Immunization Outreach Using Individual Need Assessments of Adults at an Army Hospital

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Synopsis

A comprehensive assessment of the immunization status of 2,451 adults was carried out at Walter Reed Army Medical Center's Allergy-Clinical Immunology Service, Washington, DC, during an influenza immunization program from October 1985 through February 1986. More than 66 percent of those screened needed either immunization other than for influenza, or an immunologic test, a decline from 72 percent noted during a 1984–85 influenza immunization program. The mean number of interventions was 2.00 per patient in the 1985–86 program and 2.26 during the previous program. Of patients screened in the period 1985–86, 20.5 percent received diphtheria-tetanus toxoids, 15.7 percent received pneumococcal vaccine, and 23.1 percent received a tuberculin skin test. Vaccination or titers for measles were ordered for 10.4 percent, for rubella for 10.9 percent, and for hepatitis B for 20.3 percent.

Assessment of those who came to the clinic for influenza vaccination in the second program demonstrated that the needs of some patients had been met in the first program. However, a general lack of immune protection existed in the majority of patients screened in the second program. In both programs, those older than 59 years needed pneumococcal vaccine and diphtheria-tetanus toxoids more frequently than the general population. The means of the numbers of interventions and the percentages of patients needing intervention other than influenza vaccine declined from the first program to the second, suggesting progress in meeting some individual immunization needs in a large and changing ambulatory population.

CURRENT IMMUNIZATION guides (*1–4*) allow individual patients' immunization needs to be analyzed according to age, lifestyle, occupation, travel history, and other factors. But routine comprehensive assessment of the immunity of adults is not a prevalent practice.

Large numbers of adults in the United States are unprotected against diseases that are preventable by immunization. Only 20 percent of high-risk groups are immunized against influenza A and B each year. Each influenza epidemic results in an average of 172,000 excess hospitalizations. Between 10 thousand and 40 thousand influenza deaths occur each year. Many more deaths attributed to other causes are precipitated by influenza infection (*5–7*).

Only 10 to 25 percent of high-risk groups are vaccinated against pneumococcal pneumonia (*2, 3, 8, 9*). Of the 16,000 hospitalizations annually for hepatitis B, 85 percent occur among adults, yet not more than 20 percent of adults at risk of hepatitis B are vaccinated (*3, 10, 11*). Ten to 20 percent of hospital workers and similar numbers of young adults are at risk of measles and rubella, many of them women who are of childbearing potential (*1, 2, 12–15*). Of those older than 60 years, 84 percent are susceptible to diphtheria and 47 to 71 percent to tetanus (*1, 2, 16, 17*).

Prospective, comprehensive immunization of adults as part of an autumn influenza vaccination program was described by the authors (*18*). This and other assertive inpatient and ambulatory immunization programs (*5, 8, 9, 19–26*) advocated outreach to provide immune protection to adults at risk of preventable infectious diseases.

Morbidity and mortality associated with vaccine-preventable diseases represent wasted health care resources, years of potential life lost (YPLL), and the human cost of pain and suffering. The Centers for Disease Control estimates that pneumonia and influenza together rank sixth among causes of mortality and eighth among causes of YPLL, based on total life expectancy. Pneumonia and influenza combined are 11th among causes of YPLL among those younger than 65 years (*27–29*), a reflection of the impact of the two diseases on mortality among young persons.

We questioned whether our 1984–85 comprehensive

Table 1. Immunization needs of patients requesting influenza vaccination, 1985–86, by age group

Intervention	Total number ages 18–96 years (N = 2,451)		Age group (years)					
			18–19 (N = 48)		20–29 (N = 603)		30–39 (N = 483)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Hepatitis B vaccine or core antibody titer..	498	20	22	46	271	45	173	36
Influenza A and B vaccine.....	2,434	99	46	96	599	99	478	99
Measles vaccine or titer.....	256	10	3	6	114	9	101	21
Pneumococcal vaccine.....	384	16	2	4	21	3	5	10
Poliovirus vaccine, inactivated, trivalent...	5	<1	0	0	0	0	0	0
Rubella vaccine or titer.....	265	11	8	17	116	19	102	21
Tetanus and diphtheria toxoids (adult)	502	20	1	2	15	2	66	14
Tuberculin skin test.....	566	23	15	31	274	45	151	31

immunization screening program provided protection for the majority of the ambulatory population we serve. In response, we repeated the program, using an improved screening instrument to determine the incidence of immunization needs.

