

## KNOWLEDGE, ATTITUDES AND BEHAVIORS REGARDING INFLUENZA VACCINATION AMONG HYGIENE AND PREVENTIVE MEDICINE RESIDENTS IN CALABRIA AND SICILY.

Claudio Costantino, Angelo Battaglia, Mario D'Asta, Roberto Furnari, Alessandra Gimigliano, Alessandro Guaccero, Nadia Mallamace, Claudio Marcantoni, Guido Maringhini, Maria Grazia Laura Marsala, Rocco Micò, Alessio Biafore, Riccardo Papalia, Caterina Pasqua, Benedetto Simone, Giuseppe Franchino

### SUMMARY

Vaccinating health care workers is considered to be one of the most important steps in preventing the transmission of the influenza virus to vulnerable patients. Public Health physicians are the main promoters and executors of influenza vaccination campaigns for both healthcare workers and the general population.

The objective of the present survey was to analyze the knowledge, attitudes and practices regarding influenza vaccination among Hygiene and Preventive Medicine Residents.

64% of the participants had not been vaccinated against the influenza virus in the past 5 years, and 29% had been vaccinated only occasionally, with only 7.2% of the study population having been vaccinated every year. 20.3% of those surveyed were vaccinated in the 2010/2011 season. The best strategy to increase vaccination rates among health care workers according to the study participants was the participation of future public health operators to multidisciplinary training (34.8%). The main factors associated with influenza vaccination compliance were having been vaccinated in the previous season for 2011/2012 (OR [95%]: 41.14 [7.56 - 223.87]) and having received the vaccination always or occasionally during the previous 5 years for both 2010/2011 (p-value <0.0001) and 2011/2012 (p-value <0.0001).

The findings of this study suggest that future public health physicians with a history of refusing influenza vaccination in previous years usually tend to maintain their beliefs over time. Changing this trend among Hygiene and Preventive Medicine residents is the real challenge for the future, and it can be achieved through organization of multidisciplinary training, improvement of university education and increasing the involvement of Hygiene and Preventive Medicine residents in influenza vaccination campaigns both for the general population and health care workers.

### Introduction

The National Council of Medical Residents in Hygiene and Preventive Medicine, a body of the Italian Society of Hygiene, Preventive Medicine and Public Health (S.It.I.), promotes the comparison and growth of Hygiene and Preventive Medicine Residency programs and discussion on various Public Health-related issues.

Among the principal topics of interest and relevance to our organization, influenza and

### Address of the authors

*National Council of Medical Residents in Hygiene and Preventive Medicine of the Italian Society of Hygiene, Preventive Medicine and Public Health (S.It.I.)*

**Send correspondence to:** Dr. Giuseppe Franchino, [frenk1980@hotmail.com](mailto:frenk1980@hotmail.com)

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influenza vaccination certainly play an important role. Influenza is the main respiratory infection to cause morbidity and mortality among the general population, especially in the elderly and patients with comorbidities [1, 2]. Vaccination is universally recognized as the key preventive measure to limit the transmission of the influenza virus [3].

In particular, vaccinating health care workers is considered to be one of the most important steps in preventing the transmission of the influenza virus to vulnerable patients, as well as in minimizing absenteeism of health care workers during annual epidemics [4, 5, 6].

Public Health physicians are the main promoters and executors of influenza vaccination campaigns for both healthcare workers and the general population [5].

Therefore, identifying the determinants associated with influenza vaccination compliance among future hygienists could provide a focal point for understanding the reasons underlying failure of vaccination campaigns, as well as for planning public health strategies aimed at increasing the adherence of health care workers to such campaigns. The objective of the present survey was to analyze the knowledge, attitudes and practices regarding influenza vaccination among Hygiene and Preventive Medicine Residents from four Universities in Sicily and Calabria (Catania, Catanzaro, Messina and Palermo).

## Methods

The survey was carried out between September and October 2010 on Hygiene and Preventive Medicine Residents from the Universities of Catania, Catanzaro, Messina and Palermo.

The questionnaire was designed and developed by a Working Group selected among the members of the National Council of Medical Residents in Hygiene and Preventive Medicine of the Italian Society of Hygiene, Preventive Medicine and Public Health (S.It.I), in collaboration with the "G. D'Alessandro" Department of Health Promotion Sciences of the University of Palermo.

