

# Adult Immunization in a Network of Family Practice Residency Programs

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*A substantial proportion of morbidity and mortality associated with vaccine-preventable diseases occurs among adults. Teaching residents about disease prevention is mandated in the curriculum guidelines for family practice programs. A cooperative study among the Kansas City family practice residency programs was begun to look at immunization behaviors in these teaching programs. A retrospective audit of medical records and a prospective survey of residents and faculty were performed. From the medical records of 400 patients seen for health maintenance examinations, the frequency of tetanus-diphtheria immunizations recorded was 4.75%. The pooled immunization rate recorded for pneumococcal vaccine was 25%, and for influenza vaccine, 24%. Although 93% of respondents knew patients need tetanus-diphtheria immunization every 10 years, on a written questionnaire giving clinical examples, they were less likely to elect to immunize older patients eligible for tetanus-diphtheria vaccine. The following immunization criteria were listed by respondents: for pneumococcal vaccine, age over 65 years (86%); for influenza vaccine, age over 65 years (85%), chronic diseases (69%), residence in a chronic care facility (7%), and being a health care worker (28%). Educational interventions stressing the appropriate criteria and involvement of the patient are planned at the separate programs.*

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Although immunization is a proven primary prevention behavior, vaccine-preventable disease occurs more often in adults than expected.<sup>1,2</sup> Improvement in rates of adult immunization is difficult to achieve, and target groups vary for different vaccines.<sup>3</sup> Obtaining an immunization history should be relatively easy but is often overlooked during office examination.<sup>4</sup> The failure to obtain an immunization history makes identification of candidates for vaccination less likely.

Data available indicate that 10% to 15% of adults do not have immunity to measles or rubella, and no more than 30% of those at risk for hepatitis B have been

immunized.<sup>5,6</sup> The Immunization Practices Advisory Committee (ACIP)<sup>7</sup> recently updated recommendations for mumps vaccination to cope with the increase in incidence of the disease reported between 1985 and 1987 in persons over 15 years old. In addition, the Centers for Disease Control (CDC) estimates that only 20% of persons at risk for influenza complications are vaccinated each year. In 1985, fewer than 10% of those individuals at risk from pneumococcal infection had been immunized. Of persons aged 60 years and older, 49% to 62% lacked protective levels of antibody to tetanus, and 41% to 84% lacked protection against diphtheria,<sup>6</sup> even though safe, effective, and inexpensive vaccines are available.

To improve immunization rates, the CDC,<sup>8</sup> the American College of Physicians (ACP),<sup>9</sup> and the American Academy of Family Physicians (AAFP)<sup>5</sup> have published guidelines for immunizing adults. In 1986 Congress declared the last week of October as National Adult Immunization Awareness Week<sup>10,11</sup> to increase public awareness of the need for immunizations. The American Medical Association (AMA) called for physicians to maintain complete immunization records for adults and pro-

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vide these records to patients. The public has also been alerted to the need for maintaining immunizations through articles in the popular press<sup>12</sup> and patient education materials.<sup>13</sup>

Professional medical organizations recognize that informed health care providers who recommend vaccination to patients are vital to ensure adequate vaccination levels among adults.<sup>14</sup> There has been a focus in their efforts to educate physicians about the continued need for immunizations in adulthood. While little information is available about the effectiveness of these methods on practicing physicians, it is known that there has been limited success in the area of education of resident physicians about preventive medicine.<sup>15</sup> An evaluation of quality of preventive care in a residency practice showed that only 30% of eligible patients received an influenza vaccination and 19% a pneumococcal vaccination.<sup>15</sup>

Immunization of adults is an element of physician behavior that can be monitored through chart audit. This paper presents a summary of the results of a cooperative study among the four family practice residency programs in Kansas City undertaken to determine whether health care providers in these teaching programs are informed about adult immunizations, are providing immunizations appropriately, and are recording information about them in the patients' medical records.

## METHODS

The Kansas City Family Practice Network consists of the four independent family practice residency programs in Kansas City. The programs cooperate loosely in some areas of resident teaching (eg, pediatrics, obstetrics), faculty development, and research. Otherwise their curricula, teaching philosophies, facilities, and faculty are separate and distinct entities.