Patients and Methods

For the second consecutive year, we prospectively assessed the immunization needs of all patients requesting influenza vaccination at our allergy-immunization clinic. The assessment programs were designed by the hospital's clinical pharmacist for allergy and immunology to determine the patients' comprehensive immunization needs. The adequacy of immunization of 2,451 patients was reviewed in the period October 1985 through February 1986, in a manner similar to that previously reported (*18*). The number of interventions and the proportion of patients requiring intervention were compared between the earlier and later programs using descriptive statistics and chi-square analysis.

The patients were active duty military personnel either employed at Walter Reed Army Medical Center, a 1,000-bed medical teaching center, or elsewhere in the Washington, DC, metropolitan area; retired military personnel living in the area; spouses of both groups; civilian employees of the medical center; and patients admitted to Walter Reed for any reason. About three-quarters of those ages 20 through 49 years were hospital employees. All vaccine doses and immunologic tests were offered without charge to the patients. Immunizations at the pediatric clinic and the emergency room were excluded from the analysis because the allergy-immunization clinic was the only site for influenza vaccination at the hospital.

Regulatory requirements and employment policies for active duty personnel and hospital employees mandated annual influenza vaccination; measles and rubella immunity, determined by documentation of vaccine dose or antibody titer; and annual tuberculin skin testing. No organized attempt was made by clinical or administrative staff to assure that all personnel had come for vaccination. Employees were directed to the clinic by institutional announcements, which included newsletters and staff meetings. The majority of the retirees and other patients who came referred themselves. The balance were referred by their primary care physician.

A new screening instrument to assess patients' immunization needs asked questions about pertinent risks. The questions related to hypersensitivities, immunocompetence, medical and surgical history, medications taken, pregnancy, and positive tuberculin test. Patients answered demographic questions themselves or with assistance of family members. Two clinical pharmacists and six nurses compiled the immunization histories based on documentation, if available, or on information provided orally by patients (*13, 30*).

Physicians prescribed vaccine doses or immunologic tests based on current guidelines (*1–4, 7, 10, 17, 31–33*). The diseases considered primarily for prophylaxis or assessment were diphtheria, hepatitis B, influenza A and B, measles, pneumococcal pneumonia, rubella, tetanus, and tuberculosis. Informed consent was obtained for immunization. Immunologic titers, which are measures of specific serum antibodies, were performed by the hospital laboratory.

The screening questionnaire identified indications and contraindications to vaccination. Indications were primarily based on occupation, age, immunization history, and concurrent diseases. Contraindications noted were usually the result of pregnancy, current fever, previous adverse reaction, or hypersensitivity. After immunization, each patient's medical records were updated, copies of the screening questionnaire compiled for statistical analysis, and data elements entered in an automated database for computation.

Results

During the 1985–86 influenza season, 2,434 of 2,451 persons evaluated, or 99.3 percent, were vaccinated

Table 1, continued. Immunization needs of patients requesting influenza vaccination, 1985—86, by age group

Age group (years) continued											
40-49 (N = 214)		50–59 (N = 180)		60–69 (N = 457)		70–79 (N = 352)		80–89 (N = 103)		90–96 (N = 11)	
Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
23	11	7	4	2	1	0	0	0	0	0	0
212	99	179	99	456	99	351	99	102	99	11	100
31	14	7	4	0	0	0	0	0	0	0	0
10	5	27	15	157	34	129	37	29	28	4	36
0	0	2	1	1	<1	1	<1	1	1	0	0
32	15	7	4	0	0	0	0	0	0	0	0
54	25	58	32	166	36	111	32	27	26	4	36
40	19	24	13	36	8	21	6	4	4	1	9

against influenza A and B (A/Philippines/2/82 [H3N2], A/Chile/1/83 [H1N1], and B/USSR/100/83). Whole-virion, trivalent vaccine was administered to 1,540 persons; 894 received split-virus vaccine. The population ranged in age from 18 through 96 years, with a mean age of 48.4 years and a median of 44 years.

