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# Improving Herpes Zoster Vaccination Rates Through Use of a Clinical Pharmacist and a Personal Health Record

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## Abstract

**BACKGROUND—**Preventative health services, including herpes zoster vaccination rates, remain low despite known benefits. A new care model to improve preventative health services is warranted. The objective of this study is to investigate whether the functions of an electronic medical record, in combination with a pharmacist as part of the care team, can improve the herpes zoster vaccination rate.

**METHODS—**This study was a 6-month, randomized controlled trial at a General Internal Medicine clinic at The Ohio State University. The 2589 patients aged 60 years and older without documented herpes zoster vaccination in the electronic medical record were stratified on the basis of activated personal health record status, an online tool used to share health information between patient and provider. Of the 674 personal health record users, 250 were randomized to receive information regarding the herpes zoster vaccination via an electronic message and 424 were randomized to standard of care. Likewise, of the 1915 nonpersonal health record users, 250 were randomized to receive the same information via the US Postal Service and 1665 were randomized to standard of care. After pharmacist chart review, eligible patients were mailed a herpes zoster vaccine prescription. Herpes zoster vaccination rates were compared by chi-square tests.

**RESULTS—**Intervention recipients had significantly higher vaccination rates than controls in both personal health record (relative risk, 2.7; $P = .0007$) and nonpersonal health record (relative risk, 2.9; $P = .0001$) patient populations.

**CONCLUSIONS—**Communication outside of face-to-face office visits, by both personal health record electronic message and information by mail, can improve preventative health intervention rates compared with standard care.

### Keywords

Electronic medical record; Electronic patient portal; Herpes zoster vaccine; Immunizations; Personal health record; Pharmacist; Primary care



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The underuse of preventative services in the primary care setting highlights the focus that our health care system places on providing acute care.[1] Despite the increased focus on prevention of chronic diseases and aggressive public health campaigns, preventative health care rates remain low.[2] For example, despite Advisory Committee on Immunization Practices recommendations, the end-of-season influenza vaccination rate for 2010–2011 was only 42.3%, and in 2009, only 60.6% of persons aged more than 65 years had received the pneumococcal vaccine.[3–6] There are specific explanations for the limited successes in each area of preventative health care, yet some barriers are common to all. Patients are typically educated about preventative health care during face-to-face visits in office-based settings. In the office, the ability to educate and deliver preventative health care is limited by provider scheduling capacity and time available for face-to-face patient-provider interaction.[7–9] Because of these limitations, providers often focus patient visits on acute needs and current disease management within a patient encounter. It is imperative that a new model is created to extend preventative health care delivery outside of traditional face-to-face office visits.[2] The need for these innovations will only grow in the coming years as the population ages and as more people seek primary care as the result of health reform measures.

According to the Centers for Disease Control and Prevention, approximately 1 in 3 people will experience herpes zoster, also known as “shingles,” in their lifetime.[10] The herpes zoster vaccine has been available since 2006 and can reduce the incidence of shingles by 51%.[11] As such, the Advisory Committee on Immunization Practices recommends that all patients aged 60 years or older without contraindication receive the herpes zoster vaccine.[10] Despite this recommendation, a national health interview survey conducted by the Centers for Disease Control and Prevention in 2010 estimated that only 14.4% of adults over 60 years of age have received the herpes zoster vaccine.[12] Identified barriers to the herpes zoster vaccine include: (1) its relative novelty such that physicians and patients may prioritize other more familiar vaccines; (2) not all insurance plans cover the vaccination costs (~$200); and (3) the logistics of getting the vaccine can be challenging because few clinics stock the herpes zoster vaccine because of special temperature storage requirements.[13–15] As a result, most patients must take herpes zoster vaccine prescriptions to community pharmacies for vaccine administration.

The adoption of electronic medical record systems is accelerating across the United States because of practice advantages and government-sponsored incentives.[16,17] A personal health record is one of the many tools of an electronic medical record that allows patients and providers to communicate securely over the internet and patients to view key components of their medical record, including laboratory results, medications, and immunization status. The personal health record may improve our capacity to provide preventative health care to a growing population without further stressing the primary care system.[18,19]

The primary goal of this study was to determine whether we could significantly increase the herpes zoster vaccination rate by using an electronic medical record to identify patients in need of vaccine and communicating with the patient outside of an office-based face-to-face visit. The secondary goals of this study were to compare intervention effects on vaccination rates between patients sent communications via US Postal Service and those sent communications via personal health record and report the amount of time required by a clinical pharmacist to manage this workflow.