The study involved a chart audit and a physician survey at each of the Kansas City programs: the University of Missouri-Kansas City Truman Medical Center/East (TMC/E); the University of Kansas Medical Center (KU); Baptist Medical Center Goppert Family Care Center (GFCC); and Trinity Lutheran Hospital (TLH). One hundred charts at each site for a total of 400 charts were audited retrospectively. The records of ambulatory adult patients aged 30 years and older who came in for a health maintenance examination between January 1, 1984, and June 30, 1986, were audited. Charts were randomly selected using computer records in each residency program that identified the patient visit as being for a health maintenance examination.

Resident and faculty physicians at the four programs also received a questionnaire. They were asked whether

TABLE 1. CRITERIA\* FOR MEDICAL RECORD AUDIT

Vaccines	Indications
Tetanus-diphtheria	Initial series, then every 10 years
Influenza	Patients with chronic heart and lung disease Health care workers Patients over 65 years of age Patients with chronic diseases (eg diabetes)
Pneumococcal	Patients with chronic heart and lung disease Conditions predisposing to <i>Streptococcus pneumoniae</i> Immunocompromised individuals Patients over 65 years of age
Hepatitis B	High-risk groups Health care workers

\*Established by Centers for Disease Control and US Preventive Services Task Force.

they recorded immunizations given to adults, and where in the chart they recorded them. They were asked to decide on appropriate immunizations in case examples of patients ranging in age from 25 to 65 years old, none of whom had been immunized for 12 years. They were also given case examples of patients who might require pneumococcal and influenza vaccine and asked to check those they would vaccinate. Lastly, they were asked to list their criteria for pneumococcal and influenza vaccination.\*

The criteria used for the audit were those established by the CDC and US Preventive Services Task Force for tetanus-diphtheria, influenza, pneumococcus, and hepatitis B (Table 1).<sup>16,17</sup> Measles, mumps, and rubella vaccines are more appropriate for younger patients than for those aged 30 years or older, and no notations concerning vaccination with these vaccines were present in the audited records.

Data, once collected, were submitted to statistical analyses using chi-square and descriptive techniques such as frequency calculations.

## RESULTS

### Chart Audit

The range in patient ages was similar for three of the programs (Table 2), but patients seen for health maintenance examinations at KU were younger (range 30 to 57 years old). Two factors may have influenced these results:

\*Copies of the questionnaire are available from the authors upon request.

TABLE 2. PATIENT DEMOGRAPHICS

Site	Age Range(y)	Number Older Than 65 Years	Number with Chronic Diseases
Truman Medical Center/East	30-82	15	11
Goppert Family Care Center	30-82	27	2
Trinity Lutheran Hospital	30-88	40	5
University of Kansas	30-57	0	2

older patients who were seen for physical examination more likely had the visit coded by a diagnosis rather than under health maintenance examination; and many of the patients obtained health maintenance physical examinations as members of health maintenance organizations through their employer. Twenty-six of the patients at TMC/E, 29 at GFCC, and 45 at TLH were aged over 65 years or had chronic diseases, and 2 at KU had diabetes.

At TMC/E and KU the majority of the patients were

seen by resident physicians, and at GFCC and TLH patients were seen almost equally by residents and faculty (Table 3).

Unless an allergy to the vaccine was noted in the medical record (one patient), patients whose records were audited (399 patients) were considered eligible for tetanus-diphtheria immunization, or the medical record should have had some notation about when the immunization was last given. Tetanus-diphtheria immunizations were recorded with a frequency of 4.75% (Table 4). In seven of the records from TMC/E, tetanus-diphtheria vaccine was given or noted on the emergency department record prior to the history and physical examination. No similar records from emergency department visits were available at the other sites.

Patients aged over 65 years and those with chronic diseases were considered eligible for pneumococcal vaccine. Thus, 102 patients out of 400 were eligible, and 26 received the vaccine, for an overall rate of 25% of those eligible (Table 5). Significant differences (chi-square,  $P < .01$ ) were noted between programs, with the rate of administration at TMC/E the highest at 62% of those eligible.

