

Why do not patients receive influenza vaccine in December and January?[☆]

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Abstract

Background: Influenza vaccination levels in older patients have changed little since the mid-1990s. Despite frequent health care visits by a majority of older persons, many missed opportunities continue to occur.

Methods: Patients were eligible for the study if they were age 50 and older, had not received influenza vaccine during the current season and were making a scheduled visit to one of the 13 study sites in California, New York, or New Mexico for purposes other than vaccination. Through direct observation, we determined if office staff inquired about vaccination status, discussed vaccination, or both. We defined missed opportunities as failure to administer influenza vaccine to patients for whom it was indicated.

Results: Missed opportunities increased steadily from October to January ($P < 0.0001$), and were more common when there was no inquiry or discussion ($P < 0.00001$), among patients aged 50–64 ($P < 0.0001$) and in California and New Mexico ($P = 0.001$). A classification tree analysis revealed that lack of inquiry and week of visit contributed most to missed opportunities.

Discussion: Early in the vaccination season, missed opportunities were uncommon and specific inquiries into or discussion of vaccination did not appear necessary. In December and January, patients tended to be vaccinated only when vaccination was addressed during the visit. Efforts to remind patients about vaccination later in the vaccination season may be essential to achieving higher coverage in the U.S.

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1. Introduction

Influenza vaccination coverage among adults aged 65 and older in the U.S. increased rapidly in the late 1980s and early 1990s, but has remained between 60% and 68% since the mid-1990s [1]. After the announcement that the supply of

inactivated influenza vaccine available to the U.S. public for the 2004–2005 influenza season would be reduced by approximately one half [2], initial expectations of a serious shortage soon changed to concern about the country's inability to use even the limited supply [3].

Immunization rates could be improved by reducing the number of missed opportunities to immunize [4]. For example, a substantial proportion of unvaccinated patients report they did not know vaccination was necessary or did not receive a recommendation for vaccination from their providers [5]. Observations such as these have led to recommendations that health care professionals develop systems

[☆] This study was approved by the institutional review boards of the Centers for Disease Control and Prevention, University of California (San Diego), Presbyterian Hospital Systems and the University of Rochester.

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to remind patients and health care professionals when vaccinations are due, routinely review the vaccination status of patients at each visit, and educate patients about risks and benefits of vaccination [6]. However, data on the actual reasons patients who are or are not vaccinated are usually collected retrospectively from only patients [5,7] or providers [8] at times remote from the actual office visit. To better understand aspects of patient–provider encounters that affect the likelihood of missed opportunities, we used industrial engineering techniques [9] to collect information about interactions during medical visits occurring in the influenza vaccination season. In a previous study, we described the operational conditions that were associated with vaccination [9]. In this paper, we analyze how interactions with patients change and influence the uptake of vaccination as season progressed.

2. Methods

This study was approved by the institutional review boards of the Centers for Disease Control and Prevention, University of California (San Diego), Presbyterian Hospital Systems and the University of Rochester and was conducted from October 23, 2001 to January 31, 2002. To obtain geographic diversity, we conducted the study in a convenience sample of 13 primary care facilities in San Diego, California, Rochester, New York or New Mexico (four cities). Practices were chosen to mirror the demographics of the geographic areas (public and private, urban and rural). Six were federally qualified health centers (FQHC), one an FQHC look-alike, and the remainder medium to large private group practices. Patients 50 years of age and older were eligible for inclusion if they (1) were making routine scheduled visits at a time that influenza vaccine was available in the providers' offices, and (2) had not yet received influenza vaccine during the 2001–2002 vaccination season. Patients attending only for vaccination were excluded from analysis. A single observer approached patients as they registered, asked them if they had received influenza vaccine, and, if they had not been vaccinated, requested verbal consent to observe them throughout the remainder of their visit. Influenza vaccine was not mentioned in the verbal consent. A new patient was approached if the patient had already been vaccinated, refused to participate, or the observer completed the previous observation.

