Health care workers' influenza vaccination: motivations and mandatory mask policy

V. Dorribo[1], C. Lazor-Blanchet[2], O. Hugli[3] and G. Zanetti[2,4]

[1]Service of Occupational Medicine, Institute for Work and Health, CH-1066 Epalinges – Lausanne, Switzerland, [2]Service of Hospital Preventive Medicine, Department of Medicine, Lausanne University Hospital, CH-1011 Lausanne, Switzerland, [3]Emergency Department, Lausanne University Hospital, CH-1011 Lausanne, Switzerland, [4]Service of Infectious Diseases, Department of Medicine, Lausanne University Hospital, CH-1011 Lausanne, Switzerland.

Correspondence to: V. Dorribo, Institute for Work and Health, Route de la Corniche 2, CH-1066 Epalinges – Lausanne, Switzerland. Tel: +41 21 314 74 21; fax: +41 21 314 74 30; e-mail: victor.dorribo@chuv.ch

Background	Vaccination of health care workers (HCW) against seasonal influenza (SI) is recommended but vaccination rate rarely reach >30%. Vaccination coverage against 2009 pandemic influenza (PI) was 52% in our hospital, whilst a new policy requiring unvaccinated HCW to wear a mask during patient care duties was enforced.
Aims	To investigate the determinants of this higher vaccination acceptance for PI and to look for an association with the new mask-wearing policy.
Methods	A retrospective cohort study, involving HCW of three critical departments of a 1023-bed, tertiary-care university hospital in Switzerland. Self-reported 2009–10 SI and 2009 PI vaccination statuses, reasons and demographic data were collected through a literature-based questionnaire. Descriptive statistics, uni- and multivariate analyses were then performed.
Results	There were 472 respondents with a response rate of 54%. Self-reported vaccination acceptance was 64% for PI and 53% for SI. PI vaccination acceptance was associated with being vaccinated against SI (OR 9.5; 95% CI 5.5–16.4), being a physician (OR 7.7; 95% CI 3.1–19.1) and feeling uncomfortable wearing a mask (OR 1.7; 95% CI 1.0–2.8). Main motives for refusing vaccination were: preference for wearing a surgical mask (80% for PI, not applicable for SI) and concerns about vaccine safety (64%, 50%) and efficacy (44%, 35%).
Conclusions	The new mask-wearing policy was a motivation for vaccination but also offered an alternative to non-compliant HCW. Concerns about vaccine safety and efficiency and self-interest of health care workers are still main determinants for influenza vaccination acceptance. Better incentives are needed to encourage vaccination amongst non-physician HCW.
Key words	Health care workers; microbiological hazards; occupational health policy; risk management; vaccination; workplace health promotion.

Introduction

The annual vaccination of health care workers (HCW) against seasonal influenza (SI) is indicated in order to limit nosocomial transmission and HCW absenteeism and to protect HCW exposed to influenza [1]. Prevention of nosocomial transmission of influenza is also critical for patient groups who are at risk of more severe infection or complications, such as immunocompromised, young or elderly patients and patients suffering from chronic diseases or admitted to an intensive care unit (ICU) [2].

In our tertiary-care university hospital, only 25–30% of HCW are vaccinated against SI yearly. This is despite its active promotion consisting of an information campaign, free vaccination and the use of dedicated vaccination teams at HCW places of work and covering different work shifts. Vaccination coverage rates are low especially amongst registered nurses (RN). Many of the studies published up to 2009 showed a similar 20–40%

vaccination coverage rate among HCW in European countries [3–5].

Influenza *virus A/California/04/2009* 'H1N1' emerged in Mexico and California in April 2009. The World Health Organization declared phase 6 of the pandemic on 11 June 2009. Vaccination priority target groups for pandemic influenza A(H1N1) were those defined for seasonal influenza, including HCW, pregnant women, children under 2 years and obese individuals [6]. In Swiss hospitals, the pandemic vaccine only became available after the campaign for 2009–10 SI vaccination had been completed. At that time, mass media coverage was fairly contradictory and was raising concerns about the safety and efficacy of pandemic influenza (PI) vaccine for the general population [7,8].

