



# Influenza vaccination among healthcare personnel after pandemic influenza H1N1

José Sánchez-Payá<sup>a,\*</sup>, Ignacio Hernández-García<sup>b</sup>, Vicente García-Román<sup>a</sup>, Robert Camargo-Angeles<sup>a</sup>, Julio Barrenengoa-Sañudo<sup>a</sup>, Cesar O. Villanueva-Ruiz<sup>a</sup>, Hector R. Martínez<sup>a</sup>, María González-Hernández<sup>a</sup>

<sup>a</sup> Preventive Medicine Service, University General Hospital of Alicante, Spain

<sup>b</sup> Preventive Medicine Service, University Hospital of Salamanca, Spain

## ARTICLE INFO

### Article history:

Received 9 April 2011

Received in revised form

18 November 2011

Accepted 24 November 2011

Available online 7 December 2011

### Keywords:

Healthcare personnel

Influenza vaccines

2009 pandemic A (H1N1) influenza

## ABSTRACT

The purpose of this study was to evaluate the coverage rates for influenza vaccination among healthcare personnel (HCP), and if the reasons for accepting influenza vaccine by HCP and the frequency of vaccine-related adverse events (AEs) in 2010–2011 were different compared to 2009–2010. The AEs were detected by telephoning the worker one week after the vaccination. The coverage for seasonal vaccination in 2009–2010 was 31.0%, whereas that for 2009 pandemic influenza (H1N1) was 22.2% and 24.4% ( $p < 0.05$ ) in 2010–2011. The most frequent reason for being vaccinated during the three campaigns was to “protect my health”. Over 80.5% of the HCP reported 2009 pandemic influenza (H1N1) vaccine-related AEs compared to the 25.3% and 25.4% reporting seasonal vaccine-related AEs in 2009–2010 and 2010–2011 respectively ( $p < 0.05$ ). None of the AEs were severe. Specific measures should be implemented in our country to recover and improve poor vaccination coverage.

© 2011 Elsevier Ltd. All rights reserved.

## 1. Introduction

Influenza vaccination of healthcare professionals (HCPs) is a key question in healthcare-associated prevention programs since it is one of the most effective measures to avoid nosocomial outbreaks [1], specially in long-term care facilities. Some of the benefits obtained from vaccination of HCPs are self-protection, decreased absenteeism rates and a lower rate of morbidity and mortality among their patients [2–4].

Due to the outbreak of the new 2009 pandemic virus (H1N1), several bodies, including the World Health Organization [5], the Advisory Committee on Immunization Practices [6] and the European Centre for Disease Prevention and Control [7] strongly recommended both seasonal and pandemic (H1N1) vaccination among HCPs in 2009. To date, the studies published show results for the 2009–2010 season regarding coverage rate among HCPs [8–13], reasons for accepting influenza vaccination [8–10,12,14] and the rate of new virus-related adverse effects (AEs) [8,13,15,16]. These studies reported differences between the coverage rate for 2009–2010 seasonal and 2009 pandemic (H1N1) vaccination

[8,9,11,12]. They also reported a higher number of new virus-related AEs (50.3–82.6%) [8,13,15,16] compared to that in previous seasons (28.0–42.7%) [17–19].

This study assesses the coverage rate for influenza vaccination among HCPs, the reasons for accepting the influenza vaccine and the frequency of vaccine-related AEs in 2010–2011 season were different compared to the 2009–2010 seasonal and pandemic influenza vaccination.

## 2. Materials and methods

A cross-sectional study was conducted at the University Hospital of Alicante during the 2009–2010 and 2010–2011 seasons. The workforce consists of 3126 employees. The Department of Preventive Medicine is in charge of vaccination programs. The 2009–2010 campaign was divided into two phases: the seasonal influenza vaccine (inactivated, non-adjuvanted, containing influenza virus surface antigens of strain A/Brisbane/59/2007 [H1N1], A/Brisbane/10/2007 [H3N2] and B/Brisbane/60/2008) was administered in the first phase that covered from October 1 to November 13, 2009; the new 2009 pandemic (H1N1) vaccine (inactivated, split-virus vaccine, containing the antigen of strain A/California/7/2009 [H1N1] and the adjuvant AS03) was administered in the second phase that covered from November 16 to December 30, 2009. The seasonal influenza vaccine (inactivated, non-adjuvanted vaccine, containing the influenza virus surface

\* Corresponding author at: Unidad de Epidemiología, Servicio de Medicina Preventiva, Hospital General Universitario de Alicante, Avda. Pintor Baeza, 12, 03010 Alicante, Spain. Tel.: +34 965933574; fax: +34 965352552.

