

# Influenza Vaccination Compliance Among Health Care Workers in a German University Hospital

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## Abstract

**Background:** Since 1988, the Standing Committee on Vaccination (STIKO) at the Robert Koch-Institute, Berlin, has explicitly recommended that health-care workers (HCWs) should be vaccinated against seasonal influenza. However, acceptance of the influenza vaccination by medical personnel is low.

**Methods:** This study analyzes factors associated with the compliance of HCWs with the seasonal influenza vaccination on the basis of three different anonymized questionnaires during two consecutive influenza seasons: 2006/2007 and 2007/2008. The questionnaires covered details of demographics, frequency of previous vaccinations, reasons for accepting or declining the vaccination, and the HCW's knowledge of the influenza vaccine and influenza itself.

**Results:** Our study showed that physicians were significantly more likely to have been vaccinated than nurses (38.8% vs 17.4%;  $p < 0.0001$ ). The main reasons for non-compliance included: supposition of a low risk of infection, fear of side effects, the belief that the influenza vaccine might trigger the influenza virus infection, and scepticism about the effectiveness of the influenza vaccination.

**Conclusion:** Our findings confirm the importance of a comprehensive approach to the vaccination, ensuring that HCWs are correctly informed about the vaccine and that it is convenient to receive it.

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## Introduction

Health-care workers (HCWs) are at risk of occupational exposure to and subsequent contraction of influenza [1]. Encouraging HCWs to receive the vaccine could play a vital role in preventing the transmission of flu, and thereby reduce institutional outbreaks. The vaccination of HCWs plays an important part in prevention programs aimed at reducing influenza-related morbidity and mortality among high-risk patients [2–6].

The Standing Committee on Vaccination (STIKO) at the German Robert Koch Institute (RKI) has recommended since 1988 that German HCWs should be vaccinated

against influenza to limit the spread of the illness between medical personnel and patients, as well as to reduce staff illness and absenteeism during the influenza period [7–11]. Nevertheless, compliance rates with the influenza vaccination among HCWs remain low [12–18]. Although a safe and effective vaccine is available, the reasons for such poor compliance are not well understood [13, 19].

In order to improve the influenza vaccination rates, a local campaign at the Frankfurt University Hospital started in 2003/2004. An incentive program and enhanced education strategies (e.g., articles in the clinic's newsletter, posters in all wards, email information, leaflets, and personal information) were implemented in 2005.

Within the framework of the campaign, we carried out a study to identify factors in the compliance and/or noncompliance with influenza vaccination. Survey results were used to design an intervention to increase the immunization rate of staff.

In a first approach we interviewed all participants of vaccination in the year 2006/2007 and asked for the reasons for participation. In the next step we tried to discover the reasons for noncompliance by sending questionnaires by e-mail to the nonparticipants.

Because adverse effects of influenza vaccination are frequently feared by HCWs and other vaccinees, we finally conducted a third study to rule out the incidence of vaccinee inconvenience during the winter season 2007/2008.

## Methods

The Frankfurt University Hospital is a 1,247-bed hospital with 3,900 employees (726 physicians, 1,040 nurses, and 949 medical technicians) in 12 medical disciplines. It has approximately

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44,000 inpatient admissions (2006) and about 200,000 outpatients. The University Hospital offers influenza vaccinations to HCWs free of charge through the Occupational Health Service from October to February.

Three different anonymized questionnaires on the influenza vaccination were distributed during two consecutive influenza seasons: 2006/2007 and 2007/2008. The questionnaire covered details of demographics, the frequency of previous vaccinations, as well as information on HCWs' views on the influenza vaccination and reasons for accepting or declining the vaccination. HCWs were also questioned on their knowledge of the influenza vaccine and influenza itself.

### First Questionnaire

From October 2006 to January 2007, an anonymous questionnaire concerning HCWs' views on the influenza vaccination was distributed among vaccinated HCWs during the course of the vaccination campaign.

### Second Questionnaire

Before the 2007/2008 campaign (from September to October 2007), HCWs who had not received an influenza vaccination in 2006/2007 were asked to explain their decision, in order to find ways to improve the vaccination campaign and to convince the HCWs of the importance of influenza vaccination and the consequences of refusal for both HCWs and their patients. HCWs were contacted via e-mail. Participants returned the questionnaire anonymously to the Occupational Health Service via interoffice mail.

### Third Questionnaire

Health-care workers who were vaccinated in the subsequent 2007/2008 influenza season were asked to complete an anonymous questionnaire concerning any side effects in the week following their vaccination.

