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**PNEUMOCOCCAL VACCINE RATES IN PERSONS 65 AND OLDER:
A USAF MEDICAL FACILITY RECORD REVIEW**

Author: Maj Edward G. Johnson, USAF, MC, FS

USAFSAM/GE, 2602 West Gate Road, Brooks AFB, TX 78235-5252

From the University of Texas Houston Health Science Center, San Antonio

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ABSTRACT

The pneumococcal vaccine is underutilized according to self-reported surveys and the full scope of the problem remains undetermined. **Objective:** Primary aims were to determine if the documentation of pneumococcal vaccination varied between clinics for patients 65 and older; and to compare the results with national survey reports and claims data. **Methods:** 368 medical records were examined in this prevalence survey with 268 records from the internal medicine clinic (IMC) and 100 records from the family practice clinic (FPC) at the Wilford Hall U.S. Air Force Medical Center. **Results:** The documentation rates were 92.9% and 69.0%, for IMC and FPC respectively. This difference in documentation rates was statistically significant ($\chi^2 = 35.462$; $df = 1$; $p < 0.001$) and both clinics exceeded the rates found in surveys and claims. **Conclusions:** Clinics differ in their vaccine documentation and self-reported national survey data might not accurately reflect the prevalence of pneumococcal vaccination.

INTRODUCTION

Streptococcus pneumoniae (pneumococcus) is a pathogenic bacterium that affects children and adults. It is a leading cause of illness and death among the elderly and in persons with certain medical problems.¹ As the U.S. population continues to age and incur increased medical expenditures, it is becoming vital that we minimize preventable diseases. The pneumococcal vaccine in persons 65 and older is currently markedly underutilized according to several recent surveys and claims data.

The National Health Interview (NHIS) is an ongoing annual cross-sectional survey of households that is given annually to a nationwide representative sample of civilians. The 1995 NHIS data indicated that for persons 65 and older 34% responded that they had ever had received the pneumococcal vaccine.² The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing random digit-dialed telephone survey of U.S. civilian persons 18 years of age and older. The BRFSS data for persons 65 and older for ever having had a pneumococcal vaccination for years 1995, 1997, and 1999 was 38.4%, 45.8%, and 54.9% respectively.³ The Medicare Current Beneficiary Survey (MCBS) is a continuous longitudinal survey of Medicare beneficiaries. The 1996 MCBS revealed that 45.1% of eligibles 65 and older reported ever having received a pneumococcal vaccination.⁴ Analysis of Medicare claims by the Health Care and Finance Administration for the period 1991-1998 trended with the surveys and showed that only 31% of eligible beneficiaries recorded as having received pneumococcal vaccination despite the fact that pneumococcal vaccination has been a covered benefit since 1981.⁵ There were significant differences between ethnic groups, socioeconomic classes, and states. In general however, these statistics are quite

alarming given the mortality, morbidity, and health care costs associated with this vaccine preventable disease. If accurate, these numbers do not bode well for the nation's healthcare budget given our aging baby boomer population.

The full scope of the problem of low pneumococcal vaccination rates remains to be determined. Attempts have been made to assess the validity of self-reports elicited in surveys by comparing the information in the medical records to that provided during interviews and questionnaires. The two sets of records often disagreed.⁶ A study looking at clinicians' records found that clinicians do not document immunizations for most of their adult patients.⁷ An influenza and pneumococcal vaccination self-report study found pneumococcal vaccination reporting was less valid, particularly for more distant vaccination.⁸

To elucidate the problem of vaccination rates in persons 65 and older to *S. pneumoniae* a study involving a medical record review for documentation of pneumococcal vaccine was desirable. A sample from two different clinic types was chosen for medical record review to see how they compare to each other in regards to documenting pneumococcal vaccination and to the self-reported rates from surveys and claims data. The results of the study may help clarify the extent of pneumococcal vaccination and shed light on those factors which lead to increased or decreased vaccination rates in persons 65 years of age or older.

METHODS

Study Design

A prevalence survey was used to compare the documentation of pneumococcal vaccination in the medical records of persons 65 and older in the IMC and FPC.