The questionnaire was tested and evaluated beforehand with a pilot study carried out on 50 Residents in Hygiene and Preventive Medicine at a meeting of the Council held during the XII National Conference of Public Health in Rome, Italy, in October

2011.

Each questionnaire included eight sections:

- Demographic characteristics: sex, age, year of graduation, year of Residency and location;

- Subjective evaluation of knowledge on influenza and influenza vaccination;

- Adhesion to influenza vaccination campaigns, in particular vaccination compliance during the 2010-2011 and 2011-2012 campaigns, and episodes of Influenza-Like Illness (ILI) during the previous five years;

- Main reasons to undergo (or abstain from) the seasonal influenza vaccination in 2010-2011 and 2011-2012;

- Main sources of information on influenza and influenza vaccination and any media influence regarding the pandemic AH1N1 virus phenomenon during the 2009-2010 influenza season;

- Attitude towards recommending influenza vaccination to patients, family members or the general population;

- Participation to vaccination campaigns for the general population and health care workers, and attitudes towards answering elucidation requests or recommending influenza vaccination to health care workers and the general population;

- Proposals to increase the adhesion of health care workers to influenza vaccination campaigns.

Survey answers were entered in a database, generating an alpha-numeric code ID for each included subject. Data analysis was performed using the EpiInfo 3.5.1 software. Absolute and relative frequencies were calculated for qualitative variables, while quantitative variables were summarized as mean values (standard deviation). Differences by groups for categorical variables were analyzed using the chi-square test. Odds ratio (OR) and adjusted OR (adj-OR) with 95% confidence intervals (95% CIs) were also calculated. Differences in mean values were compared with the Student t-test. The significance level chosen was  $p < 0.05$  (two-tailed).

## Results

As can be observed from Table 1, a total population of 73 Hygiene and Preventive Medicine Residents from the four Universities in Sicily and Calabria included in this study participated to the survey, and 69 of these completed and returned the survey (mean participation 94.5%). The response

rates fluctuated between 100% (Palermo and Messina), 91.7% (Catania), and 83,3% (Catanzaro). The average age of the survey sample was 31.1 years (SD  $\pm$  3.9). 69.6% of the surveyed population was female (n = 48). By splitting the sample by year of residency, it can be observed that 27.5% participants were first-year residents, while 26.1% were on their second year, 29% on the third and 17,4% on the fourth and last year. About 80% of the Residents in Hygiene and Preventive Medicine included in this study graduated after 2005 (43.5% between 2006 and 2008, 36.2% in 2009-2010).

As shown in Table 2, 58% of those surveyed had 1 to 3 episodes of Influenza-Like Illness (ILI) in the last 5 years. Only 20% had no episodes of ILI in the last 5 years. 64% of the participants had not been vaccinated against the influenza virus in the past 5 years, and 29% had been vaccinated only occasionally (mean value: 2), with only 7.2% of the study population having been vaccinated every year. 20.3% of those surveyed (n = 14) were vaccinated in the 2010/2011 season. 69.8% of those vaccinated stated that they had undergone influenza vaccination to avoid infecting

family members and the general population. 73.2% of those not vaccinated justified their choice by the fact that they did not consider themselves part of a high risk group for developing influenza. In the 2011/2012 season, the influenza vaccination rate in the surveyed population was 27.5% (n = 19). Again, the main reason for undergoing vaccination stated by the residents was avoiding the infection of family members and the general population (94.8%). 74% of unvaccinated residents did not consider themselves to be part of the high risk group for contracting the disease, despite their profession.