For statistical analysis, data were inserted into a Microsoft Excel database file. The contents of this file then underwent detailed analysis based on standard MS Excel functionality.  $\chi^2$  fourfold values were calculated using the BiAS program for Windows 8.3 (Epsilon Verlag, Hochheim-Darmstadt, Germany, 2007).

## Results

### First Questionnaire

Overall, in the 2006/2007 influenza season, the Occupational Health Service vaccinated 26.9% ( $n = 1,101/4,080$ ) of the hospital staff against influenza. The survey was completed by 1,100 HCWs. Only one physician declined to fill in the questionnaire; 59.5% ( $n = 655$ ) of the participants were female, 40% ( $n = 441$ ) were male, while 0.5% ( $n = 5$ ) did not specify their gender. Physicians were significantly more likely to have been vaccinated ( $n = 282/726$ ) than nurses ( $n = 256/1471$ ) (38.8% vs 17.4%, respectively;  $p < 0.0001$ ). Table 1 shows vaccination rates according to job description.

The main reason cited for compliance with the influenza vaccination was the belief that influenza was a serious illness which people wanted to avoid (92.2%) (see Table 1). Overall, 21.1% ( $n = 232$ ) of the HCWs replied that they had suffered from influenza in the past.

Table 1

**Vaccination rates among healthcare workers according to occupational group and reasons for accepting the influenza vaccination. Data from questionnaire 1 ( $n = 1,100$ ).**

Job description	Vaccination rate (%)
Physician	38.8
Nurses	17.4
Laboratory personnel	15.9
Total	26.9
Reasons for accepting influenza vaccination <sup>a</sup>	
Self-protection	92.2
Protection of patients	54.7
Protection of family, friends	66.9

<sup>a</sup>Multiple answers were possible

### Second Questionnaire

In total, 350 HCWs who chose not to vaccinate in the 2006/2007 influenza season returned the questionnaire and explained their reasons for noncompliance. The exact number of people who received the recruitment e-mail is unknown. Therefore, an accurate response rate cannot be calculated.

Around 67.7% ( $n = 237$ ) of the responders were female and 32.3% ( $n = 113$ ) were male, 19.4% ( $n = 68$ ) were physicians, 60.6% ( $n = 212$ ) were nurses, and 20% ( $n = 70$ ) were cleaners, medical technicians, research scientists or administrative staff. Overall, the main reasons cited by HCWs for noncompliance with the vaccination were: doubt about specific risks; fear of an adverse reaction; and scepticism about vaccine efficacy. Nearly 18% of the participating HCWs said they believed influenza was not a serious illness. Physicians also based their decision on a lack of time. The most common reasons cited for refusal of the vaccination are summarized in table 2.

The perceived barriers were broadly similar for physicians and nurses. However, a significantly higher proportion of nurses believed that the vaccine might cause influenza and lead to adverse reactions ( $p < 0.001$ ), whereas a higher proportion of doctors believed that the vaccine did not afford sufficient protection ( $p < 0.05$ ). Among the HCWs who declared that they would not take the influenza vaccine, the most common reasons for refusing the vaccination was doubt over any specific risks resulting from their job (42.3%), and concerns about side effects of the flu vaccination (29.1%).

Reasons for noncompliance were almost identical for the two genders and across the different medical disciplines. A higher proportion of women (20.7% vs 9.7% male;  $p < 0.05$ ) believed that the vaccine might cause influenza, whereas 35.4% of male participants (vs 24.5% female participants;  $p < 0.05$ ) believed that the vaccine did not provide sufficient protection. Beyond this, 40.8% of the HCWs from the Department of Internal Medicine were worried about side effects, whereas only 22% of the

Reasons for rejecting previous influenza vaccination (multiple answers were possible)	Overall (n = 244) (%)	Physicians (n = 60) (%)	Nurses (n = 73) (%)	P-value	Others (n = 111) (%)
Perceived barriers to previous influenza vaccination by occupational group reported by people who intended to take the influenza vaccination for the first time in the 2006/2007 season (n = 244: data from questionnaire 1)					
No specific risk	57.8	55.0	52.1	0.869	63.1
Influenza not perceived to be a serious illness	17.6	16.7	12.3	0.644	21.6
Vaccine does not provide sufficient protection	9.8	16.7	9.6	0.339	6.3
Fear of adverse reaction	11.9	10.0	17.8	0.302	9.0
Fear of injection	4.5	0.0	5.5	0.183	6.3
Vaccine causes influenza	11.9	0.0	19.2	< 0.001	13.5
Not specified	7.0	8.3	12.3	0.643	2.7
Reasons for rejecting previous influenza vaccination (multiple answers were possible)	Overall (n = 350) (%)	Physicians (n = 68) (%)	Nurses (n = 212) (%)	P-value	Others (n = 70) (%)
Perceived barriers to influenza vaccination by occupational group reported by persons who declined influenza vaccination in the 2006/2007 season (n = 350: data from questionnaire 2)					
No specific risk	42.3	41.2	44.3	0.751	37.1
Influenza not perceived to be a serious illness	17.7	22.1	18.4	0.625	11.4
Vaccine does not provide sufficient protection	28.0	42.6	26.9	0.021	17.1
Fear of adverse reaction	29.1	10.3	31.6	< 0.001	40.0
Fear of injection	5.4	0.0	6.6	0.064	7.1
Vaccine causes influenza	17.1	2.9	21.7	< 0.001	17.1
Not specified	10.3	14.7	7.1	0.094	15.7

