordant patient-provider race did not significantly contribute to vaccine refusal in our analysis. One explanation is that both our patient and provider populations lacked diversity, with primarily African-American patients and white providers. Therefore, most of our pairs were discordant, with only small numbers in our concordant groups. Another possibility is that patients in our study population are accustomed to the patient-provider race discordance in our clinic, and thus this discordance may play less of a role in our setting than it does in others.

Our finding that a visit to a not-usual provider was a risk factor for vaccine refusal is not surprising. Provider continuity has been associated with increased receipt of preventive services. Patients with provider continuity had a 16% increase in receipt of influenza vaccination in one study. Provider continuity is thought to lead to increased patient trust and thus a higher likelihood of following provider recommendations.<sup>14</sup>

Prior refusals of pneumococcal vaccine, refusal of health maintenance tests, and nonreceipt of flu vaccination were other significant predictors of pneumococcal vaccine refusal. This finding suggests the existence of a subgroup of patients who are less compliant with preventive services, which may be because of limited knowledge of or misinformation about the intervention offered, distrust, previous negative experiences, and co-morbidities like depression and anxiety.<sup>4,15-17</sup>

There are several limitations to our study. Given the limits of chart review, investigators were only able to ascertain whether refusal was documented or not. We could not evaluate the circumstances surrounding the refusal or the strength of the provider's vaccination recommendation. Qualitative analysis of the discussion surrounding vaccination is necessary to provide an insight into patients' reasons for refusal. Another limitation is that our low patient to provider ratio makes it difficult to establish the effect of any single provider's relationship with his or her patient on vaccine acceptance. In addition, we acknowledge the possible introduction of selection bias given that only patients offered pneumococcal vaccine were included in the study. Finally, although our sample size was relatively large, there were few subsets of patient-provider pairs with discordant race, making this analysis less statistically powerful.

This study has significant implications for programs designed to increase pneumococcal vaccination rates. Our data show that specific patient characteristics have a significant effect on pneumococcal vaccine acceptance or refusal. With this knowledge, we can focus vaccination campaigns on patients who are at highest risk for vaccine refusal, for example, those patients who have refused pneumococcal vaccine in the past or have not received influenza vaccination.

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