E-mail address: [sanchez.jos@gva.es](mailto:sanchez.jos@gva.es) (J. Sánchez-Payá).

antigens of strain A/California/7/2009 [H1N1], A/Perth/16/2009 [H3N2] and B/Brisbane/60/2008) from the corresponding season was administered in the 2010–2011 campaign that covered from September 27 to January 31, 2011.

Each program was preceded by a specific promotional campaign inviting healthcare professionals to get a vaccination. The program used posters (placed at all entrances and beside lifts in the center) and informative letters (sent to all departments). The vaccinations were administered by nurses in consulting rooms of the Preventive Medicine Department. Nurses from the Preventive Medicine Department also visited certain departments to administer the vaccines (Emergency, Neonatology and the Specialities Unit).

The HCPs were asked to fill in a self-administered questionnaire based on existing literature [9,17,20]. The questionnaire consisted of items such as gender, professional category, and date of birth. It also included a list of reasons for accepting vaccination such as self-protection, protection of their patients and their family, history of previous influenza, and whether they suffered from any chronic disease or lived with people over 65, people with bronchitis or with any cardiopathy. The AEs were detected by the same nurse telephoning each healthcare professional one week after administering the vaccine. Asked about the potential appearance of AEs within 72 h following the vaccination. All interviewees were asked about the appearance of major (e.g. allergic reactions) and minor adverse events (local pain, discomfort, myalgia, fever or other – described by the worker were written down as open answer). Five attempts were made to contact each healthcare professional.

A descriptive study was made of all the variables and a search made for any differences in vaccination coverage according to the influenza season and type of vaccine (2009–2010 seasonal influenza, pandemic influenza and 2010–2011 seasonal influenza) according to age, gender and professional category (physicians, nurses, nursing assistants/technicians, and other employees). Analyses were then made to detect any differences between the reasons for vaccination acceptance, the frequency of AEs depending on the vaccine administered. Finally, a study was made of the factors associated with the adverse events and the reasons for being vaccinated in the 2010–2011 season. A chi-square test was used to perform the association studies with  $p < 0.05$  being considered statistically significant. The statistical studies were carried out using the SPSS 17.0 computer program.

### 3. Results

Seasonal vaccination coverage in 2009–2010 and 2010–2011 were 31.0% and 24.4% respectively. Vaccine coverage for 2009 pandemic (H1N1) was 22.2%. As shown in Table 1, there were statistically significant differences for vaccine coverage among women and employees  $\geq 45$  years of age in the different campaigns. Vaccine coverage among physicians decreased progressively. On the other hand, the coverage for other professional categories was higher in 2010–2011 compared that for the new 2009 pandemic (H1N1) vaccination (there were significant differences for nursing assistants, technicians and other employees). However, the same vaccination coverage as for 2009–2010 seasonal influenza was not reached (Table 1).

The distribution of the characteristics of the eligible employees (gender, age and professional category) was significantly different according to the type of vaccine (Table 2). The main reason for vaccine acceptance was “self-protection” (between the 67.0% and 70.6%), other reasons were “history of vaccination” (15.2–55.0%), “protecting my family” (49.1–57.7%) and “protecting patients” (49.4–56.3%). These reasons varied significantly depending on the vaccination campaign (Table 2).

The appearance of AEs were assessed in 1996 HCPs, that is 82.3% of the workers who received vaccine during the three campaigns (2424). The differences between surveyed and non-surveyed employees were not statistically significant. The vaccination campaign for the new 2009 pandemic (H1N1) registered the highest rate of AEs, 80.5% of the vaccinated workers. This frequency of AEs was significantly higher than both seasonal influenza campaigns (Table 2). None of the vaccinated HCPs had an immediate allergic reaction and none of the AEs were severe. The main reactions reported were pain at the injection site and discomfort (Table 2).

The only variable showing a significant association with the appearance of AEs during the 2010–2011 campaign was age (Table 3). The variables associated with the most frequently expressed reasons why healthcare personnel got a vaccination during the 2010–2011 campaign (Table 3) were as follows: “Protect my health” was associated with gender; “Vaccinated previously” with age, professional category and having been vaccinated previously; “Protect the health of my family” was not associated with any variable; and “Protect the health of patients” was associated with age, gender and professional category.

