

Effect of the Frequency of Delivery of Reminders and an Influenza Tool Kit on Increasing Influenza Vaccination Rates Among Adults With High-risk Conditions

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Objective: To evaluate the incremental effect of a second client reminder postcard or an influenza tool kit targeted toward employers on increasing influenza vaccination rates among adults age <65 years at high risk for complications from influenza illness.

Methods: In this demonstration study, enrollees of 3 managed care organizations (n = 8881) were randomized at the employer level into 4 arms: 1 postcard, 2 postcards, 1 postcard + tool kit, and 2 postcards + tool kit. The postcards and tool kits were mailed during the fall of 2001, and their effect on influenza vaccination rates was assessed through a survey.

Results: Compared with a single postcard, 2 postcards increased vaccination rates by 4 percentage points (adjusted relative risk = 1.05; $P < .05$) among persons aged 50 to 64 years but did not have any effect among younger adults. Older adults had a greater burden of disease and reported more favorable knowledge and attitudes toward the influenza vaccine. The influenza tool kit did not appear to have any incremental effect on vaccination rates.

Conclusions: Our findings underscore the necessity of evaluating the effectiveness of interventions in different population subgroups and of identifying factors that modify the effectiveness of interventions. Rigorous assessment of intervention effectiveness in managed care settings will enable decision makers to optimize use of scarce healthcare dollars for improving the health and well-being of enrollees.

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There is insufficient evidence of efficacy to recommend that client reminders be used alone to increase influenza vaccination among persons with high-risk conditions.¹ Interventions to increase client demand in combination with provider-based interventions or interventions to increase access to vaccination services have been reported to increase vaccination among such persons.¹ However, studies are needed to resolve several issues, including the relationship between frequency of reminders and effectiveness, and identification of the least and most effective combinations of services in multicomponent interventions.² In this paper, we report results from a demonstration project where the incremental effectiveness of a second client reminder postcard or an influenza tool kit was assessed.

METHODS

Study Population

The target population comprised Colorado residents aged 18 to 64 years with high-risk conditions who were enrolled in any of the 3 participating managed care organizations (MCOs) as of September 1, 2001. The product type was HMO for 2 MCOs, and both HMO and preferred provider organization (PPO) for the third. High-risk conditions among commercially insured adults were identified by using *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* codes in insurance claims data, reviewed in September 2001 for the period from May 1, 2000, to April 30, 2001.³ The claims algorithm required 1 encounter in an acute-care hospital setting or 2 encounters in other settings for any of the following conditions: diabetes, chronic cardiovascular disease, chronic pulmonary disease, immunosuppression, chronic renal failure, or hemoglobinopathy. Pharmacy data also were reviewed to identify diabetic patients (insulin or oral hypoglycemics/antihyperglycemics dispensed at least once during the 1-year period).

Interventions

The postcards, mailed under each MCO's logo, included statements that flu shots were strongly recommended for persons with certain high-risk conditions and that "it's time for your flu shot, it could save your life." Enrollees were instructed to call their primary

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care physician (or influenza vaccination clinic sponsored by 1 of the MCOs). The first postcard was mailed during the last week of October 2001, and the second postcard was mailed a month later.

The influenza tool kit, mailed to employers on October 12, 2001, included (1) educational messages for employers, including the business case for influenza vaccination; (2) flyers, posters, a newsletter article, and e-mail and payroll stuffer communications to encourage vaccination; and (3) tips and a check list for implementing work site, employer-sponsored influenza vaccination clinics.

Randomization

Because a large number of employers contract with the MCOs and because there was concern about the cost effectiveness of sending tool kits to employers with few eligible persons, we excluded employers with 3 or fewer high-risk persons (subscribers and dependents) enrolled in the 3 MCOs. This reduced the number of employers under consideration by 80% but resulted in a loss of only 14% of the persons with high-risk conditions. Out of 611 employers with 4 or more eligible persons located in Colorado, 505 were selected using simple random sampling.

The 505 employers were randomly allocated to 1 of the following arms: 1 postcard, 1 postcard + tool kit, 2 postcards, or 2 postcards + tool kit. For the 16 employers with 126 or more persons at high risk, 125 persons were randomly selected so that a few extremely large employers did not overshadow the findings. For the remaining 489 employers, all persons with high-risk conditions were selected. Persons in the 4 arms totaled 8881.

Evaluation

Managed care organization administrative databases were used to obtain information on age, sex, subscriber/dependent status, and MCO product type. Data on receipt of influenza vaccination in September 2001 through March 2002 and other variables were collected through a bimodal mail-telephone survey conducted during summer 2002. The survey was administered to 6657 persons who were still enrolled in the MCOs as of the time of the survey. The survey administration rates were similar across the 4 arms, ranging from 74% to 76%. The survey response rate was 60% (3996/6657).

