ORIGINAL ARTICLE

Logistic regression of attitudes and coverage for influenza vaccination among Italian Public Health medical residents

V. DI GREGORI[1], G. FRANCHINO[2], C. MARCANTONI[3], B. SIMONE[4], C. COSTANTINO[5]
[1] School of Hygiene and Preventive Medicine, University of Bologna; [2] DIBINEM Department, Biomedical and Neuromotor Sciences, University of Bologna; [3] Institute of Hygiene, Epidemiology and Public Health, University of Brescia; [4] Department of Public Health, "Sacro Cuore" University, Roma; [5] Department of Science for Health Promotion and Mother to Child Care "G. D'Alessandro", University of Palermo, Italy

Key words

Medical Residents • Influenza vaccination • Risk perception

Summary

Introduction. *A few number of literature specifically addresses vaccination uptake among Public Health Residents (PHRs). Influenza vaccine attitudes and risk perceptions of PHRs across Italy were studied, contributing to literature on influenza vaccination uptake predictors, in particular among young physicians.*
Methods. *An online survey was conducted in 25 Schools of Public Health in Italy in 2011-2012. Results were analysed using prevalence and logistic regression methods.*
Results. *A total of 365 Italian public health residents were included in the study. Vaccination uptake was confirmed by 22.2 and 33.2% of PHRs in 2010-2011 and 2011-2012, respectively. For the 2010-2011 influenza season, vaccination was associated with male sex (adj-OR 3.43; 95%CI = 1.5-7.84) and vaccination history (adj-OR 29.44; 95%CI = 6.4-135.04). For the 2011-2012 season, vaccination was significantly associated with having had between one and three influenza vaccinations in the previous five years (adj-OR 11.56; 95%CI = 6.44-20.75) or more than three (adj-OR 136.43; 95%CI = 30.8-604.7) and with individual participation in general population vaccination campaigns (adj-OR 1.85; 95%CI = 1.01-3.41).*
Discussion. *Italian residents in public health have no confidence and a low personal risk perception about vaccinations therefore taking no measures to protect patients, general population and themselves. Annual influenza vaccination acceptance is associated with influenza vaccine uptake in the previous years and personal involvement in general population vaccination campaigns. These factors should be considered for the design of future campaigns targeting public health residents.*

Introduction

The bottom line health impact and the degree of success of influenza vaccination campaigns among health care workers (HCWs) has been largely discussed in literature [1-3].
Influenza vaccination is universally recognized as an essential intervention to minimize the risk for medical-care-acquired influenza illnesses among older patients and with comorbidities [4, 5].
Moreover, within HCW communities, this vaccination can reduce absence from work during annual epidemics [5, 6].
Nevertheless the communication inside the public is increasing. Influenza vaccination rates are always below the ECDC requirements. US data report 66.9% of adherence in 2012 but even European and Italian data for 2012 campaign were always below the threshold of 75% [7-9].
With regards to influenza vaccination, it is important to focus on the psychological factors that influence medical professionals regarding their vaccination behaviour [9, 10]. Attitudes and determinants associated with influenza vaccine uptake have been studied and theorized, using different models, to explain fears, complaints, disease complacency, and HCW worries and willingness to participate in annual influenza vaccination campaigns, both actively and passively [9-15].
Several studies from different European countries explored the link between HCW influenza vaccine coverage rates and their knowledge, attitudes and practice (KAPs) [14, 15].
Coverage among adults in Italy is uneasily traceable due to the non-mandatory policy on influenza vaccination in our country
It is also important to note, however, that self-reported surveys on influenza vaccination can be considered a good proxy for the real coverage rate and data reported [16].
HCWs have an important role in influencing, motivating and empowering patients, the general population and other health care workers to promote vaccination and to actively take action to reduce biological risk in sanitary settings [16, 17].
In particular, Public Health medical residents (PHRs) could be considered a particularly influential and important group, given that they act as public health advisors

for the general population and for other medical residents [18].
The main objective of our study was to investigate, through a multicenter survey, determinants for the uptake of influenza vaccination among Italian PHRs. This paper will also contribute to literature on influenza vaccination uptake predictors, in particular among young physicians.