31.9% of medical residents examined was not influenced by any information source in their vaccination choice, with 14.5% not interested in any information source, while 18.8% of the study population followed the recommendation of official sources (Ministry of Health). Finally, only 8, 8% was influenced by news from the media (data not shown). 75% of the total survey sample was not influenced in their decision by the emergency of the A H1N1 influenza virus pandemic. 37.7% of the residents surveyed had received requests for clarification regarding the vaccine from their family

Mean response rate: 94.5%	n=69/73
<b>Response Rate, (%)</b>	
- Catania	22/24 (91.7)
- Catanzaro	10/12 (83.3)
- Messina	15/15 (100)
- Palermo	22/22 (100)
<b>Age , mean in years <math>\pm</math> SD (31.1 <math>\pm</math> 3.9)</b>	
- Catania	30.6 $\pm$ 3.5
- Catanzaro	30.6 $\pm$ 4.2
- Messina	31.9 $\pm$ 3.2
- Palermo	31.4 $\pm$ 4.8
<b>Gender, n (%)</b>	
- Male	21 (30.4)
- Female	48 (69.6)
<b>Year of residency, n (%)</b>	
- First year	19 (27.5)
- Second year	18 (26.1)
- Third year	20 (29.0)
- Fourth year	12 (17.4)
<b>Year of degree, n (%)</b>	
- <2005	14 (20.3)
- 2006-2008	30 (43.5)
- 2009-2010	25 (36.2)

**Table 1:** Socio-demographic and occupational characteristics of public health residents surveyed.

members and the general population. 65% of them recommended vaccination as per the Ministerial guidelines, with a further 10% also recommending the vaccination following a personal clinical assessment. About 21% did not recommend influenza vaccination to patients and allowed a free choice for the general population, while 3% deliberately discouraged vaccination (data not shown). The best strategy to increase vaccination rates among health care workers according to the study participants was the participation of future public health operators to multidisciplinary training (34.8%), followed by a better university education (24.7%),

<b>Episodes of Influenza-Like Illness (ILI) in the previous 5 years, n(%)</b>		
- Never		14 (20.3)
- From 1 to 3 times		40 (58.0)
- More than 3 times		13 (18.8)
- Do not remember		2 (2.9)
<b>Vaccination against influenza in the previous 5 years, n(%)</b>		
- Never		44 (63.8)
- Occasionally (mean = 2)		20 (29)
- Always		5 (7.2)
<b>Vaccination against 2010/2011 seasonal influenza, n (%)</b>		
- No		55 (79.7)
- Yes		14 (20.3)
<b>If yes, for which reason n (%)</b>		
- Considered themselves at high risk for developing influenza		2 (15.4)
- To avoid infection among family members and general population		10 (69.8)
- Was strongly recommended by sanitary direction		2 (15.4)
<b>If not, for which reason n (%)</b>		
- Perception of low efficacy/security of the vaccine		4 (7.1)
- Did not consider themselves at high risk for developing influenza		41 (73.2)
- Did not consider themselves at high risk for spreading influenza to family members and general population		2 (3.6)
- Did not consider themselves at high risk for spreading influenza to patients		5 (9)
- Was not strongly recommended by sanitary direction		4 (7.1)
<b>Vaccination against 2011/2012 seasonal influenza, n (%)</b>		
- No		50 (72.5)
- Yes		19 (27.5)
<b>If Yes, for which reason n (%)</b>		
- Considered themselves at high risk for developing influenza		1 (5.2)
- To avoid infection among family members and general population		18 (94.8)
<b>If not, n (%)</b>		
- Perception of low efficacy/security of the vaccine		6 (12)
- Did not consider themselves at high risk for developing influenza		37 (74)
- Did not consider themselves at high risk for spreading influenza to family members and general population		7 (14)

**Table 2:** Attitudes and adhesion rates regarding influenza vaccination among public health residents interviewed (n=69).

the introduction of incentives for vaccination compliance, such as meal tickets and paid holidays (21.7%), and making vaccination compulsory (18.8%) (data not shown). The perceived risk of contracting the influenza virus in relation to their profession varied significantly between the Universities included in this study (from 20% to 63.6%, with a p-value of 0.01), with an average of 43.5% of study participants considering themselves in a high risk group for contracting influenza and its complications (table 3). There was also a high variation between the different Universities in regards to the participation of residents to vaccination campaigns during

their training: 13.7% to 77.3% had participated to vaccination campaigns for health care workers (p-value <0.001) and 10 to 60% had participated to vaccination campaigns for the general population (p-value 0.02) (table 3). In the surveyed population, the main factors associated with influenza vaccination compliance were having been vaccinated in the previous season for 2011/2012 (OR [95%]: 41.14 [7.56 - 223.87]) and having received the vaccination always or occasionally during the previous 5 years for both 2010/2011 (p-value <0.0001) and 2011/2012 (p-value <0.0001). Finally, as shown in Table 4, being involved in vaccination campaigns

