

# Effectiveness of an educational intervention on seasonal influenza vaccination campaign adherence among healthcare workers of the Palermo University Hospital, Italy

C. Costantino<sup>1</sup>, V. Restivo<sup>1</sup>, V. Gaglio<sup>1</sup>, G.L.M. Lanza<sup>1</sup>, C. Marotta<sup>1</sup>, C.M. Maida<sup>1</sup>, W. Mazzucco<sup>1</sup>, A. Casuccio<sup>1</sup>, M.V. Torregrossa<sup>1</sup>, F. Vitale<sup>1</sup>

*Key words: Medical education, influenza vaccination, risk perception, vaccination coverage*  
*Parole chiave: Formazione sanitaria, vaccinazione antinfluenzale, percezione del rischio, copertura vaccinale*

## Abstract

**Introduction.** Healthcare workers are continuously exposed to the risk of being infected by influenza viruses during their work, thus representing a threat especially for fragile patients. Although the Italian Ministry of Health strongly recommends influenza vaccination for all HCWs, coverage levels in Italy are still far from the expected. Several studies report that one of the preferred strategies to improve vaccination coverage among Healthcare Workers is improving vaccination knowledge through specific multidisciplinary courses. To assess the effectiveness of an educational intervention on influenza vaccination coverage among Healthcare Workers a study was conducted at “Paolo Giaccone” University Hospital of Palermo, in the occasion of the 2016/2017 seasonal influenza vaccination campaign.

**Material and methods.** Educational interventions on influenza infection and vaccination were organized involving personnel of the hospital units in which patients were more fragile. The Healthcare Workers who volunteered attend the course were considered as the intervention group, while two controls for each case, composed by Healthcare Workers not attending it, were randomly selected from the same unit. For both groups, a questionnaire was used to investigate attitude and behaviors toward influenza vaccination, while vaccination coverage data were obtained throughout the Hospital informational data system.

**Results.** Overall, out of the 125 participants, 38 (30.4%) followed the course (intervention group) and 87 (69.6%), not attending the course, represented the control group; later, only 43 Healthcare Workers out of 125 (34.4%) underwent vaccination during the season considered. In particular, after the educational intervention, 42% of the attending Healthcare Workers got vaccinated, while vaccination prevalence in the control group was 31%. The Healthcare Workers who underwent vaccination reported, before the intervention, a higher risk perception for contracting (transmitting) influenza compared to those not vaccinated ( $p < 0.05$ ), while no significant difference in risk perception of transmitting influenza to their patients was reported between the two groups.

**Discussion.** Despite the training provided, and an improvement in vaccination adherence by the Healthcare Workers involved, coverage obtained was lower than recommended to reduce influenza spread in hospital contexts. In conclusion, our data suggest that specific training alone may play a role in the improvement of influenza vaccination adherence, but it should be integrated by a wider range of public health measures, including mandatory vaccination.

---

<sup>1</sup> Department of Science for Health Promotion and Mother to Child Care “G. D’Alessandro”, University of Palermo, Italy

## Introduction

Influenza is the most widespread, and the major cause of morbidity and mortality, among infectious diseases, for the hospitalized elderly and those with chronic-degenerative diseases (1). Therefore, preventing its spread is an important public health goal, since an effective counter-measure, represented by vaccination, is available (2, 3). Thus, every year, the Italian Ministry of Health recommends seasonal influenza vaccination to all risk groups, including people over 65 years, people with specific comorbidities, pregnant women and Healthcare Workers (HCWs) (4). Moreover, HCWs often contract influenza earlier than the general population, anticipating the common peak of Influenza-Like Illnesses (ILIs) reported by the National Surveillance System (5, 6). Above all, it is proven that influenza vaccination of HCWs results in a reduction of viral spread among hospital patients, and in a decrease of the working days lost, especially during the epidemic peak (7, 8). Nevertheless, several studies demonstrated that HCWs' adherence to influenza vaccination is really low and vaccination coverage is still far from the recommended levels in Europe (9, 10). In Italy, two of the main reasons reported by HCWs for not adhering to vaccination are represented (a) by the perception of being at a low risk of contracting influenza, as well as (b) by the wrong belief that influenza is not a disease easily transmittable in the healthcare setting (11-14). Thus, the preferred strategy to implement coverage among HCWs is universally considered the organization of multidisciplinary educational courses, followed by mandatory vaccination (8, 13).

These national findings have also been confirmed in the "Paolo Giaccone" University Hospital of Palermo (Italy), where two surveys documented a poor ethical and professional attitude towards influenza vaccination, together with a low vaccination coverage, both among HCWs (15) and

medical residents (16).

The present study aims to assess the effectiveness of an educational intervention addressed to specific groups of HCWs working at Palermo University Hospital in order to try to increase the adherence to influenza vaccination and to implement an improved strategy for the following seasons.

## Methods

### *Study design and setting*

The study was designed to assess the effectiveness of an educational intervention performed to improve attitudes and knowledge, and consequently vaccination coverage, among HCWs.

The study setting was the Palermo University Hospital, a 604 beds (542 ordinary and 62 Day Hospital) facility with about 2,100 employees, including administrative staff, and additional 940 medical residents (17).

The following hospital Units were selected, according to the presence of fragile patients at higher risk to be damaged by influenza: Infectious Diseases, Oncology, Haematology, Intensive Care, Neonatal Intensive Care.

For each HCW working in one of the selected units and declaring the intention to attend the course (intervention group), at least two staff members with the same professional profile, working in the same ward and refusing to participate were selected to form the control group, with a randomized sampling procedure.

Methods used to ensure confidentiality of data were explained and a written informed consent was obtained by all participants, according to the Italian privacy law (18).

### *Educational Intervention*

Before the start of the vaccination campaign, scheduled on November 7, 2016, between October 25, 2016 and November 4, 2016, an one-hour educational course

on influenza vaccination was administered to the intervention group of the selected hospital wards. The course, focusing on the following topics, was offered by two medical doctors with a specific expertise in vaccination (19):

a) guidelines and recommendations of the Sicilian Health Authorities about influenza vaccination of HCWs;

b) description of the vaccine and of vaccination (schedule, site of vaccination, timetable, possible side effects, etc);

c) types of influenza vaccines available during the 2016/2017 season.

#### *Data collection*

Data on baseline attitudes and practices were collected from all HCWs enrolled (including intervention and control groups) throughout a self-administrated questionnaire before the educational intervention, consisting of 7 items exploring: (a) HCWs' risk perception of contracting seasonal influenza and/or complications as compared to the general population; (b) contact with patients with comorbidities and/or risk factors for contracting influenza; (c) risk perception to be a source of contagion for fragile patients; (d) frequency of use of personal protective equipment (gloves, masks, etc.) during work shifts; (e) influenza vaccination adherence during the previous 5 seasons; (f) attitude to recommend influenza vaccination to their patients; (g) main sources of information on influenza vaccination.

The questionnaire was not anonymous, in order to evaluate influenza vaccination adherence of HCWs involved in the study.

Individual data on the vaccination adherence, during 2015/2016 and 2016/2017 campaigns, was gained for each participant in the study throughout the Hospital HCWs influenza vaccination database.

#### *Statistical analysis*

Absolute and relative frequencies were calculated for categorial variables, while

continuous variables were summarized as median (interquartile range). Differences between groups for categorial variables were analyzed using the Chi-square test (Mantel-Haenszel). The significance level chosen for all analyses was set at p-value <0.05. All analyses were performed with EpiInfo software 3.5.4.

Ethics approval was obtained by the Ethical Committee of the "Paolo Giaccone" University Hospital of Palermo (Palermo 1) in September 2016.

## **Results**

Table 1 shows attitudes and behaviors of all the 125 HCWs enrolled in the study.

Globally, 38 (30.4%) HCWs attended the training course (intervention group), and 87 (69.6%) workers who did not accept to attend the course were recruited, paired for hospital wards, working position and years of experience in the position (control group) (Table 1).

Overall, no significant differences were observed, regarding attitudes and practices on influenza transmission and prevention, between intervention and control groups. Specifically, vaccination adherence in the last five seasons was similar (18.4% of intervention group and 13.8% of control group regularly vaccinated, 15.8% of intervention group and 25.3% of control group rarely vaccinated).

Moreover, 63.2% of HCWs from the educational intervention group and 61% HCWs from the control group declared to be at higher risk of contracting influenza vaccination as compared to the general population.

98.4% (123/125) of all participating HCWs declared to be in contact with patients with a comorbidity and/or risk factors (cancer patients, diabetic, hypertensive, pediatric patients, pregnant women), regardless their participation in the educational course. Exploring HCWs' awareness to be a potential source of

Table 1 - Attitudes and behaviors of the 125 HCWs recruited in the study, according to the participation in the educational intervention. Questionnaire filled before the vaccination campaign 2016-2017

HCWs n. 125	Intervention group n.38 (30.4%)	Control group, n.87 (69.6%)	p-value
Gender, n (%)			
- Male, (n=63)	21 (55.3)	42 (48.3)	0.30
- Female, (n=62)	17 (44.7)	45 (51.7)	
Influenza vaccination in the last 5 seasons, n (%)			
- Regularly vaccinated (3-5 times), (n=19)	7 (18.4)	12 (13.8)	0.46
Rarely vaccinated (1-2 times), (n=28)	6 (15.8)	22 (25.3)	
Never vaccinated, (n=78)	25 (65.8)	53 (60.9)	
Risk perception of contracting influenza vaccination compared with general population, n (%)			
- Higher, (n=77)	24 (63.2)	53 (61.0)	0.19
- Equally, (n=41)	14 (36.8)	27 (31.0)	
- Lower, (n=7)	0 (0)	7 (8.0)	
Take care of patients with comorbidities and/or risk factors for influenza, n (%)			
Yes, (n=123)	38 (100)	85 (97.7)	0.48
No, (n=2)	0 (0)	2 (2.3)	
Risk perception of transmitting influenza to their patients, n (124) %			
Yes, (n=31)	15 (39.5)	16 (18.6)	0.10
Yes, not at all, (n=72)	21 (55.3)	51 (59.3)	
No, (n=21)	2 (5.3)	19 (22.1)	
Use of personal protective equipment (gloves, mask, etc,...) during work, n