Methods

Data were collected with an anonymous, self-administered questionnaire, sent by e-mail, previously tested in a pilot study presented at the XII Italian Public Health Conference held in Rome from 12 to 15 of October 2011 and partially based on a survey conducted among medical residents in the University of Palermo [18].
Preliminary data from two regional settings (Calabria and Sicily) were published in the past year [19].
Each questionnaire included nine sections with a total of 20 items as outlined below:

a) Demographic and academic characteristics: sex, age, year of graduation, speciality if already attended (categorized in clinical, surgical and diagnostic duties).
b) Episodes of influenza/like illness in the previous five years.
c) Considering themselves as part of a high risk group for contracting influenza
d) Personal experiences of seasonal influenza vaccination in the previous five years (categorized as "never vaccinated", "one to three times" and "more than three times"), for the 2009-2010 seasonal influenza vaccination, for pandemic A (H1N1) influenza vaccination, and for 2010-2011 seasonal influenza vaccination.
e) Reasons for getting vaccinated or not getting vaccinated for 2010-2011 and for 2011-2012 seasonal influenza.
f) Main sources of information on influenza/influenza vaccination were investigated as closed- end questions (categorized as "none", "recommendation of Health Minister", "scientific sources" and "mass media").
g) The influence of the Influenza A(H1N1) pandemic vaccination campaign on vaccination choice during the following influenza seasons.
h) Attitude to recommend influenza vaccination to patients: categorized as "Yes, according to the recommendations of the Health Minister", "Yes, according to my clinical experience", "No, leaving patients to their free will", "No".
i) Participation to influenza vaccination campaign among HCWs and the general population during his/her residency program.
j) Recommended public health strategy to implement low coverage rate of influenza vaccination among HCWs (multidisciplinary courses, mandatory vaccination, vaccination incentives, settled university training on influenza vaccination, other).

We piloted a multicentre study using data collected from November 2011 to February 2012 among Italian PHRs in Hygiene, Preventive Medicine and Public Health. In total, 25 out of the 32 Italian postgraduate Italian Public Health Schools participated in the study. The post-graduate public health schools involved in the study, were Torino, Milano Bicocca, Milano Statale, Brescia, Pavia, Verona and Padova in the North, Bologna, Parma, Perugia, Modena, Siena, L'Aquila, Roma Cattolica, Roma Tor Vergata, Roma Sapienza 2, Chieti and Ancona in the Center, Bari, Napoli Federico II, Napoli Seconda Università, Catanzaro, Palermo, Messina and Catania in the South of Italy.
We collected a mailing list of PHR whose schools had accepted to participate to the project and asked the residents to complete the questionnaire anonymously.
Information contained in the questionnaires was only available to, and only reviewed by, the research investigators, with stringent assurance of the confidentiality of the individual data. The study was approved by the Institutional Review Board of the Azienda Ospedaliera Universitaria "P. Giaccone" of Palermo, Italy.
We entered all the information in a database created within EpiInfo 3.5.1 software. All the data were analysed using the R statistical software package [20].
Absolute and relative frequencies were calculated for qualitative variables. Quantitative variables were normally distributed and summarized as means (standard deviation).
The associations between the potential determinants and the two different dichotomous outcomes were evaluated by the Fisher Exact Test (dichotomous variables) or Chi-square test (categorical variables).
Odds ratio (OR) and adjusted OR (adj-OR) with 95% confidence intervals (95%CIs) were also calculated. Differences in means were compared with the Student t-test.
All variables found to have a statistically significant association (two-tailed p-value < 0.05) with vaccine uptake in the univariate analysis were included in two different multivariable stepwise logistic-regression models, having the following dependent variables:

a) Italian PHRs's decision to get vaccinated against seasonal influenza (season 2010-2011).
b) Italian PHRs's decision to get vaccinated against seasonal influenza (season 2011-2012)

Measures of goodness of fit were calculated to compare logistic regression models by using Akaike's Information Criterion (AIC) and the model with the lowest AIC was considered the best fit. The significance level chosen for all analysis was $p < 0.05$ (two-tailed).