Statistical Analysis

Because the interventions were assigned at the employer level, adjustment for potential clustering of responses within employers was performed by fitting logistic regression models with generalized estimating

equations using STATA, Version 8.2.^{4,5} Adjusted odds ratios were transformed to adjusted relative risks.⁶

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RESULTS

The distributions of age, sex, ethnicity, self-report of high-risk condition, knowledge and attitudes toward influenza vaccination, and receipt of prior influenza vaccination were similar across the 4 arms (**Table 1**). However, differences were noted in the distributions of race, marital status, education, subscriber status, MCO, PPO product, and availability of influenza vaccinations at the work site.

Among adults aged 18 to 64 years, 69% (2753/3996) received an influenza vaccination during the 2001-2002 season. Because regression modeling indicated that age modified the effectiveness of the intervention, we present results separately for the 18 to 49 and 50 to 64 age groups.

Adjusted analysis shows that a second postcard or the influenza tool kit did not significantly increase influenza vaccination rates among persons aged 18 to 49 years (**Table 2**). For persons aged 50 to 64 years, those in the "2 postcard" or "2 postcard + tool kit" arms had a 6 percentage point higher vaccination rate than those receiving a single postcard (adjusted relative risk = 1.08; *P* < .05).

Because the tool kit did not appear to increase the rate of vaccination (**Table 2**), we repeated the analysis by collapsing the 4 arms into 2 groups (**Table 3**). Among persons aged 50 to 64 years, the 2-postcard group had a 4 percentage point higher vaccination rate than the 1-postcard group (adjusted relative risk = 1.05; *P* < .05).

To assess why age modified the effect of the intervention, we compared characteristics of persons in the 2 age groups. Older persons had claims evidence of more disease: 16% of 50- to 64-year-olds had 2 or more high-risk conditions, compared with 7% of 18- to 49-year-olds (*P* < .001). Older adults also reported more favorable knowledge and attitudes toward influenza vaccine (**Table 4**).

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DISCUSSION

Our study showed that a second postcard reminder increased influenza vaccination by 4 percentage points among 50- to 64-year-old persons with high-risk conditions, but did not have any effect among younger adults. Influenza tool kits mailed to employers did not have any incremental effect among persons who were mailed single or multiple postcard reminders.

Table 1. Comparison of Study Arms, Colorado Demonstration Project, 2001-2002

Variable	1 Postcard (n = 929)	1 Postcard + Tool Kit (n = 890)	2 Postcards (n = 1138)	2 Postcards + Tool Kit (n = 1039)	P
Median age, y	52	52	52	52	NS
Male, %	45	44	45	42	NS
Subscriber, %	69	63	67	74	<.001
MCO, %					
A	26	12	12	13	<.001
B	13	17	23	13	
C	61	70	65	74	
PPO, %	12	8	9	10	<.01
Flu shots are safe, % [*]	83	83	84	84	NS
Flu shots protect from flu, % [*]	71	75	75	76	NS
Flu shots may cause flu, % [†]	34	32	35	31	NS
Person my age should get a flu shot, % [*]	76	78	80	76	NS
Person in my health condition should get a flu shot, % [*]	80	81	82	82	NS
Prior flu shot, %	81	81	82	83	NS
Self report of ≥1 high-risk condition, %	85	85	83	84	NS
Flu shots offered at work site, %	60	46	54	45	<.001
Education, %					
≤High school	29	37	29	29	<.001
Some college	38	33	37	31	
College graduate	17	15	14	14	
Beyond college graduate	16	16	20	27	
White, %	89	93	90	93	<.05
Hispanic, %	20	19	18	16	NS
Married, %	69	74	74	69	<.01
Survey completed by mail, %	78	80	77	78	NS

NS indicates not statistically significant; MCO, managed care organization; PPO, preferred provider organization.

^{*}"Agree strongly" and "agree somewhat" response categories were coded as yes. [†]"Do not agree or disagree," "disagree somewhat," and "disagree strongly" responses were coded as no.

Our study had certain potential limitations. First, we used self-report to ascertain vaccination status. However, self-report of influenza vaccination has been shown to be a reliable and valid measure.^{7,8} Any misclassification in vaccination status is likely to be non-differential across the study arms, which would result in underestimation of the intervention effect.⁹ Second, the effect of 2 postcards could have been distorted because of attrition due to disenrollment, nonresponse, or incomplete information. However, because attrition rates were similar in the study groups, the effect estimator will be unbiased.¹⁰ Third, it could be asserted that, although the findings were internally valid, the

results may not apply to persons who were excluded because of attrition. Excluded persons were similar to included persons with regard to distributions of plan, product type, and sex, but the age distribution differed (persons aged 50-64 years comprised 55% of the included vs 46% of the excluded adults; $P < .001$). Nonetheless, because we stratified our analysis by age, bias because of differing age distributions was minimized. Fourth, the 2001-2002 influenza vaccination season was characterized by vaccine supply problems.¹¹ Although it was recommended that priority be given to persons with high-risk conditions,¹¹ it is possible that the staggered or delayed supply of vaccine may