N=69	University				p-value
	CT (n=22)	CZ (n=10)	ME (n=15)	PA (n=22)	
<b>Vaccination against influenza in the previous 5 years, n (%)</b>					
- Never → 44 (63.8)	18 (81.8)	5 (50)	11 (73.3)	10 (45.5)	0.02
- Occasionally → 20 (29)	3 (13.6)	3 (30)	2 (13.3)	12 (54.5)	
- Always → 5 (7.2)	1 (4.5)	2 (20)	2 (13.3)	0 (0)	
<b>Vaccination against 2010/2011 seasonal influenza, n (%)</b>					
- No → 55 (79.7)	20 (90.9)	7 (70)	11 (73.3)	17 (77.3)	0.43
- Yes → 14 (20.3)	2 (9.1)	3 (30)	4 (26.7)	5 (22.7)	
<b>Vaccination against 2011/2012 seasonal influenza, n (%)</b>					
- No → 50 (72.5)	19 (86.4)	7 (70)	11 (73.3)	13 (59.1)	0.24
- Yes → 19 (27.5)	3 (13.6)	3 (30)	4 (26.7)	9 (40.9)	
<b>Consider themselves at high risk group for developing influenza, n (%)</b>					
- No → 39 (56.5)	17 (77.3)	8 (80)	6 (40)	8 (36.4)	0.01
- Si → 30 (43.5)	5 (22.7)	2 (20)	9 (60)	14 (63.6)	
<b>Have participated to vaccination campaigns for health care workers, n (%)</b>					
- No → 34 (49.3)	19 (86.3)	6 (60)	4 (26.7)	5 (22.7)	0.0001
- Si → 35 (50.7)	3 (13.7)	4 (40)	11 (73.3)	22 (77.3)	
<b>Have participated to vaccination campaigns for the general population, n (%)</b>					
- No → 49 (71.0)	17 (77.3)	9 (90.0)	6 (40.0)	17 (77.3)	0.02
- Si → 20 (29.0)	5 (22.7)	1 (10.0)	9 (60.0)	5 (22.7)	

**Table 3:** Attitudes, Knowledge and behaviors regarding influenza vaccination among public health residents by University (CT=Catania; CZ= Catanzaro; ME= Messina; PA= Palermo).

for health care workers during their training was significantly associated with residents' compliance with seasonal influenza vaccinations both in 2010/2011 (OR [95% CI]: 8.34 [1.70 - 40.93]) and in 2011/2012 (OR [95% CI]: 5.62 [1.63 - 19.43]). These values overlap with the correlation between participation to vaccination campaigns for the general population and compliance with the 2010/2011 (OR [95% CI]: 7.20 [2.01 - 25.83]) and the 2011/2012 (OR [95% CI]: 3.19 [1.04 - 9.79]) seasonal influenza vaccinations (Table 4).

**Discussion**

Adherence to the survey was deemed very satisfactory by the authors; in fact, the present study gained the highest adhesion rates among all surveys conducted by the National Council of Medical Residents of S.It.I. in the last two years [7]. The average age of the survey sample, the distribution by sex (with a prevalence of female residents) and other sociological and demographic characteristics of the sample confirm the findings of other surveys conducted among young Italian medical doc-

		Flu Vaccination 2010/2011		Flu Vaccination 2011/2012	
		Vaccinated n (%)	Not Vaccinated n (%)	Vaccinated n (%)	Not Vaccinated n (%)
Vaccination among HCWs	Performed	12 (85.7)	23 (41.8)	15 (78.9)	20 (40)
	Not Performed	2 (12.3)	32 (58.2)	4 (21.1)	30 (60)
OR [IC 95%]		8.34 [1.70 - 40.93] <sup>b</sup>		5.62 [1.63 - 19.43] <sup>b</sup>	
Vaccination among Population	Performed	9 (64.3)	11 (20)	9 (47.4)	11 (22)
	Not performed	5 (35.7)	44 (80)	10 (52.6)	39 (78)
OR [IC 95%]		7.20 [2.01 - 25.83] <sup>b</sup>		3.19 [1.04 - 9.79] <sup>a</sup>	
		<sup>a</sup> p<0.05	<sup>b</sup> p<0.01	<sup>c</sup> p<0.001	

**Table 4:** Univariate analysis: association between seasonal 2010/2011 and 2011/2012 influenza vaccination compliance and participation to vaccination campaigns for health care workers and the general population during residency program.

tors [8].

