Is the Influenza Vaccination Rate of Elderly Patients Affected by Raising the Vaccination Rate of the Staff at their Primary Health Care Clinics?

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ABSTRACT:
Background: Influenza vaccination of community-dwelling elderly is widely recommended. Observational studies have shown a strong association between physicians' personal vaccination status and their reported level of recommendation to patients and possibly their patients' actual vaccination. No published trials have examined whether increasing vaccination rates of primary care staff raises vaccination among their patients. Proof of a positive effect would support the notion that vaccinating health care workers benefits their patients.

Objectives: To examine whether an intervention to increase staff vaccination also increases vaccination of their patients aged 65 and over.

Methods: A trial examining an intervention aiming to raise staff immunization rates was performed in primary care community clinics in the Jerusalem area. The study population comprised the staff of 13 randomly chosen intervention clinics during the season of 2007–2008, with another 14 clinics serving as controls. The intervention resulted in a staff vaccination rate of 52.8% compared to 26.5% in the control clinics (66.1% and 32.2% among physicians). No intervention was directed at the patients. Data on patient vaccination and other patient characteristics were extracted from the health funds' computerized databases.

Results: The percentage of patients vaccinated during the intervention season was 57.8% in both intervention and control groups, reflecting an increase of 14.4% compared to the previous season in the intervention clinics and of 13.4% in the control clinics. Logistic regression demonstrated a statistically significant association between intervention and patient vaccination with an odds ratio of 1.10 (95% confidence interval 1.03–1.18). However, analysis adjusting for clustering did not show a significant association.

Conclusions: Increasing influenza vaccination of the medical staff did not substantially increase patient vaccination. These results do not show any patient benefit from staff vaccination in primary care.

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KEY WORDS: influenza vaccination, health care workers, elderly, primary health care, health behavior

Immunization against influenza has been shown to reduce morbidity and mortality among the elderly [1,2], including those living in the community [3,4]. Vaccination given annually is therefore widely recommended [5].

Studies have shown both the importance of a physician's recommendation for patient vaccination in the community [6,7] and an association between physicians being immunized and their reported recommendations to their patients [8,9]. We recently demonstrated a positive, though weaker, association between actual patient vaccination and their primary care physician's personal vaccination status and knowledge [10]. It appears therefore that an intervention program that substantially raises staff influenza immunization may be a means to increase immunization rates among their patients. As there is insufficient proof for effectiveness of most interventions to improve population vaccination coverage [11], this method could prove to be an important contribution to efforts to increase population vaccination rates.

Health authorities and organizations recommend routine influenza vaccination of health care workers [12,13] and support for mandating such vaccination is growing [14]. If increasing the vaccination rate among primary health care workers is shown to increase patient vaccination, this would substantiate the recommendation for staff vaccination.

A program trial examining an intervention aimed at raising staff immunization rates was performed during the season of 2007–2008 in primary care community clinics of the largest health management organization in the Jerusalem area (Clalit Health Services) [15]. The intervention was highly effective in increasing vaccination rates among the staff; the influenza immunization rate after intervention was 52.8% (86/163) in the intervention group compared to 26.5% (48/181) in the control group (among physicians the rates were 66.1% and 32.2% respectively). Multivariate analysis demonstrated a highly significant independent association between intervention and immunization of staff with an odds ratio of 3.51.

The present paper attempts to examine whether this highly effective intervention, directed only at staff vaccination, was also effective in increasing patient vaccination.

PATIENTS AND METHODS

The study compares the vaccination of patients aged 65 years and over, not living in institutions or sheltered housing and registered with physicians at the randomly selected 13 clinics where staff intervention was performed, with that of patients registered at the 14 control clinics [15]. No intervention was directed at any of the patients, who – as in all the HMO clinics – received routine publications recommending vaccination. All patients had health insurance (universal in Israel). Vaccinations for this age group were easily available and given at the local clinics at no cost.

Data on all study patients were extracted from HMO computerized databases. These included influenza immunization status for the intervention year (2007–08) and previous year (2006–07), age, gender and chronic disease (ischemic heart disease, congestive heart failure, diabetes, asthma or chronic obstructive pulmonary disease), having complementary insurance, religiosity (according to clinic location) and marital status.

The sample was based on the random allocation of clinics performed for the health care worker intervention trial [15]. Power calculations for the present study, with patients over 65 years old in the selected clinics as subjects, were based on a cluster intra-class correlation coefficient of 0.019 imputed from the previous year's vaccination data. The chosen sample size was calculated to have a power of 80% for detection of an increase in vaccination rates from an expected rate of 0.50 to a rate of 0.58 with a significance level of 0.05 (and 90% power for an increase to 0.60).