# MATERIALS AND METHODS

## Design Overview

The study was a 6-month, randomized controlled trial conducted at an academic medical center.

## Settings and Participants

Patients included in the study received primary care from physicians at The Ohio State University Martha Morehouse General Internal Medicine Clinic in Columbus, Ohio. After approval by the institutional review board, all patients who were aged 60 years and older and did not have herpes zoster vaccine recorded in the electronic medical record were identified using a patient-panel reporting tool within the electronic medical record. Demographic data and personal health record status also were included in this report.

## Randomization and Sample Size

There were 2589 patients aged 60 years and older without herpes zoster vaccination documentation in the electronic medical record. Patients were then stratified into 2 patient populations on the basis of personal health record activation status (personal health record users and nonpersonal health record users). Randomization was performed separately within each population. Of the 674 personal health record users, 250 were randomized to receive information regarding the herpes zoster vaccination via an electronic message and 424 were randomized to standard of care. Likewise, of the 1915 nonpersonal health record users, 250 were randomized to receive the herpes zoster vaccination information via US Postal Service and 1665 were randomized to standard of care. Randomization was performed by random number generation selecting from a list of de-identified patient study identification numbers. No clinical or demographic information was included in the patient lists. Sample sizes were selected to provide at least 80% power to detect intervention effects for vaccination rates of 11.6% in controls and 20% in intervention patients (pre-study estimates). Specifically, the study would have 83% power in the personal health record users and 93% in the nonpersonal health record users.

## Intervention

Between April 1, 2011, and May 15, 2011, patients in the intervention groups received an informational packet regarding shingles and the herpes zoster vaccine through the electronic medical record or US Postal Service mail on the basis of activated personal health record status. Patients were instructed to contact the clinic if they were interested in receiving the herpes zoster vaccine. If they had already received the herpes zoster vaccine, they were asked to contact the clinic to have their medical record updated. A pharmacist was contacted once interest from a patient was expressed. The pharmacist performed a review of the patient's medical record to confirm the herpes zoster vaccine was indicated and no contraindications existed. In either instance, the patient was notified of eligibility to receive the herpes zoster vaccine. If indicated, a prescription for the herpes zoster vaccine was mailed to the patient with instructions on how to obtain the vaccine, a list of community pharmacies known to stock the vaccine, and a letter to the pharmacist requesting fax confirmation once the vaccine was administered. In addition, the time spent by the pharmacist reviewing medical charts was tracked to estimate how much physician time could be saved.

## Outcomes and Follow-up

If confirmation was received from the pharmacy or if a patient notified the clinic that they already had received the vaccine, the patient's electronic medical record was updated. Six

months after the intervention, a second electronic medical record report was generated to determine the change in vaccination rate of both the intervention and control groups. Because a herpes zoster vaccine prescription is only valid for 30 days after the written prescription per Ohio law, patients in each intervention group were contacted to inquire about the herpes zoster vaccination status if no confirmation from the pharmacy was received within this time frame. An additional prescription was mailed if the prescription expired and the patient was still interested in vaccination.

### Statistical Analysis

Chi-square tests were used to compare the proportion of patients receiving the herpes zoster vaccine in the intervention and control groups within each personal health record population. The 2 comparisons were each evaluated at the Bonferroni corrected significance level of $\alpha = 0.025$ to control for multiple comparisons. Risk ratios with asymptotic 95% confidence intervals were calculated for each population. A secondary analysis compared the 2 intervention effects. Because personal health record activation status was not randomized, the 2 intervention effects could not be compared under the randomization assumption of balanced groups. Therefore, adjustments for demographic covariates were performed using a logistic regression model fit to vaccination status. The model included main effects and the interaction of personal health record status and intervention status, and adjusted for the covariates age, sex, race, and insurance status. The personal health record by intervention interaction was tested using a likelihood ratio test comparing the model with and without the interaction term.

## RESULTS

The electronic medical record identified 2981 patients who were greater than 60 years of age. Of those identified, 392 patients had already received the herpes zoster vaccine and were therefore excluded before randomization. The sample size consisted of 2589 patients: 674 with activated personal health record status and 1915 without.

Patient demographics are reported for the intervention and control groups within each randomization population in Tables 1 and 2. The only significant difference was for sex in the personal health record population ($P = .02$).