PI vaccination was heavily promoted inside the hospital. The promotion campaign was also used as an opportunity to implement a new mask-wearing policy in order to minimize viral circulation despite low vaccination coverage. The new policy obliged HCW in close contact (<2 m) with patients to wear a surgical mask if they were either unvaccinated against PI or had only been vaccinated in the last 14 days, regardless of the presence of respiratory tract infection symptoms, and in addition to standard infection control measures such as hand disinfection and mask use for symptomatic workers and patients. The PI vaccination coverage rate rose to 52% in our hospital's HCW, twice as high as the SI vaccination coverage rate (26%).

This study's goal was to investigate the determinants of the higher PI vaccination acceptance and in particular any possible association with the new mask-wearing policy.

Methods

This questionnaire-based retrospective cohort study took place in a 1023-bed, tertiary-care university hospital in Switzerland. A standardized questionnaire (see Supplementary Appendix 1) was developed to collect demographic data, self-declared vaccination status against 2009–10 SI and/or 2009 PI, self-declared vaccination status against SI in the three previous years and motives for accepting or refusing vaccination reported on a five-level Likert scale. These questions were based on a literature review [3,4,9–19]. Questions assessing motivation were different according to self-reported vaccination status.

The questionnaire was pretested for comprehension on 10 people from the general population and on 10 HCW. Study participation was voluntary. The protocol was approved by the regional ethics committee.

The questionnaire was administered to all HCW providing direct care to patients: medical doctors (MD), registered nurses (RN) and other caregivers (OCG). The latter category included nursing assistants and physical therapists. The study was limited to the four hospital departments where influenza vaccination coverage was deemed of greatest importance because of the expected number of influenza patients and/or the potential severity of nosocomial influenza. These were the emergency department, the ICU, internal medicine and the onco-haematology unit. The questionnaire was distributed throughout the different departments in August 2010, with a reminder sent 1 month later. The questionnaires were then collected anonymously.

The motives for acceptance or refusal of vaccination, assessed by a five-level Likert scale, were dichotomized for the purpose of analysis (claimed motives on one side, unclaimed motives and neutral opinion pooled on the other side). In order to assess the accuracy of the self-reported vaccination acceptance rates obtained using the questionnaire, we compared them to the vaccination coverage rates measured in the same departments by the occupational health service during the actual vaccination campaigns.

The results are expressed as the mean ± SD or proportion (%). The Wilcoxon rank-sum test was used to compare continuous variables between groups, and Fisher's exact tests were used to compare frequencies of categorical variables. A bilateral $P < 0.05$ was considered significant. In order to determine a model for acceptance of PI vaccination, a multivariate logistic regression analysis was performed using the variables obtained from the questions asked to all responders. In this analysis, professions were split into MD and non-MD—pooling RN and OCG because of a similar vaccination profile; all variables with $P < 0.10$ in univariate analysis became candidates for a stepwise selection for the logistic regression model. We then tested all variables not retained in the model for possible confounding. The STATA software 11.2 (StataCorp LP, College Station, TX, USA) was used for the analysis.

Results

Figure 1 shows the study flowchart. We distributed 877 questionnaires, of which 472 were returned (response rate: 54%). The response rate varied significantly between hospital departments: 44% in internal medicine, 59% in onco-haematology, 81% in the emergency department and 41% in ICU ($P < 0.001$).

