

# Influence of Physician and Physician List Characteristics on Influenza Vaccination Rates in Older People in a Health Care Area in the Community of Valencia, Spain

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**Objective.** To identify the characteristics of physicians and the patients on their list related with rates of influenza vaccination in older people, and to quantify influenza vaccination coverage in this population group.

**Design.** Observational, cross-sectional, multicenter population-based study with primary data.

**Participants.** All health centers in the health care area that used computerized registries of influenza vaccinations. Vaccination records were analyzed for 73 physicians who had been at their present post for at least 2 years prior to the study, and for 19 457 older people who were vaccinated during the 2001-2002 vaccination campaign.

**Setting.** Primary health care area number 19.

**Main measures.** Physician's age and sex, whether the physician was certified as a specialist in family and community medicine, teaching accreditation, permanent or temporary post, length of time in present post, years of professional practice, type of health center administration, total number of patients in the physician's list, population and percentage of the population >65 years old in the physician's list, influenza vaccination rate referred to the total number of patients on the physician's list. The criterion evaluated was the influenza vaccination rate in older people. Descriptive analysis, bivariate analysis and multivariate analysis were used. A *P* value <.05 was considered statistically significant, and 95% confidence intervals were calculated.

**Results.** The overall influenza vaccination rate in older people (>65 years) was 50.9%, with considerable variability between physicians (from 18% to 77%). Vaccination rates were lowest in physicians who had been in their current post for longer (*P*=.001), with larger patient lists (*P*=.03), with more older people in their list (*P*=.000), and with larger proportions of older people in their list (*P*=.001). Lower rates of vaccination in older people were also associated with lower proportions of all patients on the list being vaccinated (*P*=.000). No significant associations were found for any of the other variables. After multivariate analysis only the percentage of older people on the physician's list remained significantly associated with vaccination rate. **Conclusions.** Influenza vaccination rates for older people were low and similar to rates reported earlier for this region of Spain. The percentage of older people in the list was the only explanatory variable in the model, and was inversely proportional to vaccination coverage.

**Key words:** Influenza vaccination. Older people. Influencing factors.

## INFLUENCIA DE LAS CARACTERÍSTICAS DE LOS MÉDICOS Y DEL CUPO EN LA VACUNACIÓN ANTIGRIPIAL DE ANCIANOS EN UN ÁREA DE SALUD DE LA COMUNIDAD VALENCIANA

**Objetivo.** Identificar las características de los médicos y cupos relacionadas con la tasa de vacunación antigripal (VAG) en ancianos y cuantificar la VAG.

**Diseño.** Observacional, transversal, multicéntrico de ámbito poblacional, utilizando datos primarios.

**Participantes.** Todos los centros del área con registro informatizado de VAG, con un total de 19.457 vacunados (campana 2001-2002) de 73 médicos que permanecieron en su puesto durante los 2 años previos.

**Emplazamiento.** Atención primaria del Área 19.

**Mediciones principales.** Edad y sexo del médico, titulación MIR, acreditación docente, plaza en propiedad, antigüedad en la plaza, años de ejercicio profesional, modelo asistencial, población total asignada, población y porcentaje de población > 65 años asignada, tasa de VAG del total de asignados. El criterio de evaluación fue la tasa de VAG a ancianos. Realizamos un análisis descriptivo, bivalente, y utilizamos un modelo multivariante, fijando la significación estadística en *p* < 0,05 y calculando los intervalos de confianza del 95%.

**Resultados.** La tasa de VAG en ancianos (> 65 años) fue del 50,9%, con una gran variabilidad entre médicos (del 18 al 77%). La tasa de VAG era menor cuanto mayor era la antigüedad del médico (*p* = 0,01), la población asignada (*p* = 0,03), los ancianos asignados (*p* = 0,000) y el porcentaje de ancianos asignados (*p* = 0,001), y cuanto menor era la tasa de VAG al total de asignados (*p* = 0,000), sin que se obtuviera significación con el resto de las variables estudiadas. En el análisis multivariante sólo fue significativo el porcentaje de ancianos asignado.

**Conclusiones.** La tasa de VAG en ancianos es baja, similar a la del entorno. El porcentaje de ancianos asignado es la única variable explicativa del modelo, con una relación inversamente proporcional.