Overall, 65 patients responded to the initial inquiry: 53 patients from the personal health record group and 12 patients from the nonpersonal health record group. Of the patients in the personal health record group, 29 underwent a full chart review by the pharmacist (28 patients received a herpes zoster vaccine prescription and 1 patient had a contraindication), 15 responded to state they had already received the vaccine, 3 self-reported a contraindication, and 6 did not want to participate in the study. Of the patients in the nonpersonal health record group, 9 underwent a full chart review by the pharmacist (9 patients received a herpes zoster vaccine prescription, and 0 patients had a contraindication), 1 responded to state he/she had already received the vaccine, 1 self-reported a contraindication, and 1 did not want to participate in the study. There were 6 US Postal Service mailings returned as nondeliverable mail if the letter was sent to a previous address of record or the patient was deceased. The second electronic medical record—generated report showed 48 herpes zoster documentations in the personal health record group (after the intervention, 15 were excluded who self-verified they already received the vaccine and the chart was updated, and 33 received new herpes zoster vaccinations) and 14 herpes zoster documentations in the nonpersonal health record group (after the intervention, 1 was excluded who self-verified he/she already received the vaccine and the chart was updated, and 13 received new herpes zoster vaccinations) (Figure 1).

Within both personal health record and nonpersonal health record patient populations, vaccination rates at the end of the study were significantly higher for the intervention group than the control group. In the personal health record population, 13.2% of the intervention group had a documented vaccination compared with 5.0% of controls (relative risk, 2.7; 95% confidence interval, 1.6–4.5; $P = .0001$). In the nonpersonal health record population, the vaccination rates were 5.2% in the intervention group and 1.8% in the control group (relative risk, 2.9; 95% confidence interval, 1.6–5.5; $P = .0007$) (Table 3).

The outcome of the logistic regression interaction likelihood-ratio test revealed that the 2 intervention effects did not differ significantly ($P = .99$). The total time required by a pharmacist to review the medical charts and assess whether the herpes zoster vaccine was clinically indicated was 408 minutes (mean time per patient was ~11 minutes). In total, the pharmacist updated the immunization record for 16 patients who self-verified that they had already received the herpes zoster vaccine and updated the electronic medical record to include the specific contraindication for 5 patients.

## DISCUSSION

We found that using an electronic medical record to identify patients who were eligible to receive the herpes zoster vaccine and contacting them through standard mail or personal health record resulted in a higher herpes zoster vaccination rate when compared with a usual care office visit. Using an electronic medical record—based personal health record within a patient-centered medical home to increase vaccination rates may be an effective strategy to help reform our primary care system to emphasize preventative health care.[20] In addition, the National Committee for Quality Assurance, a recognized organization in cultivating patient-centered medical home standards aimed to reduce health care—associated costs and increase patient care, reinforces the use of an electronic medical record and enhanced access to health care.[21] The incorporation of a pharmacist in a patient-centered medical home can serve as an additional health care provider and offers unique services to the patient-focused collaborative care, such as ensuring the safety and appropriateness of vaccines for patients after an electronic medical record review. A pharmacist also can confirm that medication-related data, vaccinations, allergies, and contraindications are up-to-date and accurate within an electronic medical record to expedite primary care workflow.[22] Above all, the added value of a pharmacist in a patient-centered medical home can help carry out preventative health care activities and offers another approach to achieve a successful health care reform.[23]

A personal health record may represent a valuable way to shift away from the usual care focus to the prevention of acute and chronic complications. Even though the adoption rate in our study for patients using the personal health record was 26%, more patients responded through the personal health record compared with standard mail, which suggests that reaching out to patients using health information technology may be a practical way to increase preventative health care. Personal health record users may be more motivated to follow healthcare recommendations, which may be a reason the personal health record users had a higher overall vaccination rate. Yet, the intervention effects for the personal health record and nonpersonal health record patient populations were both statistically significant. This may suggest that it was the extra time communicating outside of a face-to-face office visit that led to the increased vaccination rates. This may have been the case for the patients who did not get a pharmacist chart review but had a documented herpes zoster vaccine documented on the second electronic medical record report. Perhaps the extra communication prompted the patient to reach out during an upcoming physician visit.