Data were analyzed using SPSS (version 15.0 for Windows) and WinPepi statistical programs for epidemiologists [16]. Data were examined at both the clinic and individual level. Mean clinic vaccination rates were compared using Welche's t-test. Bivariate and logistic regression analyses were performed for individual level data. First-degree interactions with intervention and immunization were examined. Analyses controlling for intra-cluster correlation, using the Rao-Scott procedure, were performed for the total data and separately according to the patient's previous year vaccination status. The study was approved by the Helsinki ethics committee of the Meir Medical Center, Kfar Saba.

RESULTS

Of the 11,755 patients in the intervention clinics at the beginning of the study, 420 (3.6%) were excluded from the study

HMO = health management organization

either because they died or because they left the clinics or moved to sheltered housing before the end of the vaccination period. Of the 15,600 starting the study in the control clinics, 503 (3.2%) were excluded.

Comparison of patient characteristics in the two sets of clinics [Table 1] demonstrates that the intervention group had relatively more males and patients with chronic disease, and fewer patients aged over 75, who were ultra-Orthodox, with complementary insurance, or immunized against flu in the previous season. The percentage of patients vaccinated during the intervention season was 57.8% in both the intervention and control clinics (6557/11,335 and 8722/15,097 respectively). This was an increase of 14.4% compared to the previous season in the intervention clinics and of 13.4% in the control clinics.

Since the trial was based on randomized clusters (clinics), an analysis controlling for intra-cluster correlation (intra-class correlation coefficient = 0.015) was performed (using the Rao-Scott procedure); the odds ratio (expressing the difference in immunization between the intervention and control groups) of 1.00 had an adjusted 95% confidence interval of 0.82–1.23, compared with 0.94–1.04 when the effect of clustering was not considered. Power calculations based on the clustered data revealed a power of 94% to detect a risk ratio of 1.15 and 80% to detect a ratio of 1.12 (assuming a proportion of 0.58 in the controls).

The intervention clinics' vaccination rates ranged from 44.1 to 73.1% with a mean of 58.1% compared with 49.9 to 65.6% in the control clinics with a mean of 56.7%. The 1.4% difference between these means was far from significant, $P = 0.589$ (Welche's t-test) with a CI of -3.7 to 6.4%. The absolute increase in intervention clinics ranged from 8.7 to 22.3% (mean 14.2%) and 7.6 to 20.8% in control clinics (mean 13.7%). The 0.5% difference between the mean increases was again far from significant ($P = 0.745$ with 95% CI -2.6 to 3.6%).

Logistic regression analysis [Table 2] demonstrated a statistically significant independent association between intervention and immunization, with an odds ratio of 1.10 (95% CI 1.03–1.18). The strongest independent predictor of immuniza-

CI = confidence interval

Table 1. Characteristics of patients in intervention and control clinics

Characteristic	Intervention (N=11,335)	Control (N=15,097)	Rate ratio (95% CI)
Vaccinated previous season	43.4% (4920)	44.7% (6743)	0.97 (0.95–1.00)
Male	42.7% (4840)	41.5% (6264)	1.03 (1.00–1.06)
Age 75+ (compared to 65–74)	48.4% (5483)	52.5% (7922)	0.92 (0.90–0.94)
Chronic disease	55.8% (6326)	52.9% (7983)	1.06 (1.03–1.08)
Complementary insured	64.7% (7335)	70.9% (10702)	0.91 (0.90–0.93)
Ultra-Orthodox	12.8% (1449)	17.2% (2590)	0.75 (0.70–0.79)
Married	54.8% (6215)	55.2% (8326)	0.99 (0.97–1.02)

Table 2. Associations with patient vaccination- logistic regression (n=26,432)*

Characteristic	Odds ratio	95% CI	P
Intervention clinic	1.10	1.03–1.18	0.003
Vaccinated previous season	23.81	22.05–25.70	< 0.001
Male gender	1.10	1.02–1.17	0.008
Age 75+	1.40	1.31–1.49	< 0.001
Chronic disease	1.33	1.25–1.42	< 0.001
Complementary insured	1.83	1.70–1.96	< 0.001
Ultra-Orthodox	1.03	0.95–1.13	0.457
Married	1.00	0.94–1.08	0.908

*A Hosmer-Lemeshow goodness of fit test for the model had a P value of 0.639.

tion in the model, with an odds ratio of 23.81 (22.05–25.70), was having been immunized in the previous year. There were also statistically significant associations with most of the other variables in the model. None of the variables in the model had significant interactions with intervention and immunization.