Data concerning the adherence to vaccination programs do not differ from those observed in other studies carried out among Italian health care workers, and remain below those recommended by the guidelines of the U.S. and European Centers for Disease Control and Prevention [6, 8, 9, 10]. In addition, the reasons stated by study participants to justify undergoing influenza vaccination and the ones given for abstaining from vaccination do not differ from those found in previous studies [8, 9, 11]. This is surprising considering the very selective target population in the public health field, and highlights the lack of awareness of the vaccine as a crucial measure to prevent the spread of the influenza virus among health care operators as well as their patients, family members and the general population. Failing to understand these factors could be the key critical issue to be addressed in future multidisciplinary and university training, considered by the study sample the most effective public health measures to increase vaccination rates among health care workers. It is surprising that strategies that could be considered more attractive (incentives to vaccination) or authoritarian measures (mandatory vaccination), reflected in other European and non-European realities [12, 13] are not considered as important by our survey sample. A limitation of the study could be that in addition to the answers in the 8th section of the questionnaire, the possibility to choose "informed dissent", another alternative form of vaccination "management", designed to raise awareness of the benefits and the risks (business accidents, risk of civil action against third parties) related to influenza vaccination [12, 13], was not included; however, the question was left open-ended.

The sample examined did not seem to be influenced by the media in their vaccination decision, and favored official sources (Ministry of Health, WHO, CDC) regarding their own and their patients' vaccination choice. Furthermore, the media clamor resulting from the A H1N1 influenza pandemic did not appear to have changed the general approach to vaccination. In addition to the fact that 10% of the medical residents advise undergoing vaccination or abstaining from it based on their own clinical evaluation, it is quite worrying that

20% of the total sample does not recommend vaccination, and allow their patients (often conditioned by media) to decide autonomously whether to be vaccinated or not. This attitude has been observed in other studies carried out by the Working Group of the University of Palermo, both in medical residents in training and in future general practitioners [8, 14].

The diverse perceptions on influenza contraction and transmission risk in relation to their profession among the different Universities could be associated with a different type of training during both the Medical School and Residency. This feature also appears to be related to the percentage of residents who have participated to influenza vaccination campaigns for health care workers and the general population during their training. The participation to immunization campaigns conducted during the training activities in Hygiene and Preventive Medicine was found to have a statistically significant correlation with a more positive attitude towards vaccinating against seasonal influenza, confirming that this kind of training course may change residents' awareness levels regarding the influenza virus risk, and lead to a better understanding of the importance of vaccination as an essential prevention tool.

Finally, it can be observed that, even among residents in Hygiene and Preventive Medicine, the main predictor factor for compliance with seasonal influenza vaccinations is the compliance during previous seasons. This finding confirms that the deciding to undergo vaccination is often a habit rather than a professional and ethical value shared by all [8, 9, 14].

### Conclusions

The findings of this study suggest that future public health physicians with a history of refusing influenza vaccination in previous years usually tend to maintain their beliefs over time. This fact could be a risk factor for health care workers that are not immunized, and especially for patients. In particular, public health residents can be seen as an important role model for the vaccination choice of other medical residents and health care workers, considering that in the future the former will operate in Medical Administration and Health and Prevention Departments, in addition to being responsible for planning influenza vaccination campaigns according to the

latest Public Health strategies.

Changing this trend among Hygiene and Preventive Medicine residents is the real challenge for the future, and it can be achieved through organization of multidisciplinary training, improvement of university education and increasing the involvement of Hygiene and Preventive Medicine residents in influenza vaccination campaigns both for the general population and health care workers. The main aim should be to achieve a higher vaccination coverage among health care workers, but also to avoid the establishment of unacceptable mechanisms in which patients are left free to choose whether to get vaccinated or not without correct scientific advice from their physicians.

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