HCWs from surgery considered adverse reactions a problem ( $p < 0.05$ ). Physicians (10.3%) were significantly less likely to refuse the vaccination due to possible side effects than nurses (31.6%,  $p < 0.001$ ). Whereas 42.6% of the physicians believed that the vaccine did not provide sufficient protection, only 26.9% ( $p < 0.05$ ) of the nurses shared this view (data from questionnaire 2).

### Third Questionnaire

During the winter season between October 2007 and the end of March 2008, 1,198 HCWs were vaccinated against influenza; 84.8% ( $n = 1,016$ ) of these completed the questionnaire about side effects of the influenza vaccination and took part in the study.

Some of the vaccinated HCWs (17.7%,  $n = 180$ ) reported adverse events that they considered to be side effects of the vaccination.

The rate of systemic adverse events after the influenza vaccination was comparatively low (10.0%,  $n = 102$ ); there were no reported occurrences of a high temperature ( $> 38.5$  °C), while a subfebrile temperature ( $< 38.5$  °C) was declared by 1.6% ( $n = 16$ ), and headache and arthralgia was noted by 8.5% ( $n = 86$ ) (noticed on days 0–3 post-vaccination).

Local reactions like mild arm soreness on days 0–4 were reported by 13.1% ( $n = 133$ ) of the vaccine recipients. No serious side effects were reported.

The reported side effect rates by age and by gender are summarized in table 3. Interestingly, more women than men mentioned adverse effects (20.2% vs 13.3%;  $p < 0.01$ ). Significantly more women than men mentioned local mild arm soreness (16.0% vs 7.7%;  $p < 0.001$ ). Headache and arthralgia as well as local mild arm soreness were reported by a significantly higher proportion of 31–40 year-old respondents than respondents aged 51–60 years ( $p < 0.05$ ). Beyond this, there were no further significant age-related effects.

Only 0.9% ( $n = 9$ ) of the vaccinees would refuse the influenza vaccine next year because of the side effects, while 1.6% ( $n = 15$ ) had not yet decided.

### Discussion

Low influenza vaccine acceptance among hospital-based HCWs is a problem that has been detailed in many studies from all over the world [12, 14, 20–30]. A review of published vaccination programs has reported that vaccination rates range from 2.1%–82%, with the highest uptake rates occurring in the USA [23].

A frequent reason given for HCWs deciding against influenza vaccination is their fear of side effects (see Table 2). Nevertheless, like other studies, we found a low incidence of local (up to 20%) and systemic (up to 10%) adverse reactions (see Table 3), there was no difference between HCWs and the normal population [31, 32]. Our

**Table 3**  
**Rate of reported side effects by age and by gender; multiple answers were possible (data from questionnaire 3).**

Type of adverse effect	Total (n = 180/1,016 ) (%)	Gender		P-value (n = 0.004)	Age				
		Male (n = 48/361) (%)	Female (n = 132/655) (%)		< 30 (n = 49/223) (%)	31-40 (n = 58/244) (%)	41-50 (n = 40/319) (%)	51-60 (n = 27/188) (%)	> 60 (n = 6/42) (%)
Local mild arm soreness	13.1	7.8	16.0	< 0.001	17.0	18.0	9.4	8.5	11.9
Headache and arthralgia	8.5	7.2	9.2	0.1670	12.6	8.2	5.3	8.5	11.9
Subfebrile temperature (< 38.5 °C)	1.6	1.4	1.7	0.471	2.2	1.6	0.6	2.1	2.4

data on the low incidence of side effects among vaccinated HCWs could be used to address the perceived fear of side effects among unvaccinated HCWs.