The computer program, nQuery Advisor, Version 4.0 was used to determine the minimum sample size.⁹ The study was designed to detect a difference in reporting accuracy of 20%, with a two-sided alpha of 0.050 and a power of 70%. The predicted reporting accuracy was 70% for the IMC and 50% for FPC. Based on these inputs, the minimum sample size required was 155.

Review and approval of the study proposal was done at Wilford Hall Medical Center, Lackland Air Force Base and the University of Texas Health Science Center at Houston.

Data Collection

Charts were reviewed solely by the principal investigator to determine if there was documentation of pneumococcal vaccination in the medical record. No unique identifiers were abstracted from the medical records; confidentiality and record security was maintained at all times. The medical record's jacket, problem list, vaccination sheets, or documentation in the record in any of the last three primary care visits were used to make the pneumococcal vaccine documentation determination. If there was any doubt, the medical record was considered as not having documentation of pneumococcal vaccination. Due to time constraints and shortage of staff to pull medical records, cluster convenience samples of records were used from both clinics. The records were evaluated without provider knowledge

of the prevalence survey. The entire data collection period spanned 2 weeks and covered four distinct collection days.

Charts were pulled from the medical records area and taken to the particular clinic in the morning or afternoon prior to a patient's scheduled visit, the provider utilized the record and made documentation of the encounter, the records were then collected and taken to the coding department, and finally returned to the medical records area. I screened all records going through the coding department that came from the IMC or FPC during the four survey days and included all medical records in the prevalence survey that indicated an age of 65 or older on the day of the patient's visit.

Data Analysis

The data were entered into Minitab software to facilitate statistical analysis and presentation of data. The data were organized into a two-by-two ($r \times c$) contingency table and a chi-square test was used to test for statistical significance of an association between the type of clinic and pneumococcal vaccine documentation. Odds ratios and confidence intervals were calculated to further define the extent of any association.

RESULTS

The total number of medical records reviewed was 368 with 268 from the IMC and 100 from the FPC. The pneumococcal vaccine documentation rates were 92.9% and 69.0%, for IMC and FPC respectively; see Table 1. This difference in documentation rates was statistically significant (chi-square = 35.462; $df = 1$; $p < 0.001$). Furthermore, an association of moderate degree was found to be present between clinic type and documentation of pneumococcal vaccination. The data suggest that the odds of having a pneumococcal

vaccination documented if one was seen in IMC was 5.89 times higher than if one was seen in FPC with a narrow confidence interval (3.13, 11.07).

The patient populations that generated these results were expected to be similar. The clinics were anticipated to have comparable age profiles as this study was concerned with the 65 and older population. Table 2 showed the age differences between the two clinics. The IMC had ages ranging from 65 to 93 with a mean of 73.4 years, while the FPC had ages ranging from 65 to 85 with a mean of 67.0 years. Table 3 revealed that 87.0% of the medical records from FPC were aged 65-69. While this grouping was the largest for the IMC, as well, it only had 33.2%. The gender breakdown, as shown in Table 4, had IMC with 49.3% males and 50.7% females and the FPC with 43.0% males and 57.0% females. The grades for the IMC ranged from E-4 to O-8. The grades for the FPC ranged from E-5 to O-7. The grade frequencies were similar in the two clinics with the most common grades being E7-E9 in both; see Table 5. There was no statistically significant difference in the rates at which officers and enlisted personnel had pneumococcal vaccination documented in their records according to analysis done in Tables 6 and 7. Race of individuals was not available in the medical records.

DISCUSSION

The first objective of this study was to determine if the two different clinics differed in their rates of pneumococcal vaccination documentation in the medical record. A significant difference was detected in the documentation of pneumococcal vaccination in the medical records between the IMC and the FPC. The figure of 92.9% was much higher than the 70% predicted pre-study for the IMC. The 69% figure for the FPC also much better than the 50% predicted pre-study. The finding that the overall documentation for both clinics was better than expected is encouraging for this particular facility. However, it sheds further light on the variability between self-reported vaccination rates and medical documentation. This leads to the second objective of the study that was to determine how these documented rates compared with survey and claims data. Both clinics far exceeded the pneumococcal vaccination rates found in national surveys and claims data; see Figure 1 for comparisons.