Since the previous year's vaccination status was by far the strongest independent predictor of immunization, and in order to adjust for clustering, we examined vaccination rates separately according to the previous year's vaccination status [Table 3]. Rates were slightly higher in the intervention clinics compared to the control clinics both in patients previously vaccinated and those who were not. The odds ratio was 1.16 (P = 0.040, 95% CI 1.00–1.33) among the previously vaccinated and 1.03 (P = 0.362, CI 0.96–1.11) in the not previously vaccinated. However, clustered data analysis (using the Rao-Scott procedure), presented in the same table, revealed that the association was very far from significant in both groups: P = 0.375 (CI 0.84–1.59) in the previously vaccinated and P = 0.695 (0.88–1.22) in the not previously vaccinated.

DISCUSSION

Our study demonstrates that an effective intervention program aimed at increasing influenza vaccination rates among primary health care workers had, if any, a very small effect on vaccination rates among their patients.

Multivariate analysis demonstrated, as expected, that the strongest predictor by far of vaccination was having been vaccinated for the previous season, with an odds ratio of 23.8. The model showed a small (odds ratio 1.10) but statistically significant increase in vaccination among the patients of clinics where intervention to increase staff vaccination was performed. However, clustered data analysis obligated by the trial methodology, controlling for previous season vaccination, demonstrated that the association of intervention and patient vaccination was far from significant.

Regression analysis demonstrated positive associations between being vaccinated and a number of other characteristics (male gender, age 75 and over, being chronically ill, and having complementary insurance). These associations were independent of the association with the previous year's vaccination which would already have included the positive association between these characteristics and vaccination [10]. These demonstrated associations were probably due to the greater recovery, in patients with these characteristics, from the effect of the previous year's derogatory media publications.

Recovery from this media scare, which had caused a nationwide reduction in vaccination rates [17], most probably also explains most of the observed increase in patient immunization rates in both intervention and control clinics.

Previous studies have demonstrated the importance of physician recommendation for patient vaccination [6,7] and that physicians who receive influenza immunization recommend it more to their patients [8,9]. Their counseling may also be more effective because physicians' ability to motivate patients to adopt healthy habits can be enhanced by conveying their own healthy habits [18]. The small increase in patient vaccination rates in our study may be a weak echo of the large difference in physician vaccination rates [15], reflecting the previously demonstrated weak association (odds ratio of 1.08) between physician immunization and patient immunization [10].

The intervention, which was educational and motivational, was aimed at increasing staff vaccination and did not advocate patient vaccination. However, it may itself have had an unintended effect on increasing staff motivation to vaccinate patients. If so, even the possible small increase in patient vaccination rate may be attributed to this rather than to physician vaccination.

Table 3. Patient vaccination rates according to previous season's vaccination

Previous season vaccination	Intervention clinics	Control clinics	Odds ratio	Raw data		Clustered data*	
				95% CI	P	95% CI	P
No	31.1% (1996/6415)	30.4% (2541/8354)	1.03	0.96–1.11	0.362	0.88–1.22	0.695
Yes	92.7% (4561/4920)	91.7% (6181/6743)	1.16	1.00–1.33	0.040	0.84–1.59	0.375
Total	57.8% (6557/11,335)	57.8% (8722/15,097)	1.00	0.95–1.05	0.904	0.82–1.23	0.976

*Rao-Scott method

The widely accepted recommendation for routine influenza vaccination of health care workers [12-14] is based primarily on the assumption that, in addition to self-protection, immunizing health professionals is effective in protecting their patients from infected staff. Trials in long-term geriatric institutions have demonstrated that programs increasing staff immunization bring about a reduction in patient morbidity [19-22]. However, a Cochrane review [23] examining these studies pointed out methodological problems and concluded that there was no evidence from this research that vaccinating health care workers against influenza protects elderly people in their care. Those four trials [19-22] in geriatric institutions did not specifically examine the effect of increasing staff vaccination on patient vaccination. Comparison of the crude group data in these trials, which does not take into account previous years' vaccination or other potential confounders, does not point to such an effect; only in one [20] were patient vaccination rates clearly higher in the staff-vaccinated group, in one [19] they were lower, in one [22] they were similar, and in another [21] they were higher in only one of two years.

Demonstrating an increase in patient immunization secondary to staff intervention in our study would have provided missing evidence for the claim that immunizing primary care staff benefits their patients. The absence of a substantial effect leaves the issue unresolved.

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"What do we live for, if it is not to make life less difficult to each other?"

George Eliot (1819-1880), British novelist whose works are classics today. The most famous are *The Mill on the Floss*, *Silas Marner*, *Middlemarch*, and *Daniel Deronda*. Her books are set in provincial England and are well known for their realism and psychological insight. Her real name was Mary Ann Evans but she used a male pen name, she said, to ensure that her works were taken seriously