### 4. Discussion

This is the first study to date that evaluates influenza vaccination coverage among HCPs after the 2009 pandemic (H1N1). We observed that the coverage for seasonal influenza in 2010–2011 was higher than the 2009 pandemic (H1N1), but below the vaccination coverage for 2009–2010 seasonal influenza.

Vaccination coverage for 2009–2010 seasonal influenza stands out in comparison to that expected in some countries like Greece (18%) [14] and other Mediterranean countries such as France (25.3%) [8] or Turkey (22%) [10]. It is in an intermediate position in relation to vaccination coverage in our center since 2006 (26.8–32.8%) [17] but far below the coverage among HCPs in the United States, which in 2009–2010 reached a historical peak of 71.7% [18] and where the coverage for the 2009 pandemic (H1N1) was much higher than in our center (50.6%) and other countries [8,10,13] (18% [13] – 30.7% [8]).

Several authors such as Poland, et al. have pointed out that is medically relevant to extend an influenza vaccination campaign until January or even later [21]. This is the only way to use up all the vaccine doses available and to reach the expected vaccination coverage. The lower vaccination coverage in our center may therefore be explained by the longer length of vaccination campaigns in the U.S. However this may not be the only reason after observing a lower coverage for the 2010–2011 campaign that lasted ten weeks longer than the 2009–2010 seasonal influenza campaign. These considerations suggest that the differences between vaccination coverage in our center and in the U.S. could be due to other factors. One major factor is that health organizations in the U.S. have implemented compulsory vaccination policies for HCPs. Of these, some are health care institutions (hospitals [22,23] or health care organizations [24]) and others are professional organizations [25]. Of these some must sign a declination specifying the reason(s) for refusal vaccination [22], others offer exemptions for medical or religious reasons [23,24], and some required individuals to wear a mask at work during influenza season if professionals are not vaccinated [23]. As a result of these policies some mandatory programs have reached vaccination coverage of up to 98% [23,24]. These measures reflect the context of a culture of patient safety and quality health care in the U.S. where HCP must avoid transmitting vaccine-preventable diseases to their patients [26]. For this reason physician experts in vaccines, bioethics, lawyers, etc. are proposing to begin to consider the need for a legislation that obliges workers to be vaccinated against the flu as this would result in a safer

**Table 1**

Vaccination coverage among healthcare personnel classified by age, gender and professional category.

|                         | 2009–2010 season |                  |                       | 2010–2011        |                       |
|-------------------------|------------------|------------------|-----------------------|------------------|-----------------------|
|                         | Seasonal         | AnH1N1           | <i>p</i> <sup>a</sup> | Season           | <i>p</i> <sup>b</sup> |
| Total                   | 31.0% (969/3126) | 22.2% (693/3126) | <0.001                | 24.4% (762/3126) | <0.05                 |
| Age                     |                  |                  |                       |                  |                       |
| <45                     | 27.9% (340/1219) | 24.0% (292/1219) | <0.05                 | 21.0% (256/1219) | N.S.                  |
| >45                     | 33.0% (629/1907) | 21.0% (401/1907) | <0.001                | 26.5% (506/1907) | <0.001                |
| Gender                  |                  |                  |                       |                  |                       |
| Male                    | 31.3% (313/1000) | 26.4% (264/1000) | <0.05                 | 25.4% (254/1000) | N.S.                  |
| Female                  | 30.9% (656/2126) | 20.3% (429/2126) | <0.001                | 23.9% (508/2126) | <0.01                 |
| Professional category   |                  |                  |                       |                  |                       |
| Physicians              | 35.8% (268/749)  | 33.7% (252/749)  | N.S.                  | 30.3% (227/749)  | N.S.                  |
| Nurses                  | 33.5% (312/931)  | 23.5% (219/931)  | <0.001                | 26.1% (243/931)  | N.S.                  |
| Nurse's aide/technician | 21.1% (163/772)  | 12.2% (94/772)   | <0.001                | 15.7% (121/772)  | <0.05                 |
| Others                  | 33.5% (226/674)  | 19.0% (128/674)  | <0.001                | 25.4% (171/674)  | <0.01                 |

<sup>a</sup> The comparison between vaccination coverage against seasonal influenza and vaccination coverage against new influenza A/H1N1 during the 2009–2010 season.<sup>b</sup> The comparison between vaccination coverage against 2010–2011 seasonal influenza and vaccination coverage against new influenza A/H1N1 during the 2009–2010 season.

healthcare environment and reduce the morbidity and mortality associated with healthcare as well as medical errors and healthcare costs [25–27].