A reason for the difference between the two clinics could be that they were clustered convenience samples. The records reviewed for the survey were records passing through coding, on four different days, on their way back to the medical records area. Neither the patients nor providers were aware of the study. The facility was not able to provide manpower to assist with the pulling of medical records for probability sampling. The sampling sizes were ample for a pilot study of this type however it cannot be stated that the records are fully representative of the individual clinics, IMC and FPC. The possibility of limited manpower and the need to use clustered convenience sampling was acknowledged in the proposal, however the study was felt to be of sufficient interest to pursue despite this limitation.

It appears likely that a difference in the pneumococcal vaccination documentation rates actually exists between the IMC and the FPC. It should be noted that many aspects of prevention and health care maintenance documentation were present in the medical records of both clinics. Both clinics made use of the medical record jacket, problem lists of various types, vaccine sheets and stickers to document pneumococcal vaccination in the medical records. The biggest difference that I noted was that the IMC had an overprint of prevention and health care maintenance items that virtually accompanied every patient visit. This probably served as a reminder for the provider to address these issues at every visit. This may have helped the providers use this as a memory jogger for mundane items that they needed to address but were not the principle reason for the visit. The overprint was used liberally by the providers in the IMC and proved a useful reference in looking for pneumococcal vaccine documentation. The IMC patients were older; see Tables 2 and 3. This may have helped account for, at least in part, why they had better documentation. The older patients had more visits in which to get the pneumococcal vaccination documented. FPC had 87% of their patients between the ages of 65 to 69 whereas; IMC had 33.2 % of their patients in this age range.

Philosophically, both internal medicine and family practice are primary care specialties rooted in prevention. WHMC has a residency program in internal medicine and residents were seeing patients in the internal medicine clinic that was surveyed. The presence of residents may make all providers in the clinic more attentive to documentation because of the closer scrutiny that medical records get in a residency program. It is noteworthy that the training program is considered one of the best in the country. The FPC does not have any

residents but it does have mid-level providers, physician assistants and nurse practitioners, as well as physicians seeing patients. Though not specifically studied in this survey, the mid-level providers and family physicians did not appear to have notable differences in terms of prevention documentation.

The large difference between the documentation found in these clinics, 92.9% and 69%, and that reported in the national surveys, 34% to 54.9%, and claims data, 31%, could be due to selection bias in terms of the clinics chosen and charts selected.²⁻⁴ Though this was not intentional it could very well have been present. Initially, the hope was to include two or three different facilities in the survey. However difficulties in getting cooperation and gaining access to medical records in multiple facilities proved too much to overcome and the survey ultimately evolved into a single facility with two clinics. The survey facility did not have the manpower to allow for pulling of medical records for a probability sample and a cluster convenience sample was settled on. Therefore, the clinic chosen and the medical records used in the survey may have been biased. In addition, the sample size was adequate for a pilot study however it was not of the scope used in national surveys and therefore may have been subject to sampling error.

In conclusion, this survey though limited by some factors did demonstrate a difference in documentation in two different clinic types. Furthermore, it was able to illustrate a difference in self-reported national survey data on pneumococcal vaccination and that, which was documented in the medical records of this prevalence survey. There still appears to be confusion among the general population regarding what is the influenza vaccine versus the pneumococcal vaccine. Awareness and knowledge regarding influenza

seems higher, possibly because it is an annual campaign. Pneumococcal vaccination is principally a one-time event. In the context of self-reports, it is not unreasonable that people's memory regarding its administration may not be accurate, particularly as the years go by. The burden therefore is on the medical system to improve documentation and provide more portable methods for patients to keep track of vital data such as immunizations. These could range from low technology approaches such as improved and utilized vaccine cards to computerized databases that could be securely accessed. Surely the true pneumococcal vaccination rates are somewhere between the self-reported figures and those that could be found in medical record surveys and is less than 100%. So although the figures may not be as bleak as they once were, the focus needs to be on continuing to educate the population and providers on the value of giving and documenting pneumococcal vaccination in the medical record. Finally, in this survey the use of the overprint by IMC was very helpful in locating documentation of pneumococcal vaccination in the medical record and should be considered by other clinics. Both clinics, IMC and FPC, would be served by standardizing the location of vaccine documentation in the medical record. Furthermore in the medical records that lacked pneumococcal vaccination documentation, many had up to date documentation of the influenza vaccine and the two could have been co-administered safely and without degrading the effectiveness of either vaccine.¹⁰ Efforts should be made to educate providers and patients to take advantage of all opportunities to avail themselves to this important vaccine.