**Palabras clave:** Vacunación antigripal. Ancianos. Factores influyentes.

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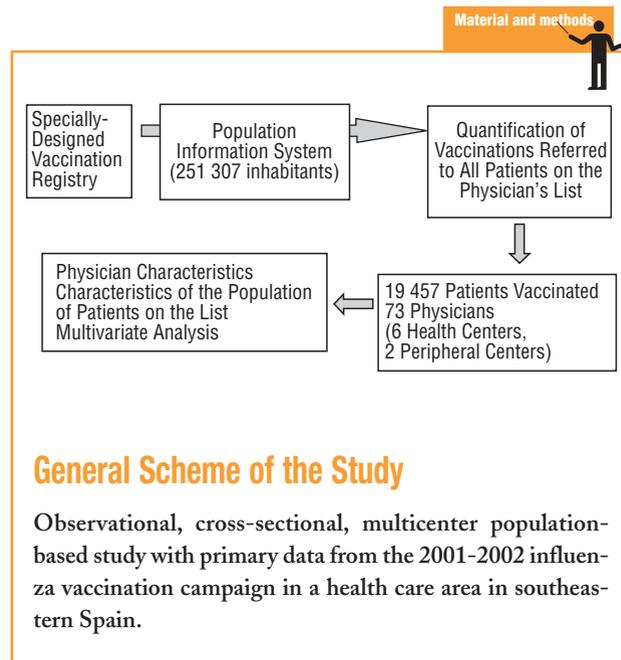
## Introduction

Influenza has been defined as the last of the untamed plagues of humanity because of the health and economic impact of annual epidemics.<sup>1</sup> The disease causes approximately 100 million cases and more than 30 000 deaths per year (in addition to considerable social and health costs) in developed countries, making it an important periodic public health problem.<sup>2,3</sup> Between 5% and 20% of the population can become ill during a “normal” epidemic, with the figure rising to 50% during a pandemic.<sup>4</sup> This has repercussions on primary care services, although only 25% of all acute febrile processes during the flu season can be attributed to influenza.<sup>5</sup> Type A evidence exists that influenza vaccination (IV) is effective in diminishing morbidity and mortality in the population.<sup>6-8</sup> Organisms such as the Spanish Society of Family and Community Medicine recommend IV in their preventive activity programs, with particular mention of groups at high risk, persons older than 65 years of age, children 6 months to 18 years of age, and persons receiving chronic treatment with acetylsalicylic acid during epidemics, travelers in areas where the disease is epidemic, and members of the general population who wish to be vaccinated.<sup>9</sup> Decreasing the incidence in risk groups is one of the aims of the Health Plan devised for the Community of Valencia,<sup>10</sup> but the desired levels of IV coverage are not always attained.<sup>11</sup> There are no primary registries, and few studies have identified the factors that influence coverage. A number of factors are related with rates of IV, and these factors pertain to the characteristics, attitudes and beliefs of patients and health care providers. The objectives of the present study were *a*) to quantify IV in Health Care Area 19 of the Community of Valencia by examining a specialized registry, and *b*) to determine whether particular characteristics of the physicians or the patients on their list were associated with IV rates for older people.

## Methods

### Design

This observational, cross-sectional, multicenter, population-based study used primary data to analyze the 2001-2002 IV season. Data were from Health Care Area 19 (Bajo Vinalopó) in the Community of Valencia (251 307 inhabitants according to the population information system (*Sistema de Información Poblacional*) of the Health Council of the regional government of Valencia (*Conselleria de Sanitat, Generalitat Valenciana*), consulted in April 2002. Of this population, 13.8% of the inhabitants were older than 65 years, and 50.4% were women. Two thirds (55%) of the population were served by health care centers operating under the reformed management model (RS), and one third (34%) attended centers operating under an older, unreformed



system of administration (OS). In 2002 the mean number of visits to health centers per user was 4.8, and mean patient load in this area was 48.2 (SD 2.8)<sup>12</sup>. Influenza vaccination in the region was one of the objectives of the regional health plan, and was included in the list of primary care services to be provided by the public health system. The target for the 2001-2002 season was to vaccinate 60% of the population of older people. Administration of the supply of vaccines and outcome measurement were managed by the General Directorate of Public Health (*Dirección General de Salud Pública*). All data for all vaccinations were entered into the recently created individualized vaccination registry (*Registro Nominal Vacunal*), a database that can be accessed and consulted from any health care center in the region. However, its use is still not widespread. We therefore used a specially designed registry created some years previously and approved by the General Directorate of Public Health to facilitate vaccination processes. This registry contains personal information about patients and identifies the physician they are assigned to. By generating a history of IV, the specialized registry obviates a number of administrative processes.