Results

The overall response rate among Italian Public Health residents from the participating schools was 80.1% (365/456). The general characteristics of the 365 PHRs included in the study are summarized in Table I.

Tab. I. Characteristics of the 365 Italian public health residents (PHRs) responding to the survey, collected from November 2011 to February 2012.

Response rate: 80.1%	n=365/456
Age, mean in years ± SD	31.4 ± 4.5
Age, median in years (interquartile range)	30 (28-33)
Gender, n (%)	
- male	145 (39.7)
- female	220 (60.3)
Age Class in years, n (%)	
- <29	99 (27.1)
- 29 to 31	123 (33.7)
- >31	143 (39.2)
Year of residency, n (%)	
- R1	106 (29.0)
- R2	105 (28.8)
- R3	88 (24.1)
- R4	66 (18.1)

In the component investigating knowledge, 64% of PHR reported that they recommended influenza vaccination to their patients as per guidelines from the Ministry of Health. An additional 19.5% declared they recommended influenza vaccination based on their clinical evaluation alone and 15.3% of medical residents did not recommend influenza vaccination, leaving patients free to decide. Only 1.4% did not recommend influenza vaccination at all.

Of the PHRs respondents in this study, 52% did not check any information sources about influenza vaccination, 28% report having read scientific reports (scientific literature, Center for Disease Control and Prevention, European Centre for Disease Control and Prevention, World Health Organization), and only 10% declaring they had read recommendations from the Italian Ministry of Health. In 2011-2012, the main reason for influenza vaccination uptake, as reported by the 123 PHRs who were vaccinated, was to avoid virus diffusion among relatives and the general population (69.9%). However, the main reason for not being vaccinated against influenza in 2011/2012 was "I do not consider myself in a high risk group for developing influenza and its complications" (data not shown in Table).

In the component investigating *attitudes,* 81 PHRs (22.2%) were vaccinated for seasonal influenza during the 2010-2011 influenza vaccine campaign. During the 2011-2012 influenza vaccine campaign, 123 PHRs (33.7%) were vaccinated for seasonal influenza (data not shown in Table).

Table II reports KAP (knowledge attitudes and practice) towards influenza vaccination. 61.1% of the sample was never vaccinated in the previous five years. For 80.8% of participants the occurrence of the Pandemic A (H1N1) influenza and the subsequent campaign did not impact their practice and attitudes towards the influenza vaccination.

Moreover, 48.2% (n = 176) of PHRs suggested that training and organisation of multidisciplinary courses on influenza vaccination, are the best strategy for increasing influenza immunization rate among Italian health care workers (HCW). The next most frequently recommended course of action was to improve University training (during degree and postgraduate medical schooling) on influenza and vaccinology (23.3%; n = 85) (data not shown in Table).

Factors associated with vaccine uptake during the 2010–2011 and the 2011-2012 influenza seasons are presented

Tab. II. Attitudes, behaviours and perception on influenza vaccination of the 365 Italian PHRs responding to the survey.

	n = 365
Personal experiences of influenza vaccination for the previous five years (2004-2008)	
- never	223 (61.1)
- for one to three years	103 (28.2)
- more than three years	39 (10.7)
Main information sources on influenza vaccination, n (%)	
- none	190 (52.0)
- recommendations of Health Minister	37 (10.1)
- mass media	31 (8.5)
- scientific reports (Literature, CDC, ECDC, WHO)	103 (28.3)
- other sources (blog, youtube, facebook, etc.)	4 (1.1)
Attitude to recommend influenza vaccination for patients, n(%)	
- Not recommended	5 (1.4)
- No, leaving patients to their free will	56 (15.3)
- Yes, according to the recommendations of the health minister	233 (63.8)
- Yes, according to my clinical evaluation	71 (19.5)
Pandemic A (H1N1) influenza modified attitudes on influenza vaccination, n(%)	
- No	295 (80.8)
- Yes, less predisposed to influenza vaccination	27 (7.4)
- Yes, less predisposed to vaccinate patients	14 (3.8)
- Yes, less predisposed to vaccinate myself and patients	27 (7.4)
- Yes, more prone to update on influenza vaccination	2 (0.5)