Influenza vaccine is given seasonally, so the number of patients eligible out of the total was determined by the number that had physical examinations during the time when the vaccine was available (Table 6). Six patients in the sample population at TMC/E were eligible and had physical examinations during the appropriate season. No influenza vaccine was given at physical examination, but one patient returned later for influenza vaccination (administration rate of 17%). At GFCC, no eligible patients

TABLE 3. PROVIDER DEMOGRAPHICS

Site	Number of Patients Seen By:	
	Residents	Faculty
Truman Medical Center/East	96	4
Goppert Family Care Center	58	42
Trinity Lutheran Hospital	43	57
University of Kansas	77	23

TABLE 4. NOTATION ON PATIENT RECORDS OF TETANUS-DIPHTHERIA IMMUNIZATION EITHER UP TO DATE OR GIVEN (N = 400)

Site	Medical Record	Emergency Department Record	Total
Truman Medical Center/East	2	7	9
Goppert Family Care Center	4		4
Trinity Lutheran Hospital	1		1
University of Kansas	5		5
	Combined total		19 (4.75%)

TABLE 5. NOTATION ON PATIENT RECORDS OF PNEUMOCOCCAL VACCINE (N = 400)

Site	Patients Eligible	Immunization UTD/Given	Percent
Truman Medical Center/East	26	16	62*
Goppert Family Care Center	29	6	21
Trinity Lutheran Hospital	45	4	9
University of Kansas	2	0	0
Total	102 (26%)	26 (25%)	

\*Chi-square,  $P < .01$ .

UTD Up to date.

TABLE 6. NOTATION ON ELIGIBLE PATIENT RECORDS OF INFLUENZA VACCINE (n = 102)

Site	Overall Eligible	Season Eligible	Vaccine Given No. (%)
Truman Medical Center/East	26	6	1 (17)
Goppert Family Care Center	29		13 (44)*
Trinity Lutheran Hospital	45	11	11 (100)
University of Kansas	2	2	0
Total		19 (19%)	25/102 (24%)

\*Immunized prior season.

from the sample population were seen during the appropriate season, but 13 patients (44% of those eligible) had vaccination recorded in the chart from the prior fall season. At TLH, 11 eligible patients from the sample population were seen, and three were up to date for influenza vaccine. No patient received the vaccine at the time of the examination, but all remaining patients received influenza vaccine later (administration rate of 100%). At KU, two eligible patients were seen from the sample population, and they did not receive vaccine. The collective administration rate for the four programs was 24%.

No notations about immunization with hepatitis B vaccine or vaccines for measles, mumps, or rubella were noted on any chart from the sample selected.

### Survey Results

The survey was completed by 102 of 134 physicians (a return rate of 76%). A cross-section of respondents from all four programs, each year of residency, and faculty completed the survey. Fifty percent of respondents said they ask about immunization status, and of those who ask, 88% said they ask about immunization status at the time of history and physical examinations.

Although 93% of respondents knew patients need tetanus-diphtheria immunization every 10 years, when given specific examples of patients, all of whom would be eligible for the vaccine, respondents were less likely to immunize patients aged 50 years and older (Figure 1). The responses among the separate teaching programs regarding the 50-year-old patient varied significantly (chi-square,  $P = .05$ ). First-year and second-year residents were less likely to immunize a 65-year-old patient than were third-year residents and faculty (chi-square,  $P = .05$ ). No other significant differences were noted.

Age over 65 years was listed by 86% of respondents as a criterion for pneumococcal vaccine, and by 85% for influenza vaccine. No other criteria were listed by 70% or more of respondents, although 69% listed chronic diseases as a criterion for influenza vaccine. Only 7% listed residence in a chronic care facility as a criterion for influenza vaccine; 28% cited being a health care worker as an

indication for immunization with influenza vaccine. No significant differences in response were noted based on site, year of residency, or faculty status.