### Inclusion and Exclusion Criteria

The number of patients needed to estimate the rate of IV in the area we studied was calculated with a formula to estimate proportions, assuming a maximum *P* value of .5, a precision of 1% and a 99.9% level of confidence. This yielded a sample size of 16 144 patients, although the final sample included all vaccinated patients in the lists of participating physicians (*n*=19 457). Participating physicians were family and community doctors at primary care centers in the area who had used the vaccination registry in the 2001-2002 flu season (*n*=106 physicians). Of this number, 29 were excluded because they had been at their current post for less than 2 years at the time of the study, and 4 were excluded because they worked at peripheral health centers that lacked the administrative support necessary to use the vaccination registry. Medical records and doctor's written orders for vaccination were not taken into account.

The physician-related variables analyzed here were age, sex, certification in family and community medicine (FCM), teaching accreditation as an FCM tutor, whether his or her current post was permanent, time in current post, years of professional practice (from the date of receipt of his or her medical degree), model of administration their center was managed with (RS or OS), total population of patients on his or her list, population of patients >65 years of age on the list, percentage of the population >65 years of age on the list, and IV rate (percentage of patients vaccinated referred to all patients in the list). The criterion evaluated in the present study was IV rate for persons >65 years old (percentage of persons >65 years old who were vaccinated, referred to total number of persons >65 years old on the list).

*Statistical Analysis*

The SPSS (v. 11.0 for Windows) was used for all statistical analyses. Descriptive statistics were compiled and bivariate analysis was done. A multivariate model was developed with step-wise hierarchical regression, using IV rate in older people as the dependent variable to verify the results and corroborate the influence of different physician-related and patient population-related factors.

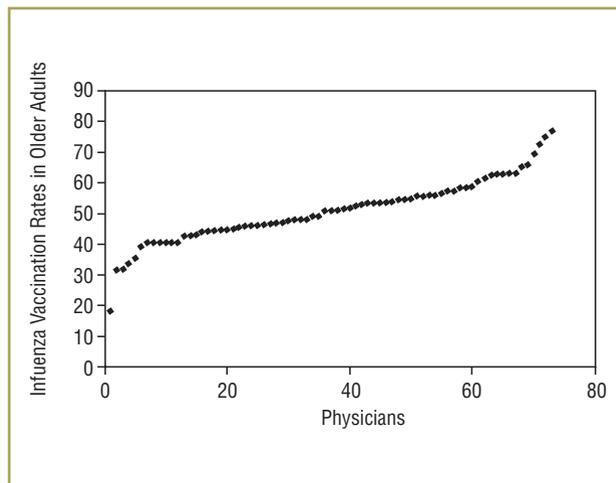
The chi-squared ( $\chi^2$ ) test was used for qualitative variables, and Student's *t* test and analysis of variance were used for quantitative and qualitative variables. Correlation coefficients (Pearson's *r*) were calculated for the relationships between quantitative variables. The level of statistical significance was set at *P*<.05 with a 95% confidence interval.

**Results**

In all, 73 physicians and a vaccinated population of 19 457 patients were included. The characteristics of the physicians and their assigned patients are shown in Table 1. The IV rate for older adults was 50.9% (95% CI, 50.2%-51.6%), with considerable variability between physicians (18.2% to 76.8%) (Figure 1).