Our study identified significant gaps in the information sources of employees. Many HCWs revealed a lack of awareness and understanding of the vaccine, especially in relation to its benefits and side effects. In our survey, doubts about the specific risks and efficacy of the vaccine and fear of side effects from using it were stated as the main reasons for refusing the vaccination (see Table 2). A similar reluctance towards influenza vaccination has been reported in a Swiss study, where unimmunized physicians expressed doubts about its necessity (56%), efficacy (32%) and concerns over side effects (24%) [33].

Our data clearly showed that self protection (92.2%) is more important for the HCW than protection of the patient (54.7%) (see Table 1). Similar data was published in a German multicenter study: self protection was shown to be the most important reason for getting vaccinated (96%), while concern for patients was only rated in third position (68%) [34]. This is an underappreciated fact and should be emphasized. Most educational programs for HCWs have focused on preventing transmission to the patients, leading to a perception among HCWs that they are being forced to do something undesirable (get the vaccine) to protect others (patients). Therefore, approaches aimed at educating HCWs on the benefits of vaccination to the HCW might be more successful.

However, two different study groups recently concluded that the influenza vaccination prevents illness effectively in young, healthy people, but to a lesser extent in people aged 70 years or older, which is precisely the age group that accounts for most influenza-related deaths [35–38]. Based on this, the vaccination of HCWs against influenza gains particular importance in the prevention of influenza virus transmission, and may therefore protect elderly patients.

A Cochrane Database Systematic Review, meanwhile, reassessed the effects of vaccinating HCWs against influenza on the incidence of the illness and its complications among elderly residents in long-term facilities. The authors concluded that there was no strong evidence to prove that vaccinating HCWs reduced the incidence of influenza or its complications in elderly patients, and that further randomized clinical trials were therefore required [37–40].

However, given how much the elderly tend to suffer from influenza, and evidence suggesting that influenza vaccination is beneficial for healthy adults, the justification of further randomized clinical trials of existing vaccines for the elderly or HCWs poses difficult ethical problems [41].

Beyond this, a matched cluster randomized controlled trial which involved over 1,700 HCWs and 2,600 predominantly elderly patients at 44 long-term care facilities demonstrated a significant decrease in mortality, in the

incidence of influenza-like illness, the number of hospitalizations associated with influenza-like illness, and the number of general practitioner consultations. These authors estimate that vaccinating eight HCWs against influenza would prevent one patient death, whereas only five HCWs need to be vaccinated to prevent a case of influenza-like illness among residents at the facility. The conclusions of these studies strongly emphasize the importance of influenza vaccination for HCWs who care for older people [42, 43].

Therefore, one of the US national health objectives for 2010 is to achieve a 60% vaccination rate in HCWs [30]. In Germany, HCWs do not seem to see their profession as a reason for vaccination. Indeed, the vaccination coverage rate among German HCWs (18.0%) is lower than the rate among nonmedical professionals (24.1%) [44]. Despite the encouraging proportional improvement in vaccine uptake in this study (3.5% in 2001/2002), only 30.7% of HCWs were vaccinated against influenza in 2007/2008 following this local campaign at the Frankfurt University Hospital starting in 2003/2004 [14].

Further efforts should be focused on identifying the best ways of distributing information on the influenza vaccine to HCWs. Comprehensive programs should focus on reducing barriers to vaccine uptake (e.g., mobile vaccination carts in all wards and medical disciplines, as well as free vaccinations and flexible vaccination appointments). Bringing the vaccine to HCWs directly on the wards would not only provide easy access to the vaccination but would also allow HCWs to address questions on influenza vaccination on a person-to-person basis.

Although this study provides new information on influenza vaccination rates among German HCWs and views on the vaccine, it nevertheless has limitations, because it used a self-reported anonymous questionnaire. It is well known that the way that a survey respondent answers a question is affected by the respondent's memory, which may result in selection bias. However, it was also a large, cross-sectional study, sampling HCWs across a wide range of professions and demographic parameters in a university hospital. There is no reason to believe that HCWs in other hospitals are intrinsically different.

Second, no data on the proportion of HCWs who received the influenza vaccine from their general practitioner or another source were available. Because of this, the overall figures for influenza vaccinations among HCWs could have been underestimated.

Our findings confirmed the importance of comprehensive approaches that combine education and convenience, and suggest that emphasizing the rationale for HCW vaccination may contribute to increasing vaccination rates [14, 45, 46]. A comprehensive influenza vaccination campaign could lead to influenza vaccinations becoming as routine to HCWs as their surgical gloves [47]. Further work is needed to identify the best strategies for improving influenza vaccination rates among all HCWs.

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