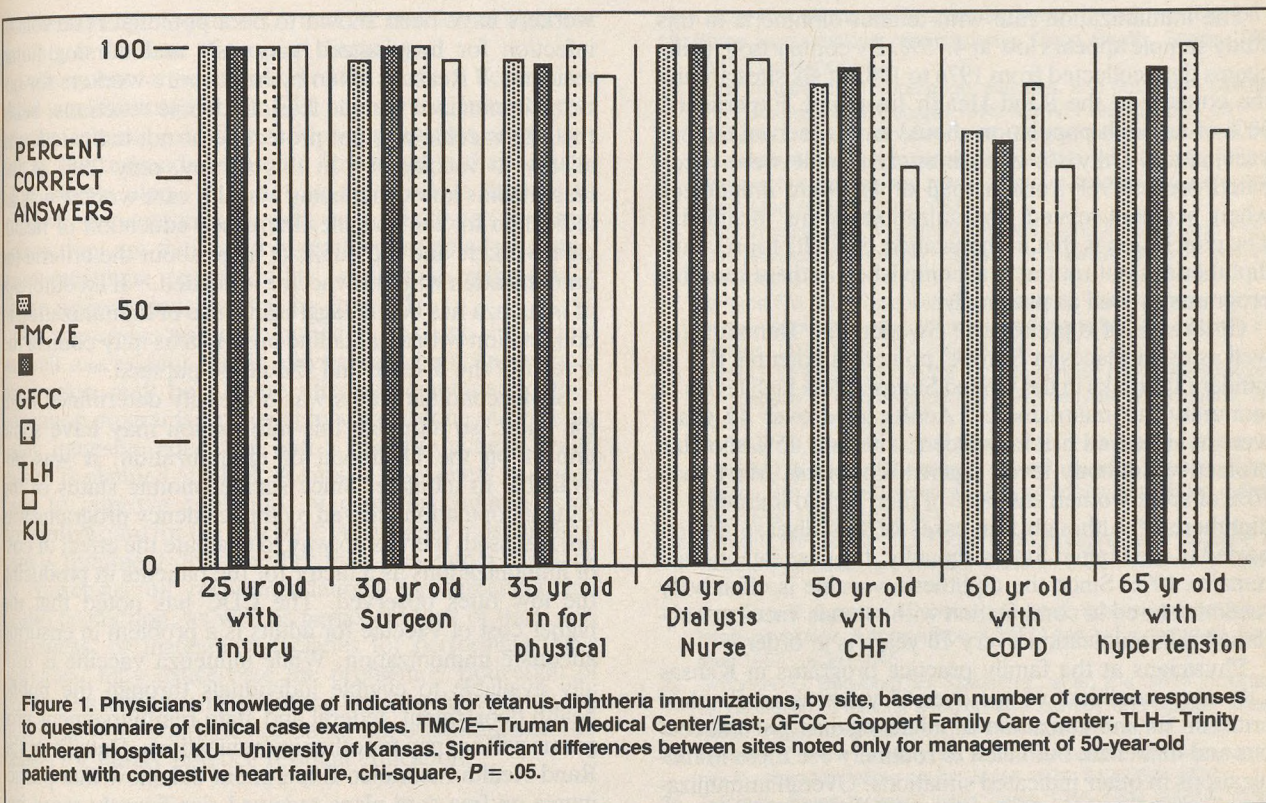
When given case examples and asked which individuals should be immunized against hepatitis B, 100% of respondents would immunize a 40-year-old hemodialysis nurse. All of the respondents would also vaccinate a 30-year-old surgery resident. Although renal failure is not a cited indication for hepatitis immunization, 41% of respondents would immunize a 55-year-old patient with renal failure.<sup>15,16</sup>

Seventy-nine percent of respondents stated immunizations should be recorded on an immunization flow sheet, and 59% said that is where they recorded immunizations. No significant differences in response were noted based on site, year of residency, or faculty status. Eighty-nine percent thought a checklist on the chart would help them remember to ask about immunizations.

### DISCUSSION

Results of the physician survey validated the premise that the time of the history and physical examination is when most physicians would be likely to ask about immunization. Whereas 50% said they asked about immunizations, and 59% stated they would record them on a flow sheet, the overall recording rate for all immunizations was much lower than would be expected based on their responses. By comparison, fewer than 50% of practicing internists surveyed considered tetanus-diphtheria immunization an essential part of the general examination, and fewer than two thirds felt it merited routine recording.<sup>18</sup> In a study comparing stated screening behaviors with patient records, providers collectively overestimated their use of screening tests.<sup>19</sup> Providers in this study similarly overestimated their notation of immunizations in the medical record.