*Physician Variables Related With Influenza Vaccination*

We found no statistically significant differences in IV rates for all patients assigned according to physician's age or sex, certification in FCM, whether the physician held a permanent post, time at current post, years of professional practice, health care administration model, teaching certification or population assigned. No significant differences were found in IV rate in older people in association with physician's age or sex, certification in FCM, whether the physician's post was permanent, teaching certification, or years of professional practice. The mean number of patients and percentage of older people assigned



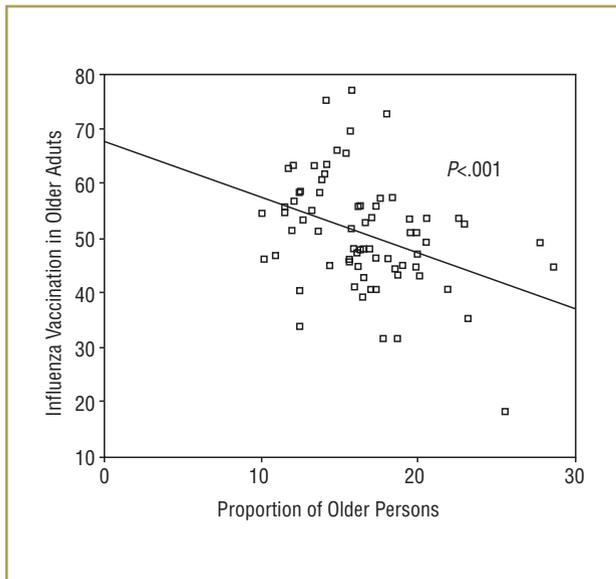
**FIGURE 1** Distribution of influenza vaccination coverage in older people among physicians in a health care area in southeastern Spain.

were higher for physicians at centers operating under the OS (2157, 18.4%) than at RS centers (1832; 95% CI, 17.7-19.1, and 15%; 95% CI, 14.2%-15.8%). The IV rate for older people was significantly lower at OS centers (46.7%; 95% CI, 46.0%-47.4%) than at RS centers (53.8%; 95% CI, 53.1%-54.5%; *P*<.004).

Influenza vaccination rates in older people were lower for physicians who had been at their current post for longer (*P*=.01), with larger patient lists (*P*=.03), with larger numbers of older people on the list (*P*=.000), and with a larger percentage of older people in the list (*P*=.001) (Figure 2). Vaccination rates were also lower for older adults when the vaccination rate for the entire patient list was lower

**TABLE 1** Characteristics of Participating Physicians and of the Patients in Their List

Physician Characteristics (n=73)		Patient List Characteristics	
Mean age, years	47.9±8.6 95% CI, 49.9-45.9	Mean number of patients in the list	2.011.4±276.2 [95% CI, 1948-2074.7
Sex, men	n=52 (71.2%) 95% CI, 60.8-81.6	Mean number of older adults assigned	331.6±92.2 95% CI, 310.4-352.7
Certified in FCM	n=13 (17.8%) 95% CI, 9.0-26.6	Percentage of older people assigned	16.4±3.8 95% CI, 15.6-17.3
Teaching accreditation	n=14 (19.2%) 95% CI, 10.2-28.2	IV rate referred to total list	13.30% 95% CI, 12.8-13.8
Permanent post	n=40 (54.8%) 95% CI, 43.4-66.2	Range of IV rates referred to total	7.8% to 20.1%
Mean time in current post, years	9.23±7.5 95% CI, 7.5-11.0	IV rate for older people	50.90% 95% CI, 50.2-51.6
Mean time in professional practice, years	22.5±8.0 95% CI, 13.1-31.9	Range of IV rates in older people	18.3% to 76.8%
Pertenencia al MT	n=29 (40%) 95% CI, 28.8-51.2		



**FIGURE 2** Correlation between the proportion of older persons in the physician's list and influenza vaccination rates in older adults.

( $P=.000$ ). Although larger patient lists meant that the number of vaccinations indicated was larger ( $P=.000$ ), this did not translate into an increase in the total rate of IV, but was instead associated with a decrease in IV rate for older

people. Both in absolute numbers and in terms of percentage of the patient list, larger numbers of older people were associated with lower rates of IV ( $P=.000$  for number of older people,  $P=.001$  for percentage of older people), despite the fact that the total absolute number of vaccinations administered was larger.

*Multivariate Analysis*

The percentage of older people assigned to the physician was the only explanatory variable in the model, such that the higher the percentage of older people, the lower their vaccination coverage. The determination coefficient was  $R^2=0.22$  (Table 2).