The study respondents' socio-demographic and professional characteristics are shown in Table 1. Most of the respondents were RN, followed by MD and then OCG. A few (4%) were not employed by the hospital during the pandemic season. Females represented the majority of HCW (68%). HCW with >9 years of post-graduate experience were the largest group (45%). A minority of HCW had risk factors for complicated SI or PI during the pandemic period: 9% declared themselves chronically ill, and 4% of women were pregnant. Furthermore, 3% lived with a chronically ill person, and 13% lived with a pregnant woman or children under 2 years old. Overall, 52%

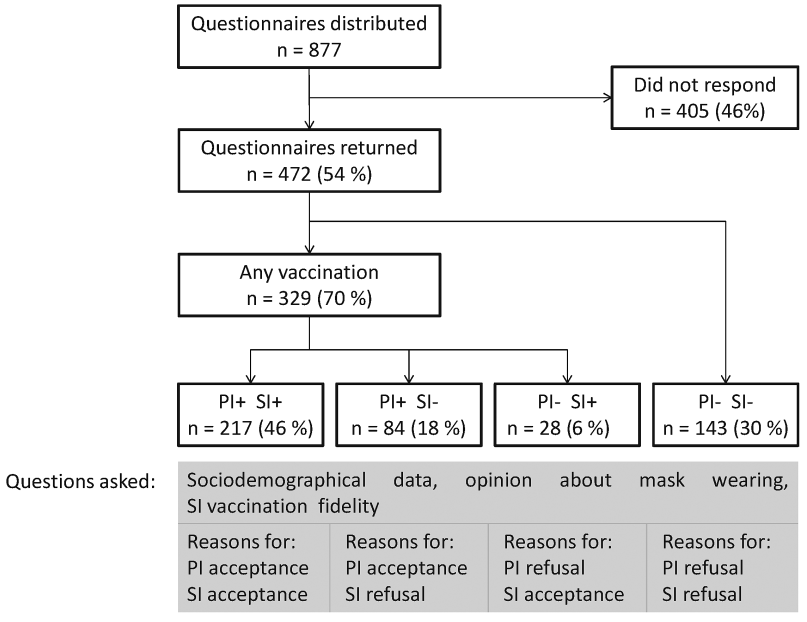

Figure 1. Study flowchart. PI+, vaccinated against pandemic influenza; SI+, vaccinated against seasonal influenza; PI−, NOT vaccinated against pandemic influenza; SI−, NOT vaccinated against seasonal influenza.

Table 1. Characteristics of the 472 responders according to self-reported vaccination status[a]

	PI+ SI+ (*n* = 217, 46%)	PI+ SI− (*n* = 84, 18%)	PI− SI+ (*n* = 28, 6%)	PI− SI− (*n* = 143, 30%)
Age (mean ± SD)	36.9 ± 8.9	35.6 ± 7.6	34.8 ± 10.8	34.6 ± 9.0
Non-MD HCW	118 (54)	76 (90)	23 (82)	139 (97)
Women	133 (61)	63 (75)	17 (61)	110 (77)
Service[b]				
Internal medicine	99 (46)	20 (24)	12 (43)	42 (29)
Emergency department	64 (29)	30 (36)	10 (36)	47 (33)
Onco-haematology ward	8 (4)	4 (5)	0	4 (3)
ICU	31 (14)	21 (25)	4 (14)	37 (26)
Work experience				
0–3 years	23 (11)	7 (8.3)	7 (25)	28 (20)
4–6 years	51 (24)	15 (18)	8 (29)	28 (20)
7–9 years	40 (18)	15 (18)	3 (11)	31 (22)
>9 years	102 (47)	47 (56)	10 (36)	54 (38)
Employed by the hospital during pandemics	195 (90)	81 (96)	22 (79)	118 (83)
Non-occupational indications to influenza vaccination				
Chronically ill	22 (10)	8 (10)	1 (4)	14 (10)
Living with a person at risk of complicated seasonal influenza	11 (5)	1 (1)	1 (4)	3 (2)
Living with a child under 2 or a pregnant woman	37 (17)	(18)	0	9 (6)
Pregnancy (*n*, % of women HCW)	3 (1)	5 (6)	0	1 (1)

PI+, vaccinated against pandemic influenza; SI+, vaccinated against seasonal influenza; PI−, NOT vaccinated against pandemic influenza; SI−, NOT vaccinated against seasonal influenza.
[a]Data are numbers (%) except if specified otherwise.
[b]Physiotherapists are not attached to a single service, hence total in each column for this category does not add up to 100%.

of HCW reported being vaccinated against 2009–2010 SI, and 64% against 2009 PI. According to the occupational health service's data, vaccination coverage rates in the departments studied were 33% for SI and 49% for PI.