in Table III. In the multivariate analysis, 2010-2011 uptake of seasonal influenza vaccination was strongly associated with being male (adj-OR 3.43; 95%CI: 1.5-7.84) and with having received more than three vaccinations in the previous five years (adj-OR 29.44; 95%CI: 6.4-135.04). Vaccination against 2011-2012 seasonal influenza was significantly associated with having had one to three (adj-OR 11.56; 95%CI: 6.44-20.75) or more than three (adj-OR 136.43; 95%CI: 30.8-604.7) vaccinations against influenza in the previous five years and with the respondent's participation in vaccination campaigns targeting general population during the period of the participant's residency programme. (adj-OR 1.85; 95%CI: 1.01-3.41)

Discussion

As previously reported in literature, the uptake of seasonal influenza vaccine (22.2% in 2010-2011 season and 33.7% in 2011-2012 season) among PHRs has increased over the past few years, but remains below the national and European target (75% of minimum coverage recommended) [9, 13, 17].
The main reason for vaccine uptake among HCWs, as supported by other studies, is that vaccination protects family members, friends and patients from being infected [10, 11, 21].
Somewhat contradictory to this, due to the role of Italian PHRs, they consider the risk of transmitting influenza as being very low, insufficient to justify influenza vaccination (70.2%; an increase of 8.6% in 2011/2012 compared to 2010/2011). These findings support several studies conducted at local and regional level [10-12].
Furthermore, in comparing Italian findings with similar contexts, a decreasing trend in influenza vaccination coverage can be observed among the whole French Medical Residents (with a rate of 45.6% in 2008 and 65.6% in 2007). 19.6% of the French MRs declared they were not willing to receive influenza vaccination for the next seasonal campaign [21].
While our study's sample covers only a specific target of adults (the majority are over 30 years of age), we could extend results to our medical doctors population.
La Torre et al. stated that 30-49 years HCWs were less likely to get the vaccination compared to younger colleagues (adj-OR=0.66; 95% confidence interval, CI: 0.52-0.83) and females also are less likely to get vaccinated (adj-OR=0.64; 95%CI: 0.51-0.8) [10].
Previous studies focusing on the H1N1 campaign, showed that Italian medical doctors use different types of information sources, including Internet (41.5%) and hospital internal communication (33.1%) [11].
In our study the majority of interviewees declared they did not get any information on the seasonal vaccination campaign at all, nor received it from scientific reports.

Tab. III. Multivariable logistic regression analysis of factors involved in the decision to get vaccinated during the 2010-2011 (A) and 2011-2012 influenza season (B) of the 365 Italian PHRs responding to the survey.

	A: Vaccine uptake during the 2010-2011 season		B: Vaccine uptake during the 2011-2012 season	
	Crude OR (95%CIs)	Adj OR (95%CIs)	Crude OR (95%CIs)	Adj OR (95%CIs)
Gender				
- females	Referent	Referent	Referent	Referent
- males	1.66 (1.01-2.73)	3.43 (1.5-7.84)	0.95 (0.61-1.49)	0.91 (0.51-1.64)
Age, in years				
- < 29	Referent		Referent	-
- 29 to 31	0.86 (0.44-1.69)	-	0.89 (0.51-1.58)	-
- > 31	1.48 (0.8-2.74)	-	1.14 (0.67-1.96)	-
Year of residency				
- R1	Referent		Referent	
- R2	1.07 (0.55-2.1)	-	1.15 (0.65-2.06)	-
- R3	1.34 (0.68-2.66)	-	1.2 (0.65-2.19)	-
- R4	1.29 (0.62-2.71)	-	1.5 (0.79-2.86)	-
Influenza vaccination in the previous 5 years				
- never	NC	-	Referent	Referent
- yes, from one to three times	Referent	Referent	12.5 (7-22.4)	11.56 (6.44-20.75)
- yes, more than three times	24.81 (5.67-108.5)	29.44 (6.4-135.04)	153.4 (34.8-676.9)	136.43 (30.8-604.7)
Partecipation to vaccination campaigns among HCWs	1.9 (1.1-3.2)	1.88 (0.77-4.58)	1.5 (0.9-2.4)	1.08 (0.56-2.08)
Partecipation to vaccination campaigns among general population	3.19 (1.91-5.34)	1.87 (0.83-4.25)	2.9 (1.8-4.6)	1.85 (1.01-3.41)