The low vaccination coverage in our center reflects how different the patient safety culture is in our country. Similar studies should be performed in other centers to more consistently demand our healthcare authorities to consider making vaccination against influenza compulsory for HCP.

The 2009 pandemic (H1N1) represented a point of inflection in the distribution of vaccination coverage among different

professional categories. The vaccination coverage rate for physicians and nurses was similar in the 2009–2010 campaign but different for the new 2009 pandemic (H1N1) campaign and different again for the 2010–2011 campaign.

Rachiotis et al. [28] reported that HCP who got information about the safety of the new pandemic vaccine from mass media showed greater reluctance because they were afraid of AEs. On the other hand, HCP who got information from medical journals, the Internet or hospital infection control committees showed better acceptance. The role of the mass media in Spain during the

**Table 2**

Characteristics of healthcare personnel, reasons for being vaccinated, and frequency of adverse events (AEs).

|                                 | 2009–2010 season |                 | 2010–2011 season |          |
|---------------------------------|------------------|-----------------|------------------|----------|
|                                 | Seasonal         | AnH1N1          |                  | <i>p</i> |
| Number vaccinated               | 969              | 693             | 762              |          |
| Age                             |                  |                 |                  | <0.01    |
| <45                             | 35.1% (340)      | 42.1% (292)     | 33.6% (256)      |          |
| >45                             | 64.9% (629)      | 57.9% (401)     | 66.4% (506)      |          |
| Gender                          |                  |                 |                  | <0.05    |
| Male                            | 32.3% (313)      | 38.1% (264)     | 33.3% (254)      |          |
| Female                          | 67.7% (656)      | 61.9% (429)     | 66.7% (508)      |          |
| Professional category           |                  |                 |                  | <0.01    |
| Physicians                      | 27.7% (268)      | 36.4% (252)     | 29.8% (227)      |          |
| Nurses                          | 32.2% (312)      | 31.6% (219)     | 31.9% (243)      |          |
| Nurse's aide/technician         | 16.8% (163)      | 13.6% (94)      | 15.9% (121)      |          |
| Others <sup>a</sup>             | 23.3% (226)      | 18.5% (128)     | 22.4% (171)      |          |
| Reasons for being vaccinated    |                  |                 |                  |          |
| Protect my health               | 69.6% (674)      | 67.0% (464)     | 70.6% (538)      | N.S.     |
| I think it is advisable         | 41.5% (402)      | 34.9% (242)     | 44.2% (337)      | <0.01    |
| It is free                      | 7.5% (77)        | 6.6% (46)       | 7.0% (53)        | N.S.     |
| I was vaccinated previously     | 51.7% (507)      | 15.2% (105)     | 55.0% (419)      | <0.001   |
| I suffered flu in other years   | 13.0% (126)      | 6.2% (43)       | 11.7% (89)       | <0.001   |
| Protect the health of my family | 49.1% (476)      | 57.7% (400)     | 49.7% (379)      | <0.01    |
| Protect the health of patients  | 49.4% (479)      | 56.3% (390)     | 53.8% (410)      | <0.05    |
| Doctor's recommendation         | 13.5% (131)      | 14.0% (97)      | 16.4% (125)      | N.S.     |
| I suffer a chronic disease      | 15.9% (154)      | 16.9% (117)     | 16.4% (125)      | N.S.     |
| I live with people >65          | 11.9% (115)      | 12.4% (86)      | 12.1% (92)       | N.S.     |
| Healthcare personnel evaluated  | 77.0% (746/969)  | 78.5% (544/693) | 92.7% (706/762)  | <0.001   |
| Healthcare personnel with AEs   | 25.3% (189/746)  | 80.5% (438/544) | 25.4% (179/706)  | <0.001   |
| Types of AEs                    |                  |                 |                  |          |
| Pain                            | 15.8% (118)      | 74.6% (406)     | 14.4% (102)      | <0.001   |
| Discomfort                      | 4.7% (35)        | 21.5% (117)     | 8.8% (62)        | <0.001   |
| Myalgia                         | 2.0% (15)        | 15.1% (82)      | 5.4% (38)        | <0.001   |
| Fever                           | 0.8% (6)         | 5.9% (32)       | 5.5% (39)        | <0.001   |
| Other AEs <sup>b</sup>          | 6.4% (48)        | 16.5% (90)      | 7.2% (51)        | <0.001   |
| Number of AEs                   |                  |                 |                  | <0.001   |
| One                             | 87.3% (165)      | 58.7% (257)     | 60.3% (108)      |          |
| Two                             | 9.5% (18)        | 23.5% (103)     | 20.7% (37)       |          |
| Three or more                   | 2.3% (6)         | 17.8% (78)      | 19.0% (34)       |          |

<sup>a</sup> Others: porters, maintenance, administrative, and cleaning staff, etc.<sup>b</sup> Other AEs: local redness, shivers, local induration, perspiration, etc.