Patients were observed throughout their visit and data were collected using a workflow data acquisition tool (the observational checklist of patient encounters (OCPE) [9]). The OCPE is used to record key operational and time sequences related to clinical information decision support activities. We documented interactions regarding vaccination and classified these as: (1) inquiry (patient asked by provider or office staff if he/she has received vaccination during the current season), or (2) discussion (further conversation with the provider regarding influenza vaccination). Inquiries were sub-classified as to whether they occurred during registration, the pre-examination period (usually when vital signs were

taken, before provider's evaluation), or during the provider's evaluation. The receipt (or refusal) of influenza vaccine was also recorded. An encounter in which an eligible patient failed to receive vaccine was defined as a missed opportunity.

Chi-square tests were performed to determine associations between vaccination and observations made during the visit. Chi-square for linear trend was used to test for associations over time and inquiry regarding influenza vaccination and missed opportunities. Odds of receiving the influenza vaccine and 95% confidence intervals were calculated using EpiInfo 2000 software. To determine how these factors jointly influence the risk of missed opportunities for influenza vaccination, we first tried to fit a multivariate logistic model. To simplify the interpretation of the complex interaction of factors, we next modeled the data using classification trees.

We identified the characteristics of groups at higher risk of missed opportunities by constructing classification trees using the classification and regression tree (CART) program (Salford Systems, San Diego, California) [10]. Factors put into CART included week of vaccination, patient age, region, inquiry during registration, inquiry during pre-exam, inquiry during exam, and discussion with provider. Using binary recursive partitioning, CART first identifies the variable having the greatest predictive ability, and then uses that variable to divide the patient population into two groups or nodes. In this analysis, the predictive ability of each variable was defined as the ability to correctly classify patients who did not receive an influenza shot. This process is repeated until a maximal tree is grown. At this point, CART examines smaller trees obtained by pruning away branches of the maximal tree. Once the maximal tree is grown and a set of sub-trees is derived from it, CART determines the best tree by testing for error rates or costs. The final classification tree (model) was validated internally using CART's 10-fold validation procedure for testing the stability of each model. This process randomly assigns patients into 10 groups and develops a predictive model from nine of the 10 groups. The predictive model is then tested on the remaining group. The process is repeated for each of the remaining sub-samples and creates a method for checking the consistency of the findings reported in the final models.

3. Results

Of 666 observations, 246 patients had scheduled visits for reasons other than vaccination and 420 were unscheduled or for vaccination only. During the 246 visits, there were 95 (38.6%) missed opportunities. In univariate analysis, missed opportunities were significantly more common in January, in patients younger than 65, when there was no status inquiry or discussion regarding vaccination, and in San Diego and New Mexico (Table 1).

Missed opportunities increased significantly as the influenza vaccination season progressed (Fig. 1 and Table 2). Early in the vaccination season, most patients requested

Table 1
Association of missed opportunities with characteristics of visit (univariate analysis)

Characteristic	Number of missed opportunities/Number of observations in category (%)		Adjusted odds ratio
	Characteristic present	Characteristic not present	
Clinics in San Diego or New Mexico	87/200 (43.5%)	8/46 (17.4%)	3.66 (1.62–8.24)
Observation in January	47/83 (56.6%)	48/163 (29.4%)	3.13 (1.81–5.42)
Patient younger than 65	65/134 (48.5%)	30/112 (26.8%)	2.57 (1.50–4.41)
No inquiry or discussion ^a	54/84 (64.3%)	41/162 (25.3%)	5.31 (3.00–9.40)

^a Patient neither asked if he/she had received influenza vaccination by office staff or provider, nor was vaccination discussed with provider.

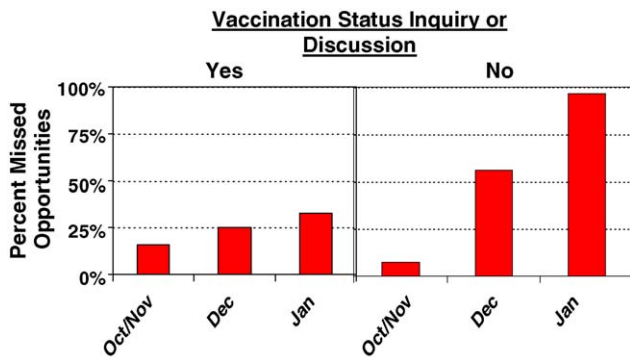


Fig. 1. Missed opportunities by month of vaccination and inquiry into or discussion of vaccination.