Of 1,835 patients who recalled their most recent influenza vaccination, 1,153 (62.8 percent), claimed to have received influenza vaccine during the period 1984–85. The most recent doses reported for other years were 305 for 1983 (16.6 percent), 132 for 1982 (7.2 percent), 75 for 1981 (4.1 percent), and 162 for 1980 or earlier (8.8 percent).

Of the 2,451 patients screened, 502 (20.5 percent) received booster doses of diphtheria-tetanus toxoids in adult strength, 384 (15.7 percent) received pneumococcal vaccine (23-valent), and 566 (23.1 percent) received tuberculin skin tests (TST). Unexpectedly, 5 patients (0.2 percent) needed inactivated poliovirus vaccine. Hepatitis B vaccine doses or core-antibody titers were ordered for 498 persons (20.3 percent) of all patients screened. Measles vaccine or titer were ordered for 256 patients (10.4 percent) and rubella vaccine or titer for 265 patients (10.8 percent). Distribution by age for all immunizations and tests ordered is shown in table 1.

Among those vaccinated, 923 patients were older than 59 years, with a mean age of 70.3 years. Of this group, 308 (33.4 percent) received diphtheria-tetanus toxoids, 319 (34.6 percent) received pneumococcal vaccine, 62 (6.7 percent) received a TST, and 3 (0.3 percent) received inactivated poliovirus vaccine.

Pneumococcal vaccine was needed for 4.3 percent of patients in their forties, 14.3 percent of those in their fifties, and 30 percent or more for those older than 60 years. Of 462 patients reporting previous immunization with pneumococcal vaccine, 69.0 percent received it in 1984 or early 1985, dates consistent with our previous mass screening. For each of the years before comprehensive immunization screening was initiated at the clinic, the average vaccination rate was 6.2 percent per year.

The need for diphtheria-tetanus toxoid boosters was negligible among young adults, but rose to 12.6 percent of those in their forties, and continued rising for each decade after age 50 years to more than 30 percent. Based on diphtheria and tetanus immunization histories, 1,117 patients (54.0 percent of 2,067 providing a reliable history) had received their most recent booster dose within the preceding 5 years. Of the 2,067, 430 (20.8 percent) reported a booster between 5 and 10 years previously; 520 (25.2 percent) exceeded the 10-year interval between booster doses and were revaccinated. Comparable statistics for patients older than 59 years yielded rates of 43.0 percent having received their most recent booster dose within the past 5 years, 12.7 percent having received a booster between 5 and 10 years previously, and 44.3 percent exceeding the 10-year interval and being revaccinated. There were 384 persons (15.7 percent of 2,451 patients) whose histories were deemed unreliable for this analysis.

The need for measles and rubella immunity in our study was essentially occupational. A crash measles-vaccination program for the hospital employees in July 1984, following three cases of measles among pediatric surgeons, resulted in higher aggregate immunization levels among employees than might otherwise have been observed. Among 703 military personnel and health care workers who needed to demonstrate immunity to measles and rubella, 266 (37.9 percent) could not document a vaccine dose or an adequate antibody titer. They were vaccinated or tested, depending on age.

