Impact of Physician Reminders on the Use of Influenza Vaccinations: A Randomized Trial

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Objective: To analyze the impact of mailed physician reminders to immunize their patients.

Design: Randomized trial involving Washington State physiatrists participating in the Medicare program. In 1997, all physiatrists in the state were separated into solo or group practice. Solo physicians and group practices were then separately randomized to receive 4 monthly reminders to have their patients immunized. In 1998, the intervention and control groups were switched.

Setting: The state of Washington.


Intervention: Repeated mailer.

Main Outcome Measure: By using multivariate analysis, Medicare billing data was analyzed to determine the impact of the physician reminders on influenza vaccination rates.

Results: Among solo practitioners, patients whose physiatrist received the reminder letters in 1998 were 34% more likely (adjusted relative risk [RR] = 1.34; 95% confidence interval [CI], .96–1.88) to have a vaccination billing. Among group practitioners, those patients whose physiatrist received the reminder letters in 1997 were 26% more likely (RR = 1.26; 95% CI, .98–1.60) to have a vaccination billing. These differences, however, were not statistically significant. The adjusted RRs for the remaining intervention groups, solo practitioners in 1997 (RR = .89; 95% CI, .63–1.26), and group practitioners in 1998 (RR = 1.00; 95% CI, .73–1.36), revealed no increase in vaccination billings for patients whose physiatrist received the intervention.

Conclusions: Repeated physician reminders did not increase the vaccination rate of Washington State Medicare patients who were seen by physiatrists in 1997 and 1998. These results were consistent whether the physiatrists were in solo or group practice. Other methods should be considered to improve the primary care delivered to this Medicare population.

Key Words: Disabled persons; Influenza; Rehabilitation; Primary health care; Vaccination.

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Influenza outbreaks are associated with a significant increase in morbidity, mortality, and health care costs in the United States. Each year, influenza epidemics claim the lives of about 20,000 Americans. It has been estimated that influenza epidemics lead to 142,000 excess hospitalizations annually and $12 billion in annual direct and indirect costs.

These statistics are regrettable given that a safe, effective, and inexpensive vaccine is available to prevent this disease. Influenza vaccination reduces hospitalization by 50% to 70% overall and reduces mortality by as much as 80% in the elderly residing in nursing homes. Influenza vaccination is also clearly cost effective, both in the elderly and in healthy working adults.

Vaccination rates have varied over time and have increased since Medicare began funding influenza immunizations in 1993. In 1997, the Centers for Disease Control and Prevention (CDC) documented that influenza coverage for persons over the age of 64 years is about 63% in the United States. Although this is an improvement from 33% in 1989, there are still populations who lag behind, including blacks, Asian and Pacific Islanders, Hispanics, and health care workers.

Currently, CDC recommends that all persons over age 49 receive a vaccination. In addition, anyone over the age of 6 months with a chronic medical condition (e.g., pulmonary, cardiovascular, or renal disease; diabetes; hemoglobinopathies; immunosuppression), anyone living in a nursing home or chronic care facility, health care providers, and household members of high-risk groups should receive an influenza vaccination in the fall of each year. Annual vaccinations are required because different virus strains circulate each year. In general, the influenza season peaks between mid December and mid March. Therefore, the vaccine should be given between September 1 and December 31.

In 2000, CDC lowered the age for universal vaccination from 65 to 50 years. Over 25% of persons between 50 and 65 years of age have a chronic medical condition that would qualify them for a vaccination, yet only 28% to 41% of these individuals are vaccinated. Because age-based strategies seem to work better than other types of patient-selection strategies, CDC believed that lowering the age of universal vaccination would increase the immunization rate in this important population.

Physiatrists have the opportunity to ensure that immunizations are performed because they care for many elderly patients with chronic problems who meet the CDC vaccination guidelines. Hospital and office-based physiatrists may coordinate the care through another physician, usually a primary care provider. Another possibility is for physiatrists to provide this type of primary care activity for their patients. Although several programs exist in which physiatrists are actively engaged in primary care activities, these programs are few in number and usually focus on patients with disabilities. In addition, other factors affect direct physiatric involvement in primary care. A 1995 nationwide survey of 100 randomly selected physiatrists examined the role of the physiatrist as primary care givers. Among the respondents, 39% felt that physical medicine and rehabilitation should be designated a primary care specialty.
and 53% felt that physiatrists should act as primary care providers to the severely disabled (those with a traumatic brain injury or a spinal cord injury [SCI]). Less than 40% felt that their residency training prepared them adequately to provide primary care and, ultimately, only 40% were interested in assuming the role of primary care physician. Thus, although some physiatrists were likely providing high-quality primary care services to their patients, the majority of physiatrists did not feel they had the interest or training to take on this role.