vaccination and missed opportunities were uncommon (8.3% of visits) when there were no queries. However, in visits in January in which there were no staff initiated queries, the proportion of missed opportunities was 96.8%. There was no significant change in the proportion of missed opportunities over time when the analysis was limited to visits in which there was an inquiry or discussion regarding vaccination. However, there was a small significant increase of missed opportunities over time among the subgroup of patients whose provider inquired about their vaccination status or discussed vaccination. For all months combined, there were fewer missed opportunities when there was inquiry or discussion by both pre-exam staff and the provider, compared to when the inquiry or discussion took place only during one of these times.

The multivariate logistic model results included several significant third order or higher interaction terms. The CART analysis (Fig. 2) confirmed that, before mid December, almost

all patients 65 and older received influenza immunization without any prompting from staff. After mid-December, the missed opportunity rate approached that seen early in the vaccination season only when both provider and staff inquired into or discussed vaccination. Variable importance was ranked as follows: inquiry during the pre-exam (ranked 100), the week of the visit (95), inquiry during the exam (87), age >65 (83), and state where the clinic was located (54). Discussion of vaccination by the provider was not ranked as high in importance as inquiry during any part of the visit.

4. Discussion

As the influenza vaccination season progressed, attention to immunization status decreased and missed opportunities to vaccinate increased despite an abundant supply of vaccine. Although the importance of continuing influenza vaccination into January has been alluded to by others [11], to our knowledge we are the first to document the problem and its contribution to lower vaccination rates.

The apparent relationship between a simple inquiry and acceptance of vaccination is not surprising since many patients report reasons for non-vaccination that are amenable to change, such as lack of knowledge of the need for vaccination or lack of recommendation [12–14]. Nicoleau et al. [14] found that 44% of patients who were asked if they wished to be vaccinated immediately accepted and an additional 19% agreed to receive the vaccine following counseling by their physician. While the importance of a physician’s recommendation to a patient acceptance of vaccination is not a new one [5,15], recent studies have suggested that paramedical staff, operating under standing orders, may be more effective at assessing and vaccinating than physicians [16].

Table 2
Number and proportion of patients not vaccinated by month of visit and inquiries regarding influenza vaccination

	October/November	December	January	All months	P-values ^a
No inquiry or discussion	1/12 (8.3%) ^b	23/41 (56.1%)	30/31 (96.8%)	54/84 (64.3%)	$P < 10^{-5}$
Any inquiry or discussion ^c	6/38 (15.8%)	18/72 (25.0%)	17/52 (32.7%)	41/162 (25.3%)	NS
By registration or pre-exam staff only	1/6 (16.7%)	2/4 (50.0%)	1/4 (25.0%)	4/14 (28.6%)	NS
By provider only	2/17 (11.8%)	12/45 (26.7%)	13/28 (46.4%)	27/90 (30.0%)	0.014
By registration or pre-exam staff and provider	3/15 (20.0%)	4/23 (17.4%)	1/20 (5.0%)	8/58 (13.8%)	NS
All observations	7/50 (14.0%)	41/113 (36.3%)	47/83 (56.6%)	95/246 (38.6%)	$P < 10^{-5}$

^a P-values were calculated using the Chi-squared for linear trend, comparing October/November with December and January.

^b Number of missed opportunities/number of observations in category (%).

^c Inquiry into vaccination status by registration or pre-exam staff or provider or discussion of vaccination with provider.