These results are consistent with the recent study by Hoffman et al.[24] After the electronic medical record created a registry of individuals due for colorectal cancer screening, study subjects were mailed information on colorectal cancer screening along with an at-home guaiac-based fecal occult blood test collection kit. A clinic visit was not required in this intervention. After 3 months, there was a statistically significant increase in the colorectal screening rate compared with the usual care control group.[24]

In addition, the incorporation of a pharmacist to the health care team was an integral part of our study. The pharmacist played a vital role regarding patient safety, updating immunization and contraindication information, and decreasing the workload of the physician. The pharmacist spent approximately 11 minutes per patient reviewing patient charts for herpes zoster vaccination contraindications. Because face-to-face patient-provider interactions range from 20 to 40 minutes, providers may not always have the time to review the patient's chart for herpes zoster vaccination contraindications. As a result, using a pharmacist in patient-focused collaborative care may create extra time for physicians to spend in an office visit or on other aspects of patient care, while improving preventative health services provided by the physician practice.

We also found that there was a major gap between vaccine administration and an updated medical chart reflecting the newly acquired herpes zoster vaccination. Many patients had already received the herpes zoster vaccine yet had no documentation in the electronic medical record to confirm vaccine administration, most likely because of the logistics of receiving the vaccine. Although this may be the case for other immunizations such as influenza and pneumococcal, an approach to fix this gap to reduce duplicate vaccinations is warranted.

### Study Limitations

There were several limitations of this study other than being conducted in a single setting and using a single electronic medical record. The total intervention response rate was only 9% (46/500), which may compromise the internal validity. After study completion, the second electronic medical record report generated to determine the change in vaccination rate showed more vaccinations in the intervention groups compared with the raw data recorded during the study. A reason for this finding may be that intervention patients who received the informational packet regarding shingles were possibly prompted to inquire about the herpes zoster vaccine during an office visit. Another limitation of this study is the gap between the vaccine administration and the updated medical chart reflecting the newly acquired herpes zoster vaccination. Because several patients from both intervention groups had already received the herpes zoster vaccine, the pool of eligible patients was reduced. Lastly, the US Postal Service mailings returned as nondeliverable mail also reduced the number of eligible patients in the nonpersonal health record intervention group.

## CONCLUSIONS

Communication outside of face-to-face office visits, by both personal health record electronic message and information by mail, can improve herpes zoster vaccination rates and may be an effective strategy for improving other components of preventative health care compared with standard care. In addition, using a pharmacist as part of a patient-centered medical home may facilitate team-based healthcare by increasing patient safety and decreasing physician workload. More research is needed to explore the use of other electronic medical record functions aimed to improve preventative health care and to evaluate the cost-effectiveness of this intervention.

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## CLINICAL SIGNIFICANCE

- Electronic medical record—based communication with patients can improve herpes zoster vaccination rates compared with standard care.
- Using an electronic medical record—based personal health record for patient-based population management outside of an office-based, face-to-face visit may be an effective strategy for improving other preventative health care measures.
- A clinical pharmacist can confirm that medication-related data, vaccinations, allergies, and contraindications are up-to-date within an electronic medical record to expedite workflow, ensure patient safety, and decrease physician workload.