A previous study performed by our research group revealed that physiatrists in Washington State were rarely involved in vaccinating their patients. In that study, by using 1994 Medicare data, we found that only 6% of physiatrists in Washington State billed for an influenza vaccination, and among patients who saw a physiatrist in that year, far fewer of them were vaccinated than were the patients seen by internists or family practitioners.

In response to these findings, we designed a randomized trial of letters sent to physiatrists in Washington State encouraging them to have their patients immunized. This project is important for 2 reasons. First, physician reminder letters are a low-cost intervention with the potential to assist a vulnerable population. The Task Force on Community Preventive Services has classified them as a strongly recommended intervention to increase vaccination rates. Second, as the field of physical medicine and rehabilitation considers enlarging its role in the provision of primary care for persons with disabilities, the success or failure of this intervention might provide an indirect assessment of physiatrist interest in providing this type of service.

METHODS

We performed a randomized crossover trial involving all Washington State physiatrists billing the Medicare program. By using Medicare’s Unique Physician Identifier Number, we identified all 105 physiatrists who had Medicare billing numbers in Washington State in 1996. We contacted these physicians to determine if they were in group or solo practice. In 1997, the solo practitioners (n = 44) and the practitioner groups (n = 13) were separately randomized to receive either 4 separate monthly mailings during the influenza season or nothing. The mailings informed each solo or group physician of the findings of our previous study and reminded them to have their patients immunized against influenza. In 1998, the intervention and control groups were switched.

After the 2-year intervention was complete, we collected all Washington State Medicare Part B claims data for 1997 and 1998. This database contains all billing data for Medicare outpatients seen in the fee-for-service arena, including information on influenza vaccination and the physicians who order them. The data included patients who were seen during the 1997–98 period but whose billing may have occurred in 1999.

To determine whether a patient received an influenza vaccination, we looked at the procedure codes. Medicare’s Part B files consist of a series of line items, with each line representing a discrete service for which a payment claim was made to Medicare for an individual patient. The line items contained services rendered directly by physicians and a wide spectrum of diagnostic tests, procedures, and durable medical equipment for which there may have been a referring physician. For the purposes of the present study, we defined a vaccination as any line item in which the billing codes for influenza immunization (CPT 90724, G0008) appeared, whether or not the vaccinations were ordered by the physiatrist seeing the patient or by another physician during a previous or subsequent visit.

We excluded any patient who was seen by more than 1 physiatrist (n = 1065). One physician in solo practice was randomized incorrectly and received the intervention in both years. This physiatrist was included in 1997, and excluded in 1998. In 1998, 5 physiatrists who had been participating in the Medicare program in 1997 did not submit claims in Washington State. (It is likely that they either retired or moved away from Washington.) They were excluded from the second-year analysis.

We analyzed patient characteristics by using a variety of statistical tests including the Student t test, generalized linear mixed model, and tests of binomial proportions when appropriate. We used a random effects log-binomial model, a generalized linear mixed model that specifies a logarithmic link function, and binomial distribution to estimate an adjusted relative risk (RR) between the intervention and control group’s vaccination billing proportions. The models included fixed effects terms for patient age, gender, and number of claims. Depending on the model, a random effect was considered to be either the physician or physician group. This random effects term accounts for potential correlation between beneficiaries seeing the same physician or physician group.

All RRs are adjusted and reported with 95% confidence intervals (CIs). Differences were considered to be statistically significant if the CIs did not include 1.0 or if the 2-tailed P values were less than .05. Analyses were conducted by using Stata, version 6.0, and SAS, version 6.12.

RESULTS

Physician and Patient Characteristics

The characteristics of the study physicians and patients are in tables 1 and 2. Thirty-eight percent of patients in the 2-year study period were seen for the following musculoskeletal problems: back, neck, joint, or soft-tissue disorders. Thirty-two percent were seen for neurologic issues, including stroke, brain injury, SCI, or neuropathy. Nearly 70% of the bills submitted

<table>
<thead>
<tr>
<th>Diagnosis for All Claims in 1997 and 1998</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back and neck disorders</td>
<td>22.4</td>
</tr>
<tr>
<td>Cerebrovascular disease or hemiplegia</td>
<td>19.1</td>
</tr>
<tr>
<td>Joint disorders</td>
<td>9.7</td>
</tr>
<tr>
<td>Neuropathies</td>
<td>6.0</td>
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<tr>
<td>Soft-tissue disorders</td>
<td>6.9</td>
</tr>
<tr>
<td>Brain injury</td>
<td>3.8</td>
</tr>
<tr>
<td>SCI</td>
<td>1.9</td>
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</tbody>
</table>

NOTE. Percentages of patients by diagnosis and billing codes do not equal 100% because only the most frequent diagnoses and bill types are shown.
were for outpatient visits or consults (evaluation and management codes). Sixteen percent were bills for electrodiagnostic services.