Unlike the case with pneumococcal vaccine, hepatitis B vaccine was needed mainly by the young. Among those vaccinated against influenza, 40.4 percent of those in their twenties needed hepatitis B vaccine, as did 33.0 percent of those in their thirties. A sharp decline for those older than 39 years reflected occupational factors prominent in the study setting. Protection against hepatitis B was needed by 496 of the 1,528 patients (32.5 percent) younger than 60 years. Hepatitis B vaccinations more than tripled from the number the previous year. Of 556 patients, 437 patients (78.6 per-

Table 2. Immunization needs of patients requesting influenza vaccination, 1984—85 and 1985—86 programs, total population and those older than 59 years

Intervention	Total patients				Older than 59 years			
	1984–85 program (N = 1,353)		1985–86 program (N = 2,451)		1984–85 program (N = 755)		1985–86 program (N = 923)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total interventions	3,053	...	4,910	...	1,896	...	1,614	...
Hepatitis B vaccine or core antibody titer	140	10.3	498	20.3	0	0	2	0.2
Influenza A and B vaccine	1,353	100	2,434	99.3	755	100	920	99.7
Measles vaccine or titer	(1)	...	256	10.4	(1)	...	0	0
Pneumococcal vaccine	569	42.1	384	15.7	503	66.7	319	34.6
Poliovirus vaccine, inactivated, trivalent	3	0.2	5	0.2	3	0.4	3	0.3
Rubella vaccine or titer	(1)	...	265	10.8	(1)	...	0	0
Tetanus and diphtheria toxoids (adult)	497	36.8	502	20.5	397	52.6	308	33.4
Tuberculin skin test[2]	491	36.3	566	23.1	238	31.6	62	6.7
Interventions other than influenza vaccine	974	72.0	1,617	66.0	(1)	...	493	53.4
Mean interventions per patient	2.26	...	2.00	...	2.51	...	1.75	...

[1] Not evaluated.
[2] Criteria were changed in 1985 to conform to guidelines of the American Thoracic Society.

cent) received a titer or the first of a series of three vaccine doses during this program, 44 (7.9 percent) received their second dose, and 17 (3.1 percent) received their third dose. Fifty-eight patients (10.4 percent) were noted who had either already completed their vaccination series or had recorded a positive core-antibody titer.

In all, 2,459 vaccine doses or immunologic tests other than influenza vaccine were ordered for the 2,451 patients assessed. Of the total group screened, 1,617 (66.0 percent) needed at least one vaccine dose or immunologic test other than influenza vaccine. The mean number of total interventions was 2.00 per patient. Of those older than 59 years, 493 (53.4 percent) needed interventions other than influenza vaccine (a mean of 1.75 inventions per patient). Those younger than 60 years needed a mean of 2.16 interventions per patient. Adults in all age groups in the study demonstrated lack of immune protection.

Those older than 59 years in the 1985–86 program included 243 (6.3 percent) who received both influenza vaccine and pneumococcal vaccine during the 1984–85 program. These returning clients caused the 1985–86 immunization rate for pneumococcal vaccine to be reduced relative to the 1984–85 program. Many patients were noted who had received a diphtheria-tetanus toxoid booster dose during the 1984–85 program.

The 1985–86 prospective, comprehensive immunization program, like its predecessor, identified adults at risk of preventable infections and immunized them (table 2). The decline in need for vaccines, other than influenza, between the two programs (from 72 to 66 percent) suggests progress in meeting the needs of the group. The decline was statistically significant (P less than 0.01 by chi-square). Similarly, the need for total interventions declined from 2.26 to 2.00 per patient (P less than 0.01 by chi-square). The mean number of total interventions declined for patients older than 59 years from 2.51 to 1.75 per patient (P less than 0.01 by chi-square).

In the interval between the 1984–85 and 1985–86 programs, we restricted tuberculin skin testing to a strict interpretation of the recommendations of the American Thoracic Society (*31–33*). The sharp decline in tests ordered in 1985–86 is shown in table 2. The recommendations advocate testing only newly arrived immigrants, new residents of nursing homes, new residents of prisons, and employees of nursing homes and hospitals. Our regulatory requirement for testing active duty personnel kept the rate in younger age groups comparable between the two programs.