The new mask-wearing policy was viewed as justifiable by 70% of respondents and as disproportionate response by 22%; some 58% of respondents declared wearing a mask to be uncomfortable. Table 2 details

these responses according to pandemic influenza vaccination status.

Motivations for accepting influenza vaccinations are shown in Table 3; they were similar for both SI and PI vaccines. The most frequently reported motivations were the protection of patients, a close relative and oneself.

Table 4 shows reasons for the refusal of the SI and/or PI vaccine. Amongst non-vaccinated HCW, most reported a preference for barrier precautions. Concerns regarding vaccine safety and efficiency were more frequently reported about PI than about SI. There were significant differences in the motivations for vaccine refusal, depending on HCWs' job categories. Non-MD HCW preferred to use barrier precautions rather than vaccination against SI ($P < 0.001$) and PI ($P < 0.01$); they also preferred to use alternative medicine rather than vaccination against SI ($P < 0.05$); and they feared the adverse effects of SI vaccine more often than MD ($P < 0.05$). For their part, MD were more likely to state that they refused SI vaccination because they did not have time ($P < 0.05$); because they were unaware of the vaccines availability ($P < 0.05$) or because they forgot to get vaccinated ($P < 0.05$).

About 37% of respondents had not been vaccinated against SI over the previous 3 years. However, 36% had been vaccinated every year, with a significantly higher vaccine uptake by MD than other HCW ($P < 0.001$). About 51% of people in our sample stated that they had been vaccinated against SI the year before, also with a significant difference according to occupational status ($P < 0.001$). About 46% of HCW reported their intention to get vaccinated against SI in the post-pandemic season (2010–11), but 38% reported their intention to refuse this. Non-MD HCW had a significantly lower intention of getting vaccinated against SI ($P < 0.001$) for the next season.

Multivariate analysis identified six of the characteristics documented in all participants that were strongly associated with PI vaccination (Table 5).

Discussion

PI vaccination was strongly associated with previous SI vaccination acceptance, being an MD and living with a

Table 2. Attitudes towards the new mask-wearing policy, according to self-reported pandemic influenza vaccination status

	PI+, any SI (n = 301, 64%)	PI−, any SI (n = 171, 36%)
Finds policy deemed justifiable (n, %)	214 (71)	115 (67)
Finds mask wearing described as uncomfortable (n, %)	195 (65)	80 (47)

PI+: vaccinated against pandemic influenza; PI−: NOT vaccinated against pandemic influenza.

Table 3. Reasons for vaccination acceptance according to self-reported vaccination status

	PI+ SI+ (n = 217, 46%)	PI+ SI− (n = 84, 18%)	PI− SI+ (n = 28, 6%)	PI− SI− (n = 143, 30%)
Reasons for SI vaccination				
Self-protection	72%	NA	71%	NA
Protection of patients	93%	NA	82%	NA
Protection of close family and friends	75%	NA	50%*	NA
Free and available vaccine	69%	NA	68%	NA
Encouraged by a colleague	14%	NA	14%	NA
Convinced by campaign	19%	NA	11%	NA
Others	6%	NA	14%	NA
Reasons for PI vaccination				
Self-protection	77%	48%	NA	NA
Protection of patients	90%	62%*	NA	NA
Protection of close family and friends	79%	68%	NA	NA
Free and available vaccine	69%	51%*	NA	NA
Encouraged by a colleague	19%	33%*	NA	NA
Convinced by campaign	29%	24%	NA	NA
Others	55%	52%*	NA	NA
Discomfort from the mask	5%	14%	NA	NA

NA, not applicable; PI+, vaccinated against pandemic influenza; SI+, vaccinated against seasonal influenza; PI−, NOT vaccinated against pandemic influenza; SI−, NOT vaccinated against seasonal influenza.
*P value < 0.05.