**Discussion**

We believe the patients included in this study to be a representative sample of the outpatient population in the area, with the caveat that some of those excluded were assigned to physicians at peripheral health centers in very small villages. Nonetheless, the population in the area we analyzed resided in only three towns each with a population of more than 20 000, so the population can be considered mainly urban.

All patients who were vaccinated were included to avoid sampling bias, since the computerized registry made it possible to study all patients. This sample size allowed us

to compare different physicians practicing in Health Care Area 19. To rule out bias from the assignment of patients to different physicians, information from the vaccination database for the area of study was checked against data from the Population Information System, which comprises all users assigned to a primary care physician. This was intended to exclude patients who may have been vaccinated at the health center but who were not assigned to any given physician. If we had not taken this precaution, biases might have arisen from vaccinations of patients referred for vaccination to a physician other than their regular general practitioner, which would have led to inaccuracies in the data for their assigned physician. In addition, we aimed to obtain data for individual users rather than for centers or areas. Our sampling method ensured that the data we obtained were as reliable as possible.

**TABLE 2** Results of Multivariate Analysis

b) Dependent Variable: Rate of Vaccination of Older Persons

Model	R	R Squared	corrected R Squared	Standard Error of the Estimate
1	0.471(a)	0.222	0.150	9.47718

a) Predictive variables: (constant), model, permanent post, population of older adults assigned, percentage of older adults assigned, mean age, time in practice

ANOVA (B)					
Model	Sum of the Squares	d.f.	Quadratic Mean	F	Sig.
Regression	1665.14	6	277.52	3.090	0.010(a)
Residual	5838.10	65	89.82		
Total	7503.25	71			

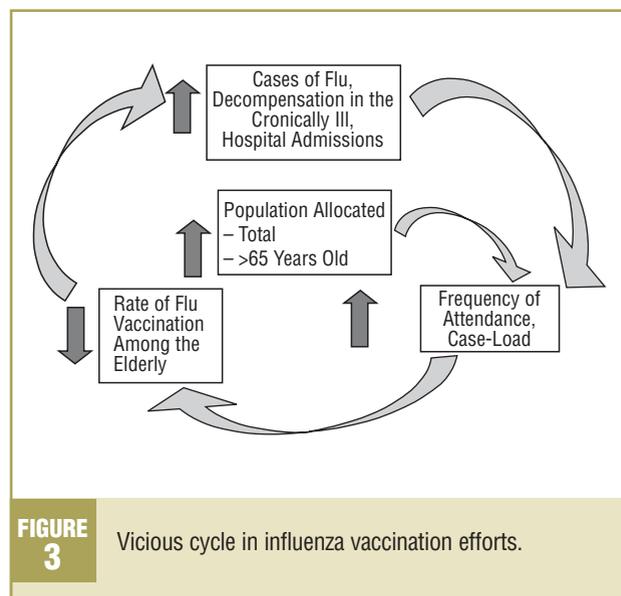
Coefficients (A)					
Model	Nonstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Standard Error	Beta		
(Constant)	78.576	15.006		5.236	0.000
% older adults assigned	-0.812	0.338	-0.306	-2.400	0.019
Population of older adults assigned	-4.823E-03	0.005	-0.122	-1.001	0.320
Permanent post	4.842	3.435	0.236	1.409	0.163
Physician's age	-5.199E-02	0.200	-0.042	-0.260	0.796
Years in current post	-0.397	0.273	-0.288	-1.456	0.150
Model of care	-1.668	3.842	-0.080	-0.434	0.666

We opted to exclude physicians who had been at their present post for less than 2 years because the influence of the physician on IV rates may need more than one flu season to become evident, and to avoid attributing the results attained by a given doctor to a different colleague who may have occupied the same post later.

We noted considerable variability in the patients assigned to each physician, with some physicians being responsible for twice as many patients as others, and with the proportion of patients older than 65 years being three times as large in some lists as in others. Influenza vaccination coverage also varied markedly between physicians, and this variation was only partly explained by the percentage of older adults on their list ( $R^2=22\%$ ). This indicates that IV coverage is influenced by other, non-physician-related or unidentified variables (for example, qualitative physician- or patient-related variables having to do with beliefs or attitudes). Given that conditions at health centers were similar, these variables may explain the differences in coverage, and further studies will be needed to analyze them. Although the variation explained by our model (22%) limits the conclusions that can be drawn, we believe our reasoning to be valid. What might have been expected was a clear difference in favor of RS centers, certification in FCM, teaching accreditation and use of informatics technology—in other words, aspects that professionals favor and that improve the quality of health care. The lack of such associations is in itself a startling result.