DISCLAIMER

The views expressed in this article are those of the author and do not reflect the official policy or position of the U.S. Air Force, Department of Defense, or the U.S. Government.

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TABLE 1

Total Counts and Percent Vaccinated Against *S. Pneumoniae*

Medical Records Surveyed by Air Force Clinic Type:

Internal Medicine & Family Practice

	Clinic		
	IM	FP	Total
Vaccinated			
Yes	249 (92.9%)	69 (69.0%)	318 (86.4%)
No	19 (7.1%)	31 (31.0%)	50 (13.6%)
Total	268	100	368

Chi-square = 35.462, $p < 0.001$, $df = 1$

TABLE 2

Age Demographics of the Medical Records Surveyed for Vaccination Against
S. Pneumoniae at an Air Force Internal Medicine Clinic & Family Practice Clinic

	Clinic	
	IM	FP
Age		
Means	73.4	67.0
S.D.	6.2	3.9
Range	65-93	65-85
N	268	100

TABLE 3

Age Breakdown by Five-Year Intervals of the Medical Records Surveyed for
 Vaccination Against *S. Pneumoniae* at an Air Force
 Internal Medicine Clinic & Family Practice Clinic

	Clinic	
	IM	FP
65-69	89 (33.2%)	87 (87.0%)
70-74	78 (29.1%)	6 (6.0%)
75-79	52 (19.4%)	4 (4.0%)
80-84	34 (12.7%)	1 (1.0%)
85-89	12 (4.5%)	2 (2.0%)
90-94	3 (1.1%)	0 (0.0%)
Total	268 (100%)	100 (100%)

TABLE 4

Gender Demographics of the Medical Records Surveyed for Vaccination Against
S. Pneumoniae at an Air Force Internal Medicine Clinic & Family Practice Clinic

	Clinic		
	IM	FP	Total
Gender			
Males	132 (49.3%)	43 (43.0%)	175 (47.6%)
Females	136 (50.7%)	57 (57.0%)	193 (52.4%)
Total	268	100	368

TABLE 5

Absolute and Relative Frequencies of Grades Found in Records Surveyed for
 Vaccination Against *S. Pneumoniae* at an Air Force
 Internal Medicine Clinic & Family Practice Clinic

	Clinics			
	IM		FP	
	N	Relative Frequency %	N	Relative Frequency %
E4-E6	70	26.1	37	37.0
E7-E9	114	42.5	42	42.0
O1-O3	11	4.1	0	0.0
O4-O6	69	25.8	20	20.0
O7-above	4	1.5	1	1.0
Total	268	100.0	100	100.0

TABLE 6

Total Counts and Percents Vaccinated Against *S. Pneumoniae*
Records Surveyed in Internal Medicine: Officer or Enlisted

		IM		
		Officer	Enlisted	Total
Vaccinated	Yes	81 (96.4%)	168 (91.3%)	249 (92.9%)
	No	3 (3.6%)	16 (8.7%)	19 (7.1%)
	Total	84	184	268

Chi-square = 2.299, p = 0.129, df = 1

TABLE 7

Total Counts and Percent Vaccinated Against *S. Pneumoniae*
Records Surveyed in Family Practice: Officer or Enlisted

		FP		
		Officer	Enlisted	Total
Vaccinated	Yes	12 (57.1%)	57 (72.2%)	69 (69.0%)
	No	9 (42.9%)	22 (27.8%)	31 (31.0%)
	Total	21	79	100

Chi-square = 1.747, p = 0.186, df = 1