Physician knowledge about criteria for all of these immunizations was less than optimal based on their responses to the case examples and listed criteria. There



was no difference in level of training, faculty status, or training site for most responses. Their uniform approach to the case examples of medical personnel needing immunization to hepatitis B is consistent with the belief among medical and surgical residents who had been vaccinated against hepatitis that physicians are at increased risk of exposure to hepatitis.<sup>20</sup> No data were available from the family practice residents in this study sample to determine whether they are obtaining hepatitis B vaccine themselves.

The majority of physicians in this study would immunize patients for tetanus-diphtheria after an injury, were comfortable immunizing younger patients against tetanus-diphtheria, and knew that it should be done every 10 years. Family physicians in academic settings have been found to report tetanus-diphtheria immunizations more appropriately in high-risk groups than family physicians in practice.<sup>21</sup> When physicians are asked to apply clinical data to a specific judgment, however, their responses may be affected by factors that are irrelevant. Respondents were less likely to immunize patients aged 50 years and older for tetanus-diphtheria. Although the difference in response was significant for the 50-year-old patient example, the decline in number of correct responses for clinical

examples using older patients came from all respondents, regardless of different curricula and teaching faculty.

All individuals need tetanus-diphtheria immunization every 10 years, and this recommendation does not vary with the clinical situation. The respondents may not have realized that as people age, their immunity to tetanus-diphtheria falls,<sup>22,23</sup> and risk of getting these diseases may increase. The US Preventive Services Task Force reported that age-specific attack rates for tetanus in the United States have shifted quite dramatically to older age groups. Mortality caused by tetanus is largely age related, with case fatality ratios greater than 50% in persons older than 60 years.<sup>16</sup> Routine immunization for tetanus is preferred to immunization at the time of treatment for injury because of an inability to identify injury in some cases. The data from the CDC on tetanus cases between 1955 to 1984 note that while an acute injury was identified in 70% of cases, 30% were associated with a variety of conditions: abscess, intravenous drug use, dental conditions, gangrene, and skin ulcers. In 9%, no associated condition was identified.<sup>24</sup> In addition, patients at highest risk for tetanus have the lowest likelihood of receiving correct antitetanus treatment in the emergency department setting.<sup>25</sup>

The immunization rate with tetanus-diphtheria in this study sample appears low at 4.75%. By comparison, using claims data collected from 1974 to 1982 at six sites around the country in the Rand Health Insurance Experiment, 30% of an adult population should have received tetanus vaccination. Only 1% of their study sample were vaccinated preventively, and a total of 4% were immunized when accident-related immunizations were included.<sup>26</sup> The conclusion is that immunization of adults for tetanus-diphtheria is not routinely accomplished in these teaching programs as well as nationally.

Outbreaks of diphtheria in Sweden and Denmark (as well as other places in Europe) point to a potential risk of similar outbreaks in the United States unless high levels of immunity are maintained.<sup>27</sup> Adults aged over 40 years were at increased risk in Sweden, with only 15% showing protective antibody levels against diphtheria. More than 70% of adult women and 50% of men lacked immunity to diphtheria.<sup>28</sup> Although few cases of this disease are reported in the United States annually, the case fatality rate remains 10%. Since the diphtheria vaccine is effectively readministered in combination with tetanus vaccine, continued reimmunization every 10 years is in order.<sup>29</sup>

Physicians at the family practice programs in Kansas City were confident of age over 65 years as an absolute criterion for immunization of adults against pneumococcus and influenza, but failed to routinely use these immunizations in other indicated situations. Overall immunization rate for pneumococcus at 25% of those eligible is comparable to national statistics. Overall immunization rate for influenza of 24% of those eligible is slightly better than the national average of 20%. There were, however, remarkable differences between the programs with regard to these immunization rates that could not be accounted for on the basis of differences in knowledge of criteria by the physicians of the different programs.