Only a few respondents reported use of mass media or unofficial Internet sources. This result suggests that PHR are not active seekers of information on influenza or influenza vaccination and instead need to be treated as passive, with information *delivered* in the most easy-to-use and accessible manner. PHRs who took part in this study showed little interest in anti-immunization information sources or materials. Information use is relevant to understand subsequent attitude towards immunization: public trust is also risen by correct information through media and national campaign [22].

PHRs participating in this study do not accurately perceive threat or severity of influenza, and this directly translates to their lack of promoting vaccination to patients. Their behavioural intent is influenced by their perceived lack of threat and their variable evaluation of the benefits of vaccination. PHRs recognize the importance of the problem and acknowledge that there is a need for more information and awareness on the topic. Same attitude was retrieved in one example of public health intervention called Intervention Mapping. This was defined as an organisational theory for the planning of the health promotion regarding the Influenza campaign which the vaccination is a benefit in health to succeed and the audience is supposed to understand the reasons and methods which drive to it. Emotional and Impulsive reactions distinguish between a reflective system and an impulsive mechanism: the first generates decision and judgement which influences behaviour while the impulsive system seeks pleasure and avoids delusion. During the one's attitude determination, many elements of the organisational field were showing the representation of different behaviours: building and transmitting information actively, meetings, convenient access and timetable arrangements [23].

While many PHRs consider the risk of transmitting influenza as being very low, insufficient to justify influenza vaccination, the perceived benefits of accepting vaccination against influenza have to do with protecting family members, friends and patients from being infected. This suggests an understanding of perceived susceptibility and severity of influenza that is not extended to the individual themselves. In other words, PHRs may see themselves as carriers and transmitters of influenza in hospital but not in the community and not potential victims. Perception of risk can influence the vaccine attitude either for the fact that adverse events are more visible than benefits either because this decision can be amended later, when necessary. Mainly, the most important perception is the self perception of benefits instead of risk. (46% wanted to be a role model and between them, 80% received Pandemic vaccination) [24].

Moreover, PHRs attitudes about influenza vaccine uptake was related to a first-person involvement during post-graduate training programme in flu vaccination campaigns among general population. This evidence should result in a standardization and harmonization of European postgraduate medical school courses to promote positive influenza vaccination attitudes.

Nevertheless, vaccination history and behaviours already adopted are clearly the strongest factors associated with influenza vaccine uptake among PHRs, and future campaign should also consider using approaches such as positive deviance to motivate non-vaccinated to vaccinate and, in turn, promote vaccination [25].

Positive deviance and similar community-driven approaches permit PHRs to take part in the development of campaigns, drawing on their personal experiences with vaccination and jointly developing plans and strategies to motivate vaccination uptake and active HCW-parent vaccination promotion within their community.

The main limitation of this study was as follow. The questionnaire is not a highly reliable mean of anonymous investigation if administered by e-mail. Despite this, Llupia et al. compared self-reported data on influenza vaccination to real coverage and concluded that the former is a good proxy, although it might somewhat overestimate the actual uptake [15].

Another limit of this study was the possible economic and environmental influences that are less explored which could also account for differences in promoting vaccination. For example, study outcomes can also be explained by socioeconomic determinants, which show a relationship between higher socioeconomic background characteristic and lower uptake of influenza vaccination [26, 27].

In conclusion, the risk perception in HCW may need to be addressed in future campaign. Future behavioural communications direct to change management in the health care sector campaigns targeting PHRs and healthcare workers should consider emotional and social responsibility elements relevant to stress on.

Ethical approval

The study was approved by the Institutional Review Board of the AOUP "P. Giaccone" of Palermo, Italy.

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■ Correspondence: Claudio Costantino, via del Vespro 133, 90127 Palermo, Italy - Tel. +39 091 6553635 - Fax 39 091 6553641 - E-mail: claudio.costantino01@unipa.it