In general, the intervention and control groups were not significantly different in terms of gender or age (table 3). Significant differences existed between the 2 groups in the total number of patients. This finding occurred in the solo group because several physicians who saw a high volume of patients were initially randomized into the control group. In the group randomization, the larger group practices were randomized into the control group in 1997, and therefore the total number of patients seen by them was much larger than the intervention group.

Results of the Intervention

When we analyzed the unadjusted percentages of patients with a billed vaccination, 2 of the 4 intervention groups, group practitioners in 1997 (42.5% vs 30.1%, \( P = .07 \)) and solo practitioners in 1998 (40.6% vs 31.6%, \( P = .12 \)), had higher levels of immunization, but they were not statistically significant.

Results of the multivariate analysis (figs 1A–B) revealed similar results. Among patients who saw solo practitioners, those whose physicians received the reminder letters in 1998 were 34% more likely (adjusted RR = 1.34; 95% CI, .96–1.88) to have a billing for vaccination. Among the patients who saw group practitioners, those whose physicians received the reminder letters in 1997 were 26% more likely (adjusted RR = 1.26; 95% CI, .98–1.60) to have a billing for vaccination. However, these differences did not meet statistical significance because their CIs included 1.0. The adjusted RRs for the remaining 2 intervention groups, solo practitioners in 1997 (RR = .89; 95% CI, .63–1.26) and group practitioners in 1998 (RR = 1.00; 95% CI, .73–1.36), revealed no increase in vac-

### Table 3: Patient and Physician Demographics by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Solo Practice</th>
<th></th>
<th></th>
<th></th>
<th>Group Practice</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Intervention Group</td>
<td>Control Group</td>
<td>( P )</td>
<td>Intervention Group</td>
<td>Control Group</td>
<td>( P )</td>
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<td></td>
</tr>
<tr>
<td>1997</td>
<td>Patients (n)*</td>
<td>1486</td>
<td>596</td>
<td>.024</td>
<td>1341</td>
<td>877</td>
<td>.452</td>
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</tr>
<tr>
<td></td>
<td>Men (%)†</td>
<td>38.5</td>
<td>42.8</td>
<td>.147</td>
<td>41.5</td>
<td>44.1</td>
<td>.709</td>
<td>41.7</td>
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<td></td>
<td>Mean age (y)†</td>
<td>72.7</td>
<td>69.5</td>
<td>.651</td>
<td>69.7</td>
<td>67.2</td>
<td>.832</td>
<td>67.5</td>
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<tr>
<td></td>
<td>Physicians (n)‡</td>
<td>23</td>
<td>21</td>
<td>.880</td>
<td>28</td>
<td>33</td>
<td>.551</td>
<td>20</td>
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<tr>
<td></td>
<td>Groups (n)‡</td>
<td>—</td>
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<td>—</td>
<td>7</td>
<td>6</td>
<td>1.000</td>
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<tr>
<td></td>
<td>Visit/patient (n)†</td>
<td>14.5</td>
<td>13.9</td>
<td>.673</td>
<td>16.4</td>
<td>17.2</td>
<td>.379</td>
<td>13.8</td>
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<tr>
<td></td>
<td>Immunized (%)†</td>
<td>31.8</td>
<td>37.8</td>
<td>.464</td>
<td>42.5</td>
<td>30.1</td>
<td>.070</td>
<td>40.6</td>
</tr>
<tr>
<td>1998</td>
<td>Patients (n)*</td>
<td>561</td>
<td>1310</td>
<td>.019</td>
<td>868</td>
<td>1286</td>
<td>.554</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Men (%)†</td>
<td>41.7</td>
<td>38.3</td>
<td>.327</td>
<td>43.6</td>
<td>40.1</td>
<td>.976</td>
<td>41.7</td>
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<td></td>
<td>Mean age (y)†</td>
<td>67.5</td>
<td>72.4</td>
<td>.080</td>
<td>65.9</td>
<td>70.1</td>
<td>.349</td>
<td>67.5</td>
</tr>
<tr>
<td></td>
<td>Physicians (n)‡</td>
<td>20</td>
<td>20</td>
<td>.880</td>
<td>32</td>
<td>27</td>
<td>.501</td>
<td>20</td>
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<tr>
<td></td>
<td>Groups (n)‡</td>
<td>—</td>
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<td>—</td>
<td>6</td>
<td>7</td>
<td>1.000</td>
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<tr>
<td></td>
<td>Visit/patient (n)†</td>
<td>13.8</td>
<td>14.7</td>
<td>.554</td>
<td>16.3</td>
<td>16.6</td>
<td>.966</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td>Immunized (%)†</td>
<td>40.6</td>
<td>31.8</td>
<td>.123</td>
<td>35.6</td>
<td>42.5</td>
<td>.832</td>
<td>40.6</td>
</tr>
</tbody>
</table>

* The Student t test analyzing the difference in patients/physician.
† Mixed model used as a statistical test.
‡ Binomial proportion used as a statistical test.