A number of studies have found low rates of IV in older adults, with figures not very different from ours ranging from 40% to 60%, and as high as 74% in well-organized vaccination programs.<sup>13-18</sup> The report issued by the regional Directorate of Public Health for Area 19 overestimated the IV rate (62.8%) in comparison to our figure (50.9%).<sup>11</sup> Thus there was a discrepancy between the IV rate we found and the official rate for Area 19 as reported by the regional Health Council. In absolute terms, we found IV coverage to be 17% lower, a figure that translates as 20% lower in relative terms. In other words, official figures for vaccination coverage overestimated the actual rate by 20%. One possible cause for this discrepancy is the method used by the regional authority to measure IV rates. Because the municipal census was used as the denominator, this failed to take into account inhabitants not included in the census although these persons are also vaccinated. The number of vaccines used, rather than vaccinations administered to specific users, was used as the numerator.

Several other variables have been reported to be related to IV rates. The variables analyzed most often are *patient-centered*. A study by Sarriá-Santamera et al of the population of older people in Spain<sup>19</sup> found that the risk of not being vaccinated was greatest in persons aged 65 to 69 years, women, persons living in cities with a population of more than 1 million, smokers, persons with chronic disea-



ses, and those who had not seen their doctor in the preceding months. *Patients' previous beliefs* have been explored and found to be associated with aspects such as age (directly related) and the belief that their general health is good (inversely related to IV rates). Fear of the side effects is the most frequent reason for not being vaccinated.<sup>20-22</sup> Few studies have analyzed whether *characteristics of health professionals* influence vaccination rates. Of two recent studies that examined this issue, one found that coverage among hospital nurses was 62%, and was higher among those who responded correctly on a test of knowledge about IV (80%) than among those who responded incorrectly (49%).<sup>23</sup> A study of pediatricians found that 50% of the participants were not vaccinated. The response rate for the survey was higher among vaccinated than among unvaccinated participants, and the latter expressed more skepticism as to the need, efficacy and side effects of IV. Almost all participants (98%) said they intended to be vaccinated, although only 60% actually were. A finding of particular note was that many professionals remained unconvinced by type A evidence of the effectiveness of IV in risk groups.<sup>24</sup> Among factors associated with IV, some studies have identified the *physician's own beliefs*, i.e., knowledge of the patients' attitude<sup>17</sup>, whether the physician had been vaccinated, female sex, and belief in the effectiveness and cost-effectiveness of vaccination.<sup>25</sup> We found no studies that systematically investigated the influence of *characteristics of the physicians and their population of assigned patients* (age, sex, educational level, size of the list, proportion of older people on the list, frequency of

Discussion  
Key points



### What Is Known About the Subject

- Influenza is a periodic problem of relevance to public health that has considerable social and health costs, and that causes marked morbidity and mortality in the population at risk.
- In a “normal” epidemic, from 5% to 20% of the population may become ill with influenza annually; this figure can rise to 50% in a pandemic.
- Type A evidence is available that influenza vaccination is effective in decreasing morbidity and mortality in the population.

### What This Study Contributes

- We found, from primary data, that the rate of influenza vaccination in older people in the population studied here was 50.9%, a figure similar to that reported previously for the region but much lower than the rate reported by institutional sources of information on public health for the health care area studied here.
- The population of older people in each physician’s list of assigned patients was the only variable with explanatory power in the multivariate model: the larger the proportion of older people, the lower the vaccination rate.

health service use, etc) on IV rates. The study that comes closest to investigating this aspect analyzed physician-related factors that were related with the recommendation to be vaccinated.<sup>25</sup>

The objective of our study was to evaluate physician-related factors rather than all possible causes in general. In an earlier study in the Community of Valencia, Puig-Barberá and colleagues found with multivariate analysis that the number of practitioners per 1000 inhabitants and the coverage rates attained during the previous year were the variables that most strongly influenced IV.<sup>26</sup> These findings are in partial agreement with our results regarding the importance of the patient load.