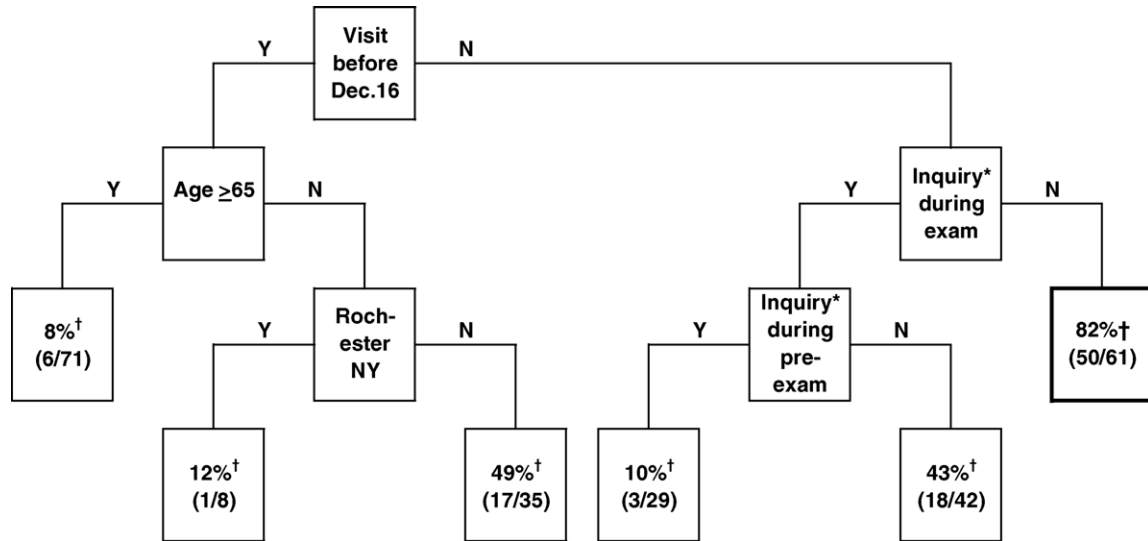


Fig. 2. Cart model showing interaction between missed opportunities and inquiry into vaccination status, age, and week of vaccination. (*) Patient was asked if he/she had received an influenza vaccination this season. (†) Percent missed opportunities (number of missed opportunities/number of observations in terminal node).

Why is prompting more important late in the vaccination season? Throughout most of the 1990s, federal recommendations encouraged vaccination in October and November [11,17–24]. In October and November, patients are exposed to extensive promotion of vaccination through public service announcements and other publicity outside of provider's offices, and the belief that the vaccination season ends in November remains widely entrenched. The 2001–2002 season was the first season during which vaccination in December and January was recommended (because distribution of vaccine was delayed) [25]. Many physicians prefer to administer influenza vaccine before influenza activity begins [11]. Of note, sufficient vaccine was available in each of the offices and nationally when observations were made [1]. Thus, vaccine supply did not play a role in our study.

There are a number of limitations to this analysis. Participating physician offices and patient were chosen on the basis of willingness to participate and may not have been representative. We do not know the attitudes of participating physicians toward influenza vaccination, and observation of their patients may have influenced their usual practices regarding vaccination. Vaccination with little staff involvement early in the season may have been due to efforts by the office to promote vaccination that were not observed. The offices that stopped inquiring may have been unwilling to administer vaccination even though vaccine remained in stock. Finally, some patients may have been vaccinated later in other settings [6]. Other conditions may have been necessary for assuring influenza vaccination. More research is needed on organizational, policy and structural factors in office settings that yield robust systems for assuring the delivery of preventive services [8]. In spite of all these limitations, we found a large number of missed opportunities despite sufficient vaccine supply and the fact that providers knew

that they were being observed to study influenza vaccination practices.

Visits to the physicians' office in December and January may represent a patient's last chance to be vaccinated during the influenza vaccination season. While the physician's inquiry into and discussion of vaccination status is highly desirable, a physician's ability to address vaccination may be displaced by the need to attend to other acute and chronic medical problems. When there is time for discussion of prevention, immunization is but one of many preventive services recommended for adults, and therefore cannot be the sole focus of prevention efforts. Office team strategies, such as dedicated prevention clinics and empowering paramedical personnel to discuss immunization and administer vaccines under standing orders can offset some of these difficulties [16,26].

While vaccination may occur without inquiry by office staff in the early weeks of influenza vaccination season, inquiry and discussion by primary care office staff regarding vaccination are closely linked to the administration of influenza vaccine in some settings. This study, as well as experiences in the 2004–2005 season demonstrate that it is especially important to develop mechanism to increase the administration of influenza vaccine late in the vaccination season, when there may be a decrease in physician and patient awareness of vaccination as well as the availability of office-based vaccination services. This emphasis should include but not be limited to continued inquiry into vaccination status and discussion of the importance of vaccination with patients.

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