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Fig 1. Adjusted RR of receiving an influenza vaccination for (A) 1997 and (B) 1998. Results are separated into patients seen by physicians in group versus solo practice. Bars represent 95% CIs. Results compare the likelihood of getting a vaccination for those patients whose doctors received reminders with those whose doctors did not receive them.
cination billings for those patients who were seen by physicians receiving the intervention.

**DISCUSSION**

The results of the present study suggest that the use of physician reminders to physiatrists seeing Medicare beneficiaries has a minimal effect on improving influenza vaccination rates. Although 2 of the 4 intervention groups had some improvement in immunization, these findings were not statistically significant.

Our findings are inconsistent with similar interventions involving primary care providers. Kumar et al. performed a similar randomized trial among all Louisiana primary care providers and found that the addition of 1 mailed reminder to the physician, which included information regarding their “missed opportunities,” significantly increased vaccination rates, but the increase was small (<2%). Balas et al. in a meta-analysis of 33 randomized trials of primary care physician prompts to increase preventive care, found that influenza vaccinations rates could be improved by 18% through the use of physician reminders. Most, but not all, of the studies included in Balas’s analysis included reminders that were patient specific and thus more frequent. Although we did not have a specific “control group” of primary care providers testing our intervention, it appears that similar interventions have worked among primary care providers in the past. Thus, the negative results of our present study may reflect more on the attitudes of physiatrists than on the effectiveness of the intervention.

The overall billings for vaccination rates we found were lower than one would expect based on other data sources. In our present study, we used the available billing data to define immunized patients. Inevitably, we underestimated vaccination rates because some individuals were immunized in state heath clinics, pharmacies, or by other providers who do not participate in the Medicare program. In these cases, patients would have been vaccinated, but our data might not reflect this fact. Previous studies have suggested a classification rate of 22% for influenza vaccinations when estimating from Medicare Part B data. However, this misclassification would lead to a nonconservative error in our results only if there were some systematic way in which the control and intervention groups were classified. Because the groups were randomly assigned, the misclassification is more likely to be nondifferential with respect to the intervention, and the RRs will therefore be biased toward the null hypothesis (no significant difference between the control and intervention groups). Given that our results were nearly statistically significant in 2 of the 4 analyses, patient misclassification clearly represents a limitation of our study design. A decrease in the patient misclassification might have altered the results of our analysis and shown that it was effective.

There are other limitations to the present study. The small sample size in the physician group analyses reduced the chances of detecting a positive impact of the intervention. Our results may have been different if there were more than 13 separate groups to analyze. In addition, our randomization procedures may not have completely eliminated the impact of confounding variables. Variables such as socioeconomic status and presence of a primary care physician, which were not measured in the present study, could have altered the results. Finally, we do not know the functional status of the patients involved in the study. Physiatrists may only see themselves as primary care providers for individuals with disabilities and perhaps the population we studied was not appropriate. However, in general, the Medicare population is quite disabled. Over one third of all Medicare beneficiaries have at least 1 health-related limitation in activities of daily living (ADLs), and 14.6% have severe disabilities, with limitations in 3 or more of the 6 ADLs.

**Implications for Physical Medicine and Rehabilitation**

The field of physical medicine and rehabilitation has debated the issue of how to improve primary care for individuals with disabilities. This issue is important because a growing body of evidence suggests that disability is an independent risk factor for inadequate preventative health care.

The results of the present study support the idea that most physiatrists do not see themselves as providers of primary care for their patients. In our study, frequent reminders were not particularly effective in increasing vaccination rates. Given that vaccination is among the easiest preventive procedures to perform, our results call into question whether physiatrists would be willing to provide more time-intensive services such as Papanicolaou smears and mammograms. Although some physiatrists undoubtedly are interested in and able to provide primary care to their patients, other methods should be strongly considered to improve the level of primary care to the bulk of individuals with disabilities. These methods are likely to involve traditional providers of primary care and might include collaborating with them directly on patient care issues or educating them on the rehabilitation aspects of the disabled individuals in their care.

**CONCLUSIONS**

Repeated mailed physician reminders did not increase the proportion of vaccinations received by Washington State Medicare patients seen by physiatrists in 1997 and 1998. These results were consistent whether the physicians worked in a solo or group practice. The findings of the present study suggest that most physiatrists in Washington State may not see themselves as providers of primary care and other methods should be considered to improve the primary care delivered to physical medicine and rehabilitation patients.

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**References**


Suppliers
a. Stata Corp, 4905 Lakeway Dr, College Station, TX 77845.
b. SAS Institute Inc, SAS Campus Dr, Cary, NC 27513.