Pneumococcal vaccine has been available since 1977, with a 23-valent vaccine licensed in 1983. Efficacy of the vaccine in the elderly has been the subject of some controversy,<sup>30,31</sup> which may have contributed at least partly to low immunization rates with the vaccine.<sup>32</sup> Recent studies have shown a clinical effectiveness of 70% in the elderly, approximating its effectiveness in the general population.<sup>33</sup> A recommendation has been made to consider offering pneumococcal vaccine to patients at 55 years old to elicit a vigorous antibody response prior to the age-related increase in pneumococcal infections and before development of immunodebilitating chronic diseases.<sup>32</sup> The criteria for pneumococcal vaccine have recently been updated to include asymptomatic or symptomatic human immunodeficiency virus (HIV) infection.<sup>34</sup>

Published recommendations for influenza vaccination include health care workers: those individuals capable of transmitting influenza to high-risk persons.<sup>35</sup> Health care

workers have been shown to be a potential reservoir of infection for hospitalized patients<sup>36</sup> and nursing home residents.<sup>37</sup> Reasons given by health care workers for not being immunized include fear of adverse reactions, belief that the vaccine was not protective or not indicated, and allergy to vaccine.<sup>36,38</sup> In this survey, only 28% of the respondents knew that being a health care worker was an indication for the vaccine. Increased education of health care workers and the public at large about the criteria for immunization with this vaccine is needed.<sup>39</sup> If an outbreak of influenza has begun, aggressive use of immunization in conjunction with amantadine prophylaxis may control the spread of the disease and should be pursued.<sup>40</sup>

Socioeconomic status was not easily determined from the chart, so although this information may have some impact on the likelihood of immunization, it was not available to tabulate. Since socioeconomic status of the patient populations served by the residency programs was not assessed, there is no way to evaluate the effect of cost of immunizations as a factor for the patients in producing the low rates observed. The CDC has noted that the higher cost of vaccine for adults is a problem in ensuring adequate immunization. While influenza vaccine is usually available to eligible individuals through the public health department, federal and state reimbursement programs will not pay for other immunizations. Data from the Rand Health Insurance Experiment did show that participants on free care plans received significantly more immunizations, but the overall immunization rates still remained low.<sup>26</sup> Cost might partially account for the low rates of immunization, but would not negate the need to record whether the patients had received immunizations from another source.

During the period that charts were audited, there were no immunization record sheets present in any of the four programs. A checklist or computer reminder system has been found to improve documentation of health screening procedures.<sup>41-44</sup> Physicians in this study felt it would be helpful for them as well. It may be more appropriate to address periodic health screening needs each time the patient is in the clinic, rather than attempting to cover prevention needs only at the time of physical examination, and to use ancillary personnel as well as physicians to fulfill these needs.<sup>45</sup> Other strategies found to be effective in increasing immunization rates of susceptible adults include a nurse-initiated reminder system,<sup>46</sup> a standing order for nurses to vaccinate patients aged 65 years and older,<sup>47</sup> a computer-generated summary produced for each clinic visit showing dates of immunizations,<sup>48</sup> an institutional policy to administer influenza vaccine in an extended care facility,<sup>49</sup> screening adults for multiple immunization needs when they present for influenza vaccination,<sup>50</sup> letters encouraging pneumococcal vaccina-

tion sent to eligible patients,<sup>51</sup> and vaccination of high-risk patients at the time of hospital discharge.<sup>52</sup>

Subsequent to the initiation of the study, a tickler flow sheet was instituted at the GFCC program. In a study of primary internal medicine residency programs, about one half of the respondents used a flow sheet in their clinics. Flow sheets alone may not be an effective method to improve prevention behaviors in a residency program unless they are facilitated by faculty, selected readings, team meetings, record audits, and nurse reminders.<sup>53</sup> These interventions need to be stressed.

An aggressive approach aimed at teaching the patient as well as resident family physicians about appropriate prevention may be a more effective combination than education programs aimed at physicians alone. A program using intensive education and a portable patient health record is planned at TLH. A similar instrument has been used to improve continuity of care for children<sup>54</sup> and preventive care for the elderly.<sup>55</sup> At present, most medical care is treatment driven rather than preventive.<sup>56</sup> A lack of consensus on recommendations for screening and health promotion, as well as perceived lack of time, forgetfulness, or inadequate facilities for performing these activities, may exacerbate the problem.<sup>20</sup> Education of physicians and patients about the need for disease prevention behaviors continues to be an important area of emphasis for family practice resident education.

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