**Table 3**

Factors associated with the adverse events and the reasons for being vaccinated in the 2010–2011 season.

|                       | Adverse events |           |       | Protect my health |           |       | Vaccinated previously |           |        | Protect the health of my family |           |      | Protect the health of patients |           |        |
|-----------------------|----------------|-----------|-------|-------------------|-----------|-------|-----------------------|-----------|--------|---------------------------------|-----------|------|--------------------------------|-----------|--------|
|                       | %              | n         | p     | %                 | n         | p     | %                     | n         | p      | %                               | n         | p    | %                              | n         | p      |
| Age                   |                |           | <0.01 |                   |           | N.S.  |                       |           | <0.001 |                                 |           | N.S. |                                |           | <0.001 |
| <45                   | 31.5%          | (74/235)  |       | 69.1%             | (177/256) |       | 43.8%                 | (112/256) |        | 52.0%                           | (133/256) |      | 64.5%                          | (165/256) |        |
| ≥45                   | 22.3%          | (105/471) |       | 71.3%             | (361/506) |       | 60.7%                 | (307/506) |        | 48.6%                           | (246/506) |      | 48.4%                          | (245/506) |        |
| Gender                |                |           | N.S.  |                   |           | <0.01 |                       |           | N.S.   |                                 |           | N.S. |                                |           | <0.05  |
| Male                  | 23.7%          | (55/232)  |       | 76.8%             | (195/254) |       | 54.3%                 | (138/254) |        | 52.4%                           | (133/254) |      | 59.4%                          | (151/254) |        |
| Female                | 26.2%          | (124/474) |       | 67.5%             | (343/508) |       | 55.3%                 | (281/508) |        | 48.4%                           | (246/508) |      | 51.0%                          | (259/508) |        |
| Professional category |                |           | N.S.  |                   |           | N.S.  |                       |           | <0.01  |                                 |           | N.S. |                                |           | <0.001 |
| Physicians            | 26.6%          | (55/207)  |       | 70.9%             | (161/227) |       | 45.8%                 | (104/227) |        | 46.3%                           | (105/227) |      | 69.6%                          | (158/227) |        |
| Nurses                | 24.9%          | (57/229)  |       | 73.7%             | (179/243) |       | 58.8%                 | (143/243) |        | 55.6%                           | (135/243) |      | 55.6%                          | (135/243) |        |
| Aide/technician       | 23.2%          | (26/112)  |       | 69.4%             | (84/121)  |       | 56.2%                 | (68/121)  |        | 50.4%                           | (61/121)  |      | 52.9%                          | (64/121)  |        |
| Others                | 25.9%          | (41/158)  |       | 66.7%             | (114/171) |       | 60.8%                 | (104/171) |        | 45.6%                           | (78/171)  |      | 31.0%                          | (53/171)  |        |
| Vaccinated previously |                |           | N.S.  |                   |           | N.S.  |                       |           | <0.001 |                                 |           | N.S. |                                |           | N.S.   |
| Yes                   | 24.9%          | (153/613) |       | 72.7%             | (476/654) |       | 61.2%                 | (384/654) |        | 52.2%                           | (327/654) |      | 54.5%                          | (342/654) |        |
| No                    | 28.1%          | (26/93)   |       | 61.5%             | (66/108)  |       | 19.2%                 | (21/108)  |        | 42.3%                           | (44/108)  |      | 55.8%                          | (58/108)  |        |

outbreak of the new 2009 pandemic (H1N1) was controversial, since messages of people opposed to the vaccine, were widely circulated which gratuitously and unscientifically discredited the vaccine [29]. This may have potentially influenced individuals not to take the vaccine in all professional categories, except physicians, which was the only group in which vaccination coverage did not decrease. Moreover, as the 2010–2011 seasonal influenza vaccine contained the pandemic (H1N1) 2009 strain, some of these HCPs were still reluctant to receive the seasonal vaccine so the coverage rate was still lower than that for the 2009–2010 season. From the above, we infer that physicians have a greater knowledge of vaccines than other groups because their level of health education is higher, however, the above explanation might not be valid to justify the progressive drop in vaccination coverage in this group. That is why we consider that this decrease is due to the high number of new pandemic vaccine-related AEs since physicians were the most vaccinated in this campaign and they suffered the highest number of AEs. This fact may have caused some physicians to be reluctant to receive vaccine in the 2010–2011 campaign.

