

Effect of a Microcomputer-Based Registry on Adult Immunizations

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A survey of patients attending the Cosmopolitan International Diabetes Center showed that one third of those born prior to 1935 did not know their immunization status, and only 56% of this group remembered ever receiving tetanus vaccine. In contrast, of those born after 1935, 98% gave a history of being vaccinated for tetanus, either as a child (76%) or as an adult (22%). Eight of the 35 patients who could not remember or denied receiving pneumococcal vaccine had in fact received it. Most patients could remember whether and when they had received influenza vaccine.

A microcomputer-based registry was used to generate summaries of clinical information at each patient visit. These summaries included prevention-related items. There was a three- to five-fold increase in immunization rates when the dates of the most recent vaccinations were prominently displayed on the summary at the time of each visit.

Appropriate immunizations have made many childhood infectious diseases a rarity in the United States. The success is due both to the development of safe and effective vaccines and to widespread awareness and concern on the part of physicians and parents. The state of Missouri has required tetanus immunization for school-age children since the early 1940s, with subsequent requirements for other vaccinations. In 1977 public schools throughout the nation were charged with ensuring that all children be properly immunized; as a result, childhood immunization rates in the United States currently exceed 97%.¹ No such policy exists for adults. While tetanus is rare in the United States, most cases occur in adults over the age of 60 years.² People in high-risk groups, the elderly, and those with chronic diseases should receive influenza vaccine annually and be immunized against pneumococcal diseases.¹⁻³ The American College of Physicians has noted that only about

20% of high-risk persons receive influenza vaccine each year, and even fewer have been given pneumococcal vaccine.²

When the Division of Endocrinology and Metabolism at the University of Missouri-Columbia transferred its outpatient clinic activities to the Cosmopolitan International Diabetes Center in 1984, it was decided that as part of the comprehensive care program, all patients with diabetes mellitus should receive the recommended immunizations against diphtheria-tetanus, influenza, and pneumococcal diseases.^{2,3} All staff were encouraged to offer needed immunizations. The current medications and the dates of the pneumococcal and the most recent diphtheria-tetanus vaccinations were recorded on a billfold-sized card that was given to the patient. During the last quarter of 1984, a microcomputer-based registry for adult diabetic patients was put into operation.⁴ This registry included the dates of immunizations. The computer-generated summaries produced for each clinic visit initially showed only the dates of the pneumococcal and influenza vaccinations. The date of the most recent diphtheria-tetanus vaccination was added later.

The present study was undertaken to determine the effects of these procedures on the immunization status of the patients and to find out how well patients remembered their own immunization status.

Submitted, revised, May 22, 1989.

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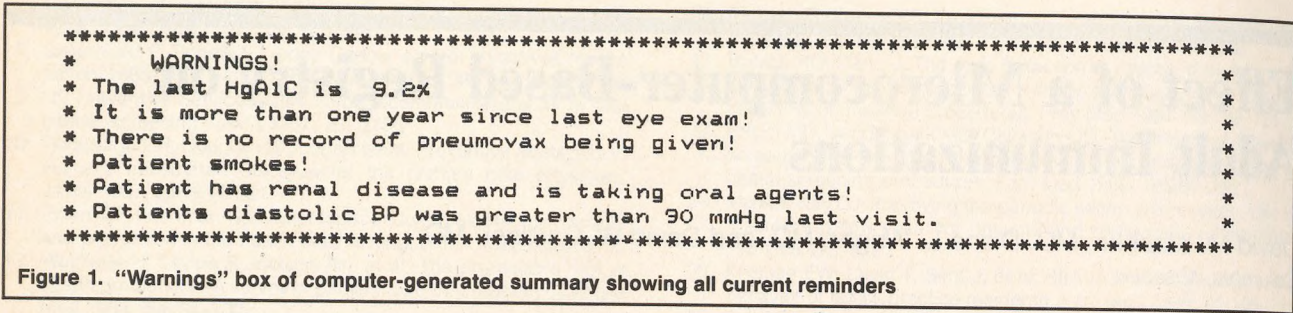