For some physicians the vaccination rate for older people was markedly low; these practitioners represent “vaccination sinks.” We interpret this as an indication that if the patient does not request vaccination, the physician does not make efforts to provide it. This has direct consequences for morbidity and mortality in their patients, and for health costs in general.<sup>6-8,27-29</sup>

It could be thought a priori that the preventive activities of health centers are of higher quality than those of outpa-

tient centers run under the previous (unreformed) model of administration. However, multivariate analysis showed that the lower vaccination rates of physicians at OS centers resulted from the higher percentages of older people on their patient lists. In view of the lack of differences between reformed and unreformed centers in the use of informatics technology, teaching activities and certification in FCM (factors all seen at RS health centers), it appears that health centers limit themselves to vaccinating on demand. We assume that problems with accessibility (attributable to the larger patient lists) lead to decreases in IV rates in older people. This gives rise to a vicious cycle as illustrated in Figure 3.

Influenza vaccination rates in older people were not related with the model of health care administration or other physician characteristics such as specialization, sex, age, whether their post was a permanent one, or years in practice. We believe that physicians do not maintain a vigilant attitude toward the indications for vaccination, as—surprisingly—time in the current post was associated with a decrease in vaccination rates in older people, despite the fact that the frequency of visits by these users to the health center would almost guarantee that patients were seen by their doctor, possibly several times during the year.<sup>30</sup> Apparently, the importance of IV is underestimated and there is no systematic attempt at prevention. This notion is supported by research in the region of Valencia, Spain, that showed preventive care activities to be rare at health centers.<sup>31</sup> Profound reflection is needed about our attitudes toward interventions such as IV, given that there is incontrovertible scientific evidence of its usefulness in public health.

Achieving improvements in preventive activities should be interpreted from a population-based perspective. Such improvements are influenced by many factors. Increases in vaccination coverage have been achieved with multifactorial interventions adapted to individual practitioners, whereas many studies have presented opposing views on the efficacy of training or general information activities.<sup>16,17,26,32-37</sup>

Changing the number of older people on a physician’s patient list is one intervention that might improve vaccination coverage, but we should not assume that this is the only solution to the low rates of IV we found, nor should it serve as an excuse, particularly for physicians working in RS centers. At these health centers there are clear opportunities for improvement that are not fully exploited. To break the vicious cycle we posit, efforts to control the number of older patients in the physician’s list as a way to increase IV rates should be accompanied by a series of additional measures. These include management of physician consultations to decrease the patient load, timely use by nursing staff of opportunities to vaccinate patients who consult for chronic illnesses, reorganization of health care centers to remove barriers to vaccination (especially during

the early weeks of the campaign), involvement of residents and training units, and interventions aimed at reducing "vaccination sinks."

The coverage rate for IV in the health care area we analyzed here was higher than the mean figure reported for the entire region. This difference may be attributed in part to the use of a computerized registry that improves accessibility to IV and facilitates quantification of the number of patients actually vaccinated by each physician. In the Community of Valencia, the individualized vaccination registry (*Registro Nominal Vacunal*) is being introduced, and will eventually be linked via computerized access to the patient's medical record. In this connection we feel that Area 19 has moved ahead of other health care areas in implementing a computer program adapted to the needs of the primary care system.

In our opinion, influenza vaccination should be based on an organized vaccination system that makes it possible to evaluate performance and to use a multifactorial approach to design interventions that can be personalized.

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## COMMENTARY

# Vaccination Coverage in Adults and Health Professionals: an Unresolved Issue in Primary Care

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There is no doubt that vaccination of the population against different infectious diseases is a highly useful preventive activity that affords maximal benefits. Influenza vaccination in adults has been widely shown to be effective in preventing flu and its complications, especially in older patients or those who are especially vulnerable because of underlying chronic disease. In contrast to vaccination in children, where coverage rates in Spain are considered among the highest in the world, vaccination rates in adults and among health professionals remain surprisingly low. Simply reporting this fact is not enough; research is needed to investigate the possible causes and to design strategies aimed at improving vaccination coverage among health professionals for whom it is indicated, and in the general population. In this connection the analysis by Schwarz Chávarri et al<sup>1</sup> of physician-related factors and the characteristics of the population of patients assigned to physicians is of considerable interest. The authors describe how these factors influence vaccination rates in the population of persons older than 65 years, in whom the indication for influenza vaccination is well established and for whom annual vaccination campaigns appear to be fully integrated into the activities of primary care health centers. It is fundamental to foment all activities and strategies aimed at increasing awareness of the benefits of vaccination in adults and children in the general public, and in he-