The frequency of new 2009 pandemic (H1N1) vaccine-related AEs was quite high (80.5%); three fold that of the 2009–2010 and 2010–2011 seasonal influenza campaigns. These differences may be explained by the AS03 adjuvant included in the pandemic vaccine. This adjuvant is composed of squalene (10.69 mg), DL- $\alpha$ -tocopherol (11.86 mg) and polysorbate 80 (4.86 mg). Squalene is associated with local reaction at the injection site [30], especially local pain. This coincides with our study since local pain at the injection site was the most common AE.

The frequency of seasonal influenza vaccine-related AEs was similar to that for the 2009–2010 season (25.3%) [8] and lower than the rates for previous seasons [17–19,31,32] (28% [17] – 90% [31]). As this kind of study cannot include a placebo group for ethical reasons, we cannot distinguish between vaccine-induced symptoms, those caused by an intercurrent disease, or those arising from excessive self-examination. None of the AEs were considered severe so the data obtained endorse the safety of the influenza vaccines used during the three seasons under study.

The reasons for accepting the influenza vaccine were no different from those previously described in a study on seasonal influenza [20]. The main reason for accepting was still “self-protection” and this coincides with the findings of other authors’ for seasonal influenza [33,34] and for the new 2009 pandemic (H1N1) [8]. Considering that another of the important reasons for accepting the vaccine was “protecting my family and my patients”, we need to keep providing HCP with information about the vaccine’s capacity to reduce the risk of suffering from influenza, and

consequently reduce the risk of transmitting it to their family and their patients.

The only variable associated with a higher AE rate with the 2010–2011 vaccine was age. This had already been observed in our center during the administration of the vaccine against the AnH1N1 virus [15], and in the study by Zhu et al. [35], where the younger age group showed a higher AE rate. On the other hand, it is important to note that vaccination “to protect my health” was the only reason given more often among men than women. At the same time, it seems logical that the reason “protect my family” was evenly distributed among all the categories of variable studied. The profile of the healthcare professional most often associated with “protect my patients” was a male doctor under 45 years of age.

Just like in other studies of this kind [33], one limitation may be the lack of data about the percentage of employees who received the vaccine in other centers. This would mean that the vaccination coverage is underestimated. This is, however, considered unlikely as the vaccine campaigns covered a wide time-scale that included the beginning and end of the working day.

Another limitation may be a potential classification bias arising from the use of a telephone interview to get AE-related information and a potential selection bias due to the impossibility of contacting some HCPs. A classification bias is a common limitation in previous studies [17,32]. As the intention was for the worker to describe the AE in their own words, a telephone interview was considered the most practical and inexpensive way to get this information [17]. An attempt was made to limit the potential selection bias by trying to contact the healthcare professional on up to five different occasions. As a result the survey included 1996 of a total of 2424 workers vaccinated (82.3%), the highest series of influenza vaccine-related AEs studied in HCPs.

The low vaccination coverage shows that, unfortunately, the evidence-based strategies to maximize vaccination coverage among HCPs [36] have been inadequate to achieve successful vaccination coverage, especially during and after the 2009 pandemic (H1N1). In view of the reasons for accepting the vaccine, and given that influenza vaccination is safe, the importance of vaccination among patients and HCPs should be promoted in the framework of safety policies to improve vaccination coverage in our country. These policies should be aimed at preventing influenza infection among HCPs and thus avoid its transmission to patients. At the same time, a wider debate should be opened to discuss the need to adopt more aggressive measures to improve vaccination coverage. These measures should include compulsory vaccination for HCPs, implementing a vaccine refusal form, or linking influenza vaccination to an incentive scheme.

## Acknowledgements

We would like to thank Ana Diaz Medina and M<sup>a</sup> Jose Molina Gómez, nurses of the Preventive Medicine Department, for their collaboration in performing the fieldwork and data entry.