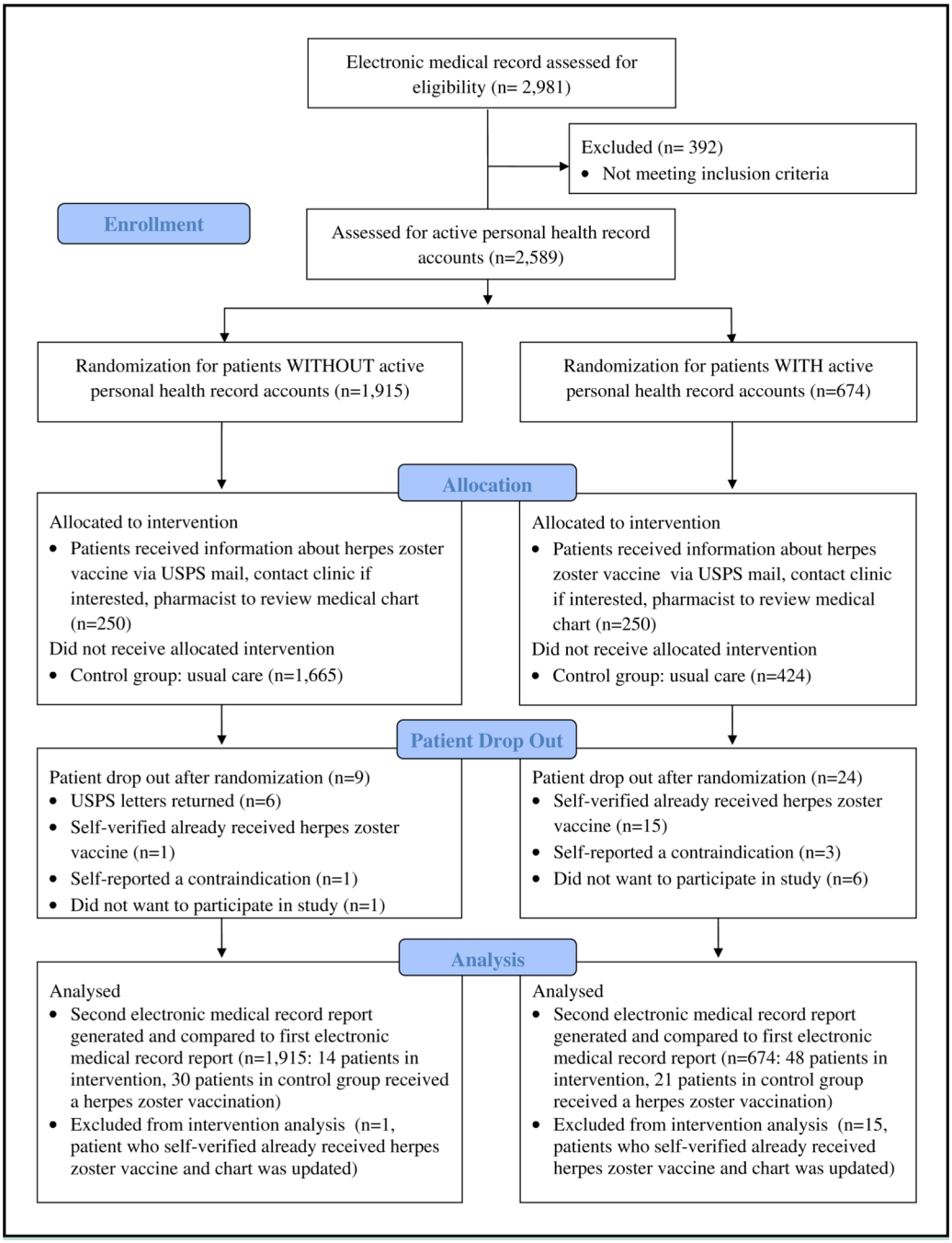


**Figure 1.**
Flow diagram. USPS = US Postal Service.

## Table 1

Personal Health Record Patient Baseline Characteristics, Mean (Standard Deviation) or n (%)

| Characteristic | Intervention (n = 250) | Control (n = 424) | *P* |
|---|---|---|---|
| Age | 69.8 (8.3) | 68.6 (7.9) | .09 |
| Sex, female | 119 (48%) | 242 (57%) | .02 |
| Race | | | .10 |
| White | 217 (87%) | 372 (88%) | |
| African American/black | 14 (6%) | 36 (8%) | |
| Asian | 7 (3%) | 5 (1%) | |
| Other | 12 (5%) | 11 (3%) | |
| Insurance | | | .40 |
| Private | 112 (45%) | 205 (48%) | |
| Medicare | 129 (52%) | 210 (50%) | |
| Medicaid | 6 (2%) | 4 (1%) | |
| Self-pay/other | 3 (1%) | 5 (1%) | |

## Table 2

Nonpersonal Health Record Patient Baseline Characteristics, Mean (Standard Deviation) or n (%)

| Characteristic | Intervention (n = 250) | Control (n = 1665) | *P* |
|---|---|---|---|
| Age, y | 74.4 (10.0) | 74.0 (9.8) | .49 |
| Sex, female | 146 (58%) | 932 (56%) | .47 |
| Race | | | .97 |
| White | 183 (73%) | 1203 (72%) | |
| African American/black | 51 (20%) | 344 (21%) | |
| Asian | 4 (2%) | 33 (2%) | |
| Other | 12 (5%) | 85 (5%) | |
| Insurance | | | .33 |
| Private | 59 (24%) | 392 (24%) | |
| Medicare | 161 (64%) | 1123 (67%) | |
| Medicaid | 17 (7%) | 71 (4%) | |
| Self-pay/other | 13 (5%) | 79 (5%) | |

## Table 3

Primary End Point: Vaccinated at Study Completion, n (%)

| Patient Group | Intervention | Control | Relative Risk (95% CI) | *P* |
|---|---|---|---|---|
| Personal health record | 33/250 (13.2%) | 21/424 (5.0%) | 2.7 (1.6–4.5) | .0001 |
| Nonpersonal health record | 13/250 (5.2%) | 30/1665 (1.8%) | 2.9 (1.6–5.5) | .0007 |

CI = confidence interval.