### Key Points

- In contrast to vaccination coverage in children, coverage in adults and health professionals in Spain is surprisingly low.
- Vaccination registries need to be improved to take advantage of new informatics technologies.
- It is fundamental to foment activities and strategies aimed at increasing the general population's awareness of the benefits of vaccination, especially in adults and particularly among health professionals.

alth professionals. The efficacy of these measures and strategies to enhance vaccination coverage has been evaluated, notably in the extensive review published by the Task Force on Community Preventive Services of the Centers for Disease Control and Prevention.<sup>2,3</sup> This publication evaluated the effectiveness of a number of strategies, based on computer, generated reminders or established protocols used at health centers, specially designed forms to record

**TABLE 1**  
**Recommendations of the Preventive and Health Promotion Activities Program for Vaccination Strategies**

Follow the vaccination schedule recommended by appropriate health authorities
Integrate the current vaccination program into consultations that form part of the Health Child Program
Take advantage of the switch from pediatric to adult care to verify and update vaccination status
Systematically review vaccination status whenever the patient's medical record is consulted
Administer as many indicated vaccinations as possible at the same time
Take advantage of nursing or emergency service consultations to update tetanus vaccination
Use consultations for chronic illnesses to administer vaccinations in appropriate risk groups
Update vaccination status in prenatal care consultations
Update vaccination status in preoperative examinations
Disseminate information about vaccinations at health centers with posters and pamphlets, and organize health education activities

preventive activities in the patient's medical record, pamphlets to remind patients about vaccinations (these measures share the drawback of being usable only for persons who visit health care facilities), retrospective and comparative studies of the levels of coverage attained by other professionals and other facilities, using house calls or visits for other motives to perform vaccinations, extending working hours or reducing administrative tasks to facilitate vaccination, or active outreach by contacting patients by telephone.

Other strategies have been suggested to increase vaccination rates in older people who have difficulties with access to health facilities. The activities shown to be most effective include active outreach with telephone or written reminders and computer-generated reminders to professionals, and comparative follow-up of coverage rates attained by different health centers. Strategies based on training for professionals have not been found to be very useful.<sup>4,5</sup>

Table 1 summarizes the general vaccination strategies recommended by the Preventive and Health Promotion Activities Program of the Spanish Society of Family and Community Medicine. The vaccination registry recently introduced in the health care system operating in the area studied by Schwarz Chávarri et al comprises a collection of fundamental, individualized documents that provide information on the user's vaccination status. This document is, in effect, an immunization biography that facilitates follow-up of all vaccinations regardless of where they are received (e.g., at work, a health center or a hospital). This system this will, it is hoped, prevent missed doses and

overdoses, which are frequent for certain vaccines such as tetanus.

We should not overlook the opportunities for improving vaccination coverage provided by situations such as traveler counseling, health care for immigrants, and care for collectives such as penitentiary inmates or residents of detoxification facilities. The workplace, in particular, is a setting of key importance for health care workers.<sup>4</sup>

We should improve registry systems and the computer-based management of this information by taking advantage of new informatics technologies that facilitate the centralization of data on vaccinations. At the same time, we should ensure interoperability to be able to share information across different levels of health care. This would improve follow-up of the population and provide better information on the number of vaccinations administered, and thus provide an integral view of the user's vaccination status throughout his or her lifetime. In addition, this would make it possible to detect potential groups of unvaccinated persons, and apply general or specific measures as needed to further increase coverage.<sup>6</sup>

These reasons make it important to give careful consideration to activities relating to vaccination in general, and vaccination in the primary care setting in particular. Such activities should aim to foment research and the development of truly effective strategies to improve coverage levels—especially in adults and health professionals—and to ensure that these activities are accurately recorded. Moreover, it is fundamental to actively seek out persons susceptible to disease for whom vaccination is especially indicated.

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