## References

- [1] Stewart AM. Mandatory vaccination of health care workers. *N Engl J Med* 2009;361(21):2015–7.
- [2] Jordan R, Hayward A. Should healthcare workers have the swine flu vaccine? *BMJ* 2009;339:b3398.
- [3] Carman WF, Elder AG, Wallace LA, McAulay K, Walker A, Murray GD, et al. Effects of influenza vaccination of health-care workers on mortality of elderly people in long-term care: a randomised controlled trial. *Lancet* 2000;355(9198):93–7.
- [4] Potter J, Stott DJ, Roberts MA, Elder AG, O'Donnell B, Knight PV, et al. Influenza vaccination of health care workers in long-term-care hospitals reduces the mortality of elderly patients. *J Infect Dis* 1997;175(1):1–6.
- [5] World Health Organization. Strategic Advisory Group of Experts on Immunization – report of the extraordinary meeting on the influenza A (H1N1) 2009 pandemic, 7 July 2009. *Wkly Epidemiol Rec* 2009;84(30):301–4.
- [6] National Center for Immunization and Respiratory Diseases, CDC; Centers for Disease Control and Prevention (CDC). Use of influenza A (H1N1) 2009 monovalent vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* 2009;58(RR-10):1–8.
- [7] European Centre for Disease Prevention and Control ECDC Interim Guidance. Use of specific pandemic influenza vaccines during the H1N1 2009 pandemic. Stockholm; 2009.
- [8] Barrière J, Vanjak D, Kriegel I, Otto J, Peyrade F, Estève M, et al. Acceptance of the 2009 A(H1N1) influenza vaccine among hospital workers in two French cancer centers. *Vaccine* 2010;28(43):7030–4.
- [9] Sánchez-Payá J, Hernández-García I, Barrenengoa Sañudo J, Rolando Martínez H, Camargo Ángeles R, Cartagena Llopis L, et al. Determinants of influenza vaccination in health staff: 2009–2010 season. *Gac Sanit* 2011;25(1):29–34.
- [10] Torun SD, Torun F. Vaccination against pandemic influenza A/H1N1 among healthcare workers and reasons for refusing vaccination in Istanbul in last pandemic alert phase. *Vaccine* 2010;28(35):5703–10.
- [11] Centers for Disease Control and Prevention (CDC). Interim results: influenza A (H1N1) 2009 monovalent and seasonal influenza vaccination coverage among health-care personnel – United States, August 2009–January 2010. *MMWR Morb Mortal Wkly Rep* 2010;59(12):357–62.
- [12] Virseda S, Restrepo MA, Arranz E, Magán-Tapia P, Fernández-Ruiz M, de la Cámara AG, et al. Seasonal and Pandemic A (H1N1) 2009 influenza vaccination coverage and attitudes among health-care workers in a Spanish University Hospital. *Vaccine* 2010;28(30):4751–7.
- [13] Amodio E, Anastasi G, Marsala MG, Torregrossa MV, Romano N, Firenze A. Vaccination against the 2009 pandemic influenza A (H1N1) among healthcare workers in the major teaching hospital of Sicily (Italy). *Vaccine* 2011;29(7):1408–12.
- [14] Maltezou HC, Dedoukou X, Patrinos S, Maragos A, Poufta S, Gargalianos P, et al. Determinants of intention to get vaccinated against novel (pandemic) influenza A H1N1 among health-care workers in a nationwide survey. *J Infect* 2010;61(3):252–8.
- [15] Sánchez-Payá J, Hernández-García I, Barrenengoa-Sañudo J, Camargo-Angelès R, Rincon A, Romero-Candeira S. Frequency and factors associated with adverse reactions following the administration of influenza vaccine in personal health during the 2009–2010 Season. *Rev Esp Salud Publica* 2010;84(6):851–9.
- [16] Dinh A, Lawrence C, Salomon J, Descatha A. Expected and unexpected adverse effects H1N1 vaccination for health care workers in a university hospital. *Vaccine* 2010;28(9):2063.
- [17] Hernández-García I, Sánchez-Payá J, Camargo R, Barrenengoa J, Martínez H, González-Torga A. Frequency of adverse reactions after influenza vaccination in health care personnel of a university hospital in Spain. *Enferm Infecc Microbiol Clin* 2010;28(7):435–8.