Table 4. Reasons for vaccination refusal, according to self-reported vaccination status

	PI+ SI+ (n = 217, 46%)	PI+ SI− (n = 84, 18%)	PI− SI+ (n = 28, 6%)	PI− SI− (n = 143, 30%)
Reasons for refusal of SI vaccination				
Allergy	NA	1%	NA	3%
Contraindication(s)	NA	2%	NA	1%
Vaccination of other HCW deemed sufficient	NA	5%	NA	3%
Not prone to flu	NA	14%	NA	17%
Fear of adverse effects	NA	35%	NA	59%*
Avoidance of drugs	NA	37%	NA	68%*
Vaccination deemed ineffective	NA	20%	NA	44%*
Vaccination deemed unsafe	NA	21%	NA	41%*
History of adverse effects	NA	13%	NA	16%
Barrier precautions preferred	NA	60%	NA	85%*
Fear of injections	NA	5%	NA	10%
Lack of time	NA	16%	NA	5%*
Vaccination forgotten	NA	12%	NA	3%*
No awareness of vaccination availability	NA	5%	NA	2%
Use of alternative medicine	NA	25%	NA	30%
Others	NA	5%	NA	8%
Reasons for refusal of PI vaccination				
Allergy	NA	NA	0%	2%
Contraindication(s)	NA	NA	0%	1%
Vaccination of other HCW deemed sufficient	NA	NA	4%	2%
Not prone to flu	NA	NA	7%	18%
Fear of adverse effects	NA	NA	57%	65%
Avoidance of drugs	NA	NA	25%	65%*
Vaccination deemed ineffective	NA	NA	18%	49%*
Vaccination deemed unsafe	NA	NA	54%	61%
History of adverse effects	NA	NA	4%	8%
Barrier precautions preferred	NA	NA	82%	79%
Fear of injections	NA	NA	0%	8%
Lack of time	NA	NA	4%	3%
Vaccination forgotten	NA	NA	4%	1%
No awareness of vaccination availability	NA	NA	4%	2%
Use of alternative medicine	NA	NA	4%	29%*
Others	NA	NA	14%	6%

NA, not applicable; PI+, vaccinated against pandemic influenza; SI+, vaccinated against seasonal influenza; PI−, NOT vaccinated against pandemic influenza; SI−, NOT vaccinated against seasonal influenza.
*P value < 0.05.

Table 5. Multivariate analysis of the determinants of vaccination against pandemic influenza

	OR	95% CI
Being vaccinated against SI	9.54	5.54–16.44
Being a MD	7.67	3.08–19.12
Working in the hospital during pandemics	6.84	2.71–17.25
Living with a pregnant woman or a child <2	5.83	2.30–14.80
Work experience >9 years	2.25	1.36–3.73
Feeling uncomfortable wearing a mask	1.68	1.03–2.75

pregnant woman or an infant. The strong association with previous SI vaccination has been described previously [20]. The last point could be partially explained by the fact that new indications for vaccination, such as living with infants and being pregnant, emerged during the 2009 pandemics. The higher PI vaccination uptake is less easily explained by respondents' motivations, as these motivations did not differ between SI and PI.

The main reasons for not receiving PI vaccination were fears that the PI vaccine was unsafe or ineffective; although these reasons for refusal were given for both vaccines, they were more prominent for PI vaccine. Other studies also found these results [21–23]. This could be a consequence of the worldwide debate regarding the novelty of the PI vaccine and its fast marketing and distribution [7,24]. Moreover, the PI vaccines offered by our hospital contained an adjuvant, while the SI vaccines had always been adjuvant-free. Multivariate analysis showed

that the perception of discomfort while wearing a surgical mask was associated with PI vaccination acceptance. To our knowledge, this has never been described in the literature, although the compulsory use of surgical masks by unvaccinated, asymptomatic HCW has been proposed as a promising incentive to vaccination [18]. HCW in our study perceived this to be an uncomfortable, but fair policy.