Most patients received all or most of their immunizations or tests on the same day. Often, those for whom a TST was prescribed received a portion of their vaccine doses on the day they returned for TST evaluation.

Contraindications to vaccination were few, and the merits of immunization were individually evaluated. Seventeen claims of previous adverse immunization reactions were noted; the majority were vaccinated after more thorough questioning. Tetanus toxoid or antitoxin hypersensitivity accounted for 11 of the claims. Four persons with a history of neurologic disorders (including history of seizures) were identified. Those patients and five with systemic lupus erythematosus were referred to their primary physician for detailed evaluation of their immunization needs. Seven pregnant

patients were identified; in general, inactivated vaccines or toxoids were administered these patients, deferring live-virus vaccines. Nineteen patients identified themselves as immunocompromised to varying extents. In most cases, vaccinations were prescribed to provide at least limited protection. Egg or feather allergy was claimed by 28 patients. Four of the claims were considered serious enough to evaluate by skin testing with egg allergen extract and diluted vaccine (*34, 35*). Vaccination was waived for two patients who reacted positively.

Discussion

This report confirms the effectiveness of prospectively assessing the immune status of large populations and promptly delivering immune protection. Significant shortfalls in immune protection against preventable diseases were resolved through our programs, to the benefit of several thousand patients. The screening instrument we developed incorporates the questions needed for comprehensive immunization assessment. Despite the large number of patients evaluated, due regard for individual indications and contraindications was provided each patient.

However, the two programs addressed only those persons who came for influenza vaccination with little stimulus. There are many other patients who need greater encouragement to seek the protection that immunizations offer adults, and their needs may be even greater.

The extent of migration of military personnel, workers, or other beneficiaries into or out of the study population between the two periods is unknown. Nonetheless, we postulate that our 1984–85 immunization program contributed to the decline in immunization needs seen in 1985–86, given the more than 500 patients known to be repeat clients during both programs. Annual repetition of this type of program will likely be needed because of the large numbers of patients presumed to enter and leave the hospital population; more stable populations may be successful with less frequent comprehensive immunization evaluation.

Data reported in this paper may be generalized to civilian clinics only with caution. Military mobilization requirements may result in a higher level of surveillance of immune status in our military population and their families than in a comparable civilian population; if so, comprehensive immunization assessment of a civilian community may disclose greater needs than we observed. Conversely, the repeated movement of military personnel and families from the care of one hospital to another may disrupt continuity of care, although immunization records are part of the medical records carried to the gaining military command. Comparable studies of civilian populations are needed.

A dedicated immunization service in a hospital may be the most effective way to assess risks, deliver immunizations, monitor patients for adverse events, and assure accurate records. (*18, 25*). But every clinician should incorporate immunization assessment daily into patient workups. Computerized patient databases will make centralized recording of immunization status, and lists of patients needing initial or booster doses, more efficient and effective (*8, 22, 25, 36*).

Some practices rely on events to prompt immunization of adult patients in the course of routine medical practice, such as hospital admission (*19, 8, 9*) and discharge (*12, 23–25*); admission to a nursing home (*34*); certain medical diagnoses, such as Hodgkin's disease (*37*), planned therapeutic immunosuppression, asthma, laboratory confirmation of certain infections, and scheduling of surgical procedures, such as splenectomy and organ transplant. The Walter Reed clinical service performs prospective, comprehensive immunization screening throughout the year, rather than only in influenza season.

Pharmacists can effectively encourage patient immunization. Maintaining immunization profiles along with drug profiles, taking immunization histories, counseling patients on benefits and risks, and educating health care workers on indications and contraindications are areas in which the pharmacist's expertise can be valuable. Depending on local authority and protocols, pharmacists can be involved in every step of immunization delivery (*18, 26, 38–41*).

The next area of inquiry will be the usefulness of computerized pharmacy databases in screening prescription drug use for indications of risk factors for vaccine-preventable diseases, such as theophylline for asthma, insulin for diabetes, and digoxin for cardiovascular disease.

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