Figure 1. "Warnings" box of computer-generated summary showing all current reminders

METHODS

Computer-Generated Summaries

A diabetes registry using an IBM XT computer and a commercial database program was developed.⁴ During the first visit to the diabetes center, a new patient registry form, which included the dates of the most recent immunizations for tetanus, pneumococcal, and influenza vaccines, was completed for each patient. These dates were gathered from the available medical records or from patient recollections. Immunizations were offered, if needed, and injected if the patient consented. The patient received a billfold-sized card that included the current medications and the dates of the most recent diphtheria-tetanus and pneumonia vaccinations. As influenza vaccine was offered annually, the date was not recorded on the card but was stored in the registry. Starting in early 1985, the clinic nurse would enter into the computer a list of all diabetic patients scheduled for return visits, and a summary was printed and attached to the front of the chart. This two-

page summary included the dates of the pneumococcal and influenza vaccinations. If the former was not present, the statement "There is no record of pneumovax being given!" was printed in the warnings box of the summary sheet (Figure 1). At the end of 1985, a review of the comparative rates for pneumococcal and tetanus vaccinations was convincing enough to add a reminder for the date of the most recent tetanus vaccination to the summary. Other health maintenance reminders have since been added (Figure 2). Spaces on the summary sheet permit changes to be written in. When the patient arrives, the nurse checks the accuracy of the current medication and allergy list and reviews the health maintenance section. The physician enters any changes in management or problems. After each clinic session the nurse or clinic clerk enters any changes into the computer registry, and the summary sheet is filed in the patient's medical record.

Survey of Immunization Status of Patients

During random days of the week during a 2-month period in 1986, all diabetic patients over the age of 18 years

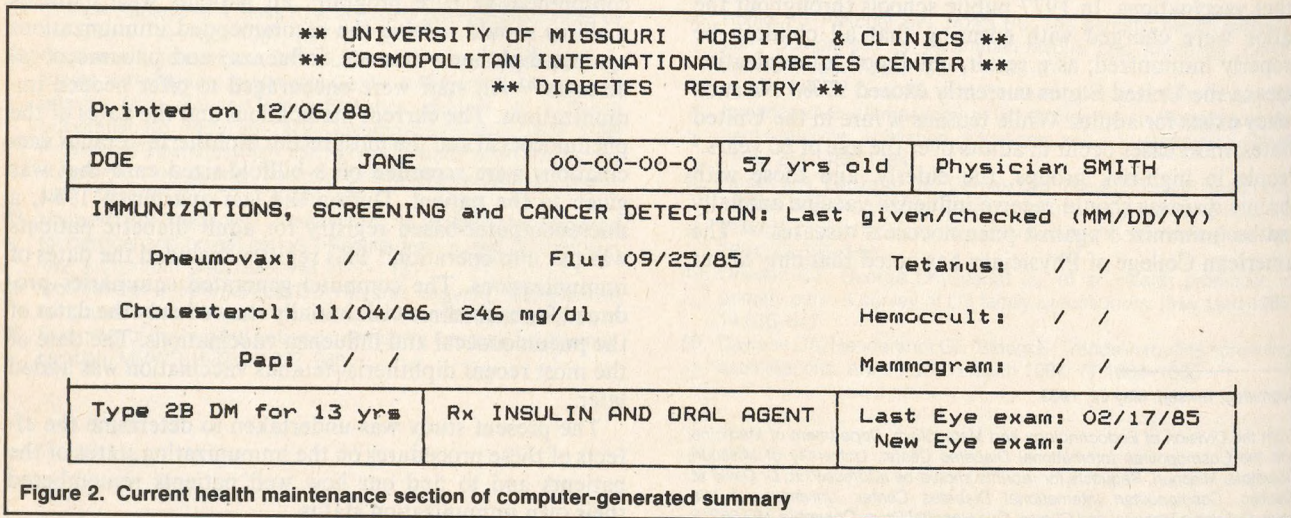


Figure 2. Current health maintenance section of computer-generated summary

TABLE 1. RESPONSES (PERCENTAGE) TO SURVEY OF TETANUS VACCINATION

Vaccination status	Aged Over 50 years (N = 53)	Aged 50 years or younger (N = 38)
Received vaccine		
As a child	19	76
As an adult	37	22
Never	9	2
"Don't know"	35	0