Whether the mask policy impacted the PI vaccination uptake cannot be inferred from our study, given its retrospective design and limitations. Of note, SI vaccination uptake did not remarkably evolve during the four following seasons (data not shown), while the mandatory mask-wearing policy remained enforced during SI epidemics. Nevertheless, two interesting arguments were outlined by the study: on one hand, not needing to wear a surgical mask during the epidemic season was one of the main self-declared motivations for vaccination; on the other hand, some HCW preferred barrier precautions (i.e. wearing a mask) over vaccination, and in this case, the policy possibly offered them an alternative to vaccination. This has never been described before in the literature.

Overall, the self-reported vaccination acceptance rate for PI was higher than for SI. Similar findings have been reported by German [25], Canadian [26] and French studies [22,27]. This acceptance rate was higher than the pre-pandemic willingness to be vaccinated against PI expressed by HCW in several other studies [20,22,23,26,27]. For example, <40% of HCW in nine primary care clinics in Singapore expressed a willingness to receive the H1N1 vaccination [23].

As in similar studies [28], MD better accepted SI vaccination than non-MD. Living with a person at risk from complications of SI, as well as older age, also raised the number of SI vaccinations; the acceptance rate of influenza vaccine was also dependent on the hospital department that the HCW worked in. This was also reported in a university clinical centre in Germany, where vaccination rates varied widely between different departments (4–71%) [25].

The response rate of 54% was around the average for such a study [11,16,17]. Most of the respondents were women and RNs. Aside from being a target population for vaccination as HCW, few of the respondents had an indication for SI vaccination, either due to a personal health condition or to a private close contact with a person at risk.

The respondents stated that the vaccination promotion campaigns did not influence their motivation to get vaccinated, which is in contrast to the findings of several studies [9,29]. This may reflect a social acceptance bias as vaccinated HCW may want to claim that they arrived at their decisions independently. Another explanation could be a response bias. Indeed, those HCW highly motivated to take an SI or PI vaccine—and thus not influenced by promotion campaigns—may be over-represented among respondents.

This study was limited by its retrospective, questionnaire-based design, and closed questions may have induced a response bias. Furthermore, self-declared vaccination acceptance rates were higher in our sample than the vaccination coverage rates provided by the occupational health service; this design was subject to a participation bias, which cannot be well described because of the lack of data on non-responders. However, some characteristics of vaccination uptake remained similar, such as a higher acceptance by MDs than by other HCW, despite an over-representation of vaccinated HCW. Moreover, due to the rotation of young MDs through different departments every 3–6 months, it cannot be ruled out that some of the MDs present in the study departments at the time of the pandemic did not participate in the study. Furthermore, a social acceptance bias cannot be excluded.

In conclusion, the discomfort of wearing a surgical mask as a barrier protection was a motivation to get vaccinated against influenza. Nevertheless, this particular barrier protection might also be regarded as counter-productive for the sole purpose of improving immunization rates, because it could offer an alternative to vaccination to non-vaccinated HCW. The fact that vaccination against either SI or PI was higher in MDs points to a need for more information and innovative motivation strategies for other HCW. These results could be used to focus future vaccination campaigns on HCW interests and concerns in order to raise SI vaccination coverage. They could also be used to design novel study protocols to clearly assess the impact on vaccination acceptance rates of a compulsory mask-wearing policy for unvaccinated HCW.

Key points

- The discomfort of a mandatory mask policy was associated with pandemic influenza vaccination acceptance.
- Concerns and self-interests of health care workers play a major role in influenza vaccination acceptance.
- Influenza vaccination acceptance differed between medical doctors and other health care personnel.

Conflicts of interest

None declared.

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