- [18] Kara A, Devrim I, Celik T, Akca T, Tezer H, Simsek OP, et al. Influenza vaccine adverse event and effect on acceptability in pediatric residents. *Jpn J Infect Dis* 2007;60(6):387–8.
- [19] Lee CS, Lee KH, Jung MH, Lee HB. Rate of influenza vaccination and its adverse reactions seen in health care personnel in a single tertiary hospital in Korea. *Jpn J Infect Dis* 2008;61(6):457–60.
- [20] Galicia-García MD, González-Torga A, García-González C, Fuster-Pérez M, Garrigós-Gordo I, López-Fresneña N, et al. Influenza vaccination in health-care workers. Why are some vaccinated whereas others are not. *Enferm Infecc Microbiol Clin* 2006;24(7):413–7.
- [21] Poland GA, Johnson DR. Increasing influenza vaccination rates: the need to vaccinate throughout the entire influenza season. *Am J Med* 2008;121(7 Suppl. 2):S3–10.
- [22] Paltore TN, Vandersluis JP, Morris J, Michelin A, Ruprecht LM, Schmitt JM, et al. A successful mandatory influenza vaccination campaign using an innovative electronic tracking system. *Infect Control Hosp Epidemiol* 2009;30(12):1137–42.
- [23] Rakita RM, Hagar BA, Crome P, Lammert JK. Mandatory influenza vaccination of healthcare workers: a 5-year study. *Infect Control Hosp Epidemiol* 2010;31(9):881–8.
- [24] Babcock HM, Gemeinhart N, Jones M, Dunagan WC, Woeltje KF. Mandatory influenza vaccination of health care workers: translating policy to practice. *Clin Infect Dis* 2010;50(4):459–64.
- [25] Talbot TR, Babcock H, Caplan AL, Cotton D, Maragakis LL, Poland GA, et al. Revised SHEA position paper: influenza vaccination of healthcare personnel. *Infect Control Hosp Epidemiol* 2010;31(10):987–95.
- [26] Poland GA, Jacobson RM, Boyce T. Health care worker pertussis immunization requirements and patient safety. *Am J Infect Control* 2008;36(6):390–1.
- [27] Ottenberg AL, Wu JT, Poland GA, Jacobson RM, Koenig BA, Tilburt JC. Vaccinating health care workers against influenza: the ethical and legal rationale for a mandate. *Am J Public Health* 2011;101(2):212–6.
- [28] Rachiotis G, Mouchtouri VA, Kremastinou J, Gourgoulialis K, Hadjichristodoulou C. Low acceptance of vaccination against the 2009 pandemic influenza A(H1N1) among healthcare workers in Greece. *Euro Surveill* 2010;15(6), pii=19486.
- [29] Alonso P. Criticar las vacunas es de una irresponsabilidad pasmosa. *elmundo.es*. October 26th, 2009; Biociencia (Salud). <http://www.elmundo.es/elmundosalud/2009/10/26/biociencia/1256582836.html> [accessed on 23.01.10].
- [30] Lippi G, Targher G, Franchini M. Vaccination, squalene and anti-squalene antibodies: facts or fiction? *Eur J Intern Med* 2010;21(2):70–3.
- [31] Scheifele DW, Bjornson G, Johnston J. Evaluation of adverse events after influenza vaccination in hospital personnel. *CMAJ* 1990;142(2):127–30.
- [32] Lopes MH, Mascheretti M, Franco MM, Vasconcelos R, Gutierrez EB. Occurrence of early adverse events after vaccination against influenza at a Brazilian reference center. *Clinics (Sao Paulo)* 2008;63(1):21–6.
- [33] Wicker S, Rabenau HF, Doerr HW, Allwinn R. Influenza vaccination compliance among health care workers in a German university hospital. *Infection* 2009;37(3):197–202.
- [34] Hollmeyer HG, Hayden F, Poland G, Buchholz U. Influenza vaccination of health care workers in hospitals – a review of studies on attitudes and predictors. *Vaccine* 2009;27(30):3935–44.
- [35] Zhu FC, Wang H, Fang HH, Yang JG, Lin XJ, Liang XF, et al. A novel influenza A (H1N1) vaccine in various age groups. *N Engl J Med* 2009;361:2414–23.
- [36] Pearson ML, Bridges CB, Harper SA. Healthcare Infection Control Practices Advisory Committee (HICPAC); Advisory Committee on Immunization Practices (ACIP). Influenza vaccination of health-care personnel: recommendations of the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* 2006;55(RR-2):1–16.