Table 2. Effect of Interventions, Colorado Demonstration Project, 2001-2002

Age Group and Intervention	Crude Vaccination Rate	Adjusted Odds Ratio (95% CI) [*]	Adjusted Vaccination Rate (%) [†]	Adjusted Relative Risk (95% CI) [‡]
18-49 y				
1 postcard	60% (241/400)	1.00 (reference)	59	1.00 (reference)
1 postcard + tool kit	57% (205/360)	0.92 (0.65, 1.32)	58	0.97 (0.87, 1.09)
2 postcards	54% (261/479)	0.83 (0.60, 1.16)	56	0.94 (0.84, 1.05)
2 postcards + tool kit	59% (241/406)	1.04 (0.73, 1.49)	60	1.01 (0.91, 1.13)
50-64 y				
1 postcard	73% (387/529)	1.00 (reference)	71	1.00 (reference)
1 postcard + tool kit	78% (412/530)	1.26 (0.88, 1.81)	75	1.05 (0.97, 1.14)
2 postcards	78% (512/659)	1.42 (1.02, 1.98) [‡]	77	1.08 (1.00, 1.15) [‡]
2 postcards + tool kit	78% (494/633)	1.44 (1.03, 2.03) [‡]	77	1.08 (1.01, 1.16) [‡]

CI indicates confidence interval.

^{*}Adjusted using logistic regression with generalized estimating equations.⁵ Covariates in the final parsimonious model were study arm, age, sex, marital status, subscriber status, managed care organization, work-site flu shots, and receipt of prior flu shot (complete information on these covariates was available for 3168 persons). Intracluster correlation coefficients were 0.0017 and -0.0015 for the 18 to 49 and 50 to 64 age groups, respectively.

[†]Adjusted using the method of Flanders and Rhodes.⁶

[‡]*P* < .05.

Table 3. Effect of 2 Postcards Compared With 1 Postcard, Colorado Demonstration Project, 2001-2002

Age Group and Intervention	Crude Vaccination Rate	Adjusted Odds Ratio (95% CI) [*]	Adjusted Vaccination Rate (%) [†]	Adjusted Relative Risk (95% CI) [‡]
18-49 y				
1 postcard [§]	59% (446/760)	1.00 (reference)	59	1.00 (reference)
2 postcards [§]	57% (502/885)	0.96 (0.75, 1.22)	58	0.99 (0.91, 1.07)
50-64 y				
1 postcard [§]	75% (799/1059)	1.00 (reference)	73	1.00 (reference)
2 postcards [§]	78% (1006/1292)	1.29 (1.02, 1.64)	77	1.05 (1.00, 1.10)

CI indicates confidence interval.

^{*}Adjusted using logistic regression with generalized estimating equations (see Table 2, second footnote).

[†]Adjusted using the method of Flanders and Rhodes.⁶

[§]"1 postcard" and "1 postcard + tool kit" arms combined.

^{§§}"2 postcards" and "2 postcards + tool kit" arms combined.

^{||}*P* < .05.

have attenuated the effect of the intervention. Finally, our regression model adjusted for differences in the availability of work-site influenza vaccinations across the study arms, which could have masked the effect of tool kit-motivated work-site vaccination clinics. However, excluding the work-site vaccination variable from the model did not alter our finding that the tool kit was ineffective. If an employer received a tool kit in

October, it would likely be too late to implement a vaccination clinic that year.

The observation that 2 postcard reminders were effective among older persons may be because of fewer barriers in the form of negative attitudes toward and beliefs about influenza vaccination.¹² Two postcard reminders are likely to be cost effective, largely due to avoidance of influenza-associated productivity losses.

Table 4. Knowledge and Attitudes of Study Participants Toward Flu Shots, Colorado Demonstration Project, 2001-2002

Knowledge or Attitude	Percentage	
	Persons aged 18-49 y (n = 1645)	Persons aged 50-64 y (n = 2351)*
Flu shots are safe	80	86
Flu shots protect from flu	70	77
Flu shots may cause flu	37	30
Person my age should get a flu shot	65	86
Person in my health condition should get a flu shot	74	86
Prior flu shot	76	85

* $P < .001$ for all.

The finding that the influenza tool kit did not have an incremental effect might be because employers did not use the tool kit or because the tool kit may be adding little to the postcard messages. However, we caution against extrapolating our findings to interventions involving tool kits with more intensive outreach efforts. Also, our findings may not be generalizable to populations with lower vaccination rates.

Our findings have several implications. First, mailing tool kits to employers did not have any incremental effect on vaccination rates. Developing methods to more effectively encourage employers to use such tool kits merits attention. Second, 2 postcards produced an increase in vaccination among persons aged 50 to 64 years but not among younger adults. This observation underscores the fact that interventions need to be evaluated in different population subgroups. Further research is needed to identify factors that modify effectiveness. With 170 million enrollees in MCOs, efforts to further improve preventive service delivery by MCOs are laudatory, although limited resources should not be committed to interventions before rigor-

ous evaluation proves them effective.

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