returning for a routine visit were asked to fill out a multiple-choice questionnaire. They were told that the survey was to see how well they remembered receiving immunizations. They were asked to recall the year they received their first tetanus vaccination and the most recent vaccinations for tetanus, pneumonia, and influenza. Answers were compared with the information recorded in the diabetes registry and in the patient's medical record.

RESULTS

Patient Survey

All 91 patients responded to the questionnaire. Fifty-three of these patients (58%) were born before 1935.

Forty-one people recorded a date for their most recent tetanus vaccination (Table 1), 35 agreeing with data previously recorded in the computer registry or medical record. All patients who correctly recorded the date had been vaccinated within the past 10 years, most since 1980. Five of these patients, however, had been unable to provide this information for the registry at the time of their initial visit. Six patients recorded a date that disagreed with the date in the registry by more than 2 years; for four of these patients, the date recorded in the registry was confirmed from their medical records.

Of the 50 patients unable to recall a date, six had re-

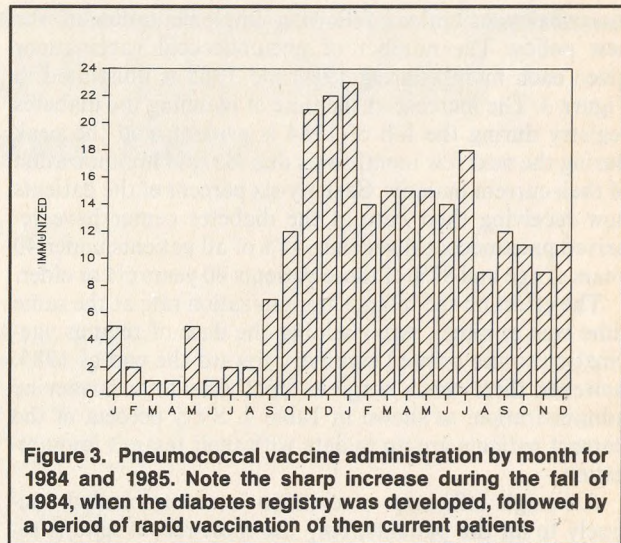


Figure 3. Pneumococcal vaccine administration by month for 1984 and 1985. Note the sharp increase during the fall of 1984, when the diabetes registry was developed, followed by a period of rapid vaccination of then current patients

ceived the vaccine at the diabetes center (one less than 1 month before the survey) and two others had previously supplied a vaccination date for the registry.

Fifty-six patients (62%) said that they had received pneumococcal vaccine, and all these responses were within 2 years of the correct date. Thirty (33%) denied receiving the vaccine, although four of them had according to clinic records. Of the five patients who could not remember, four were recorded as having been vaccinated.

Seventy-three patients stated that they had received an influenza vaccine, and only one was incorrect by more than 2 years on the date of the most recent vaccination. Fifty-eight (64%) had received it in the 1985–86 season.

Effect of Computer-Generated Summaries

The number of pneumococcal and tetanus vaccinations given each year, as recorded in the registry, is shown in Table 2, which demonstrates the marked increase in pneu-

TABLE 2. NUMBER OF VACCINATIONS ADMINISTERED

	1982	1983	1984	1985	1986	1987
Clinic visits	1895	1901	2179	2367	2680	3180
Pneumococcal (total)	20	27	81	166	174	132
Number per 100 visits	1.1	1.4	3.7	7.0	6.5	4.2
Tetanus (total)	14	26	23	70	117	112
Number per 100 visits	0.7	1.4	1.1	3.0	4.4	3.5

mococcal vaccinations following implementation of the new policy. The number of pneumococcal vaccinations given each month during 1984 and 1985 is illustrated in Figure 3. The increase at the time of planning the diabetes registry during the fall of 1984 is evident, and the peak during the next few months was due to rapid immunization of then current patients. Seventy-six percent of the patients now receiving their care at the diabetes center have received pneumococcal vaccine; 44% of all patients under 40 years of age and 87% of those patients 40 years old or older.

The effect on the tetanus immunization rate at the same time was minimal. After adding the date of tetanus vaccination to the printed summary toward the end of 1985, however, there was a surge in diphtheria-tetanus vaccine administration, as shown in Table 2. Sixty percent of the current patients are up to date with their tetanus immunization.

Although influenza vaccination is recommended routinely to all the patients, only the most recent date is recorded in the registry. Therefore comparative data for each year are not available.

DISCUSSION

A major factor impacting on immunization status is the commitment to an immunization policy. The survey reaffirms the success of current national policies for immunization of children. Seventy-six percent of those patients born after 1935, who therefore entered school after 1940, were immunized as children. The success of a policy to immunize adults at the time of discharge from hospital has been described.⁵ Similarly, establishing an immunization policy has helped patients at the Cosmopolitan International Diabetes Center. The immunization rate for pneumococcal vaccine is high except for patients aged under 40 years. Vaccination has been promoted less vigorously to this group, and more of these younger patients refuse to take it.

Even more important is the implementation of any policy. Although a single dedicated individual, for example, an infection control nurse, can make a very significant impact,⁵ even a commitment to the principles of health maintenance and disease prevention easily can be forgotten in the midst of a busy practice. Previous studies have shown that visible reminders are much more effective than educational seminars or delayed feedback on performance. This finding applied regardless of whether the reminders were general checklists⁶ or computer-generated patient-specific checklists.⁷ The effect of visible reminders in the diabetes center is shown by comparing the marked rise in

use of pneumococcal vaccine following the institution of the registry with the minimal increase for tetanus vaccine until it too was added to the summary sheet. Both the nurses and physicians in the clinic find the summary sheet extremely useful in maintaining quality care.

An accurate record of the date of the last vaccination is important, especially for tetanus vaccination, which only needs a booster dose every 10 years, or for pneumococcal vaccination, which should not be repeated.

The results of the patient survey illustrate some of the shortcomings of relying on memory. Even though pneumococcal vaccine was licensed as recently as 1977, at least one fourth of those patients who could not remember or even denied receiving it had a record of having received the vaccine. Over one third of the patients born before 1935 did not know their tetanus immunization status. As expected, patients were most likely to remember an annual vaccination (influenza) and least likely to remember a more remote one (tetanus).

It is not practical to check immunization status by measuring antibody levels in everyday clinical practice. Admittedly, some patients have received vaccines they did not need, and some have not yet received ones they do need. The results, however, support the observation that the immunization status of the patients is much improved since the introduction of the computer-based diabetes registry. It appears that repetitive reminders and a prominent display of immunization status at each visit is an effective method of increasing preventive medicine practice in an adult clinic population.

References

1. Fedson DS: Adult immunization: Protocols and problems. *Hosp Pract* July 15, 1986, pp. 143-158
2. Committee on Immunization: Guide for Adult Immunization. Philadelphia, American College of Physicians, 1985
3. Routine immunization for adults. *Med Lett Drugs Ther* 1985; 27:98-100
4. Gardner DW, Klachko DM: Development of a diabetic patient registry on a microcomputer. In Levy AH, Williams BT (eds): Proceedings of American Association of Medical Systems and Informatics Congress. Bethesda, Md, American Association of Medical Systems and Informatics, 1985, pp 286-288
5. Klein RS, Adachi N: An effective hospital-based pneumococcal immunization program. *Arch Intern Med* 1986; 146:327-329
6. Cohen DI, Littenberg B, Wetzel C, et al: Improving physician compliance with preventive medicine guidelines. *Med Care* 1982; 20:1040-1045
7. Tierney WM, Hui SL, McDonald CJ: Delayed feedback of physician performance versus immediate reminders to perform preventive care: Effects on physician compliance. *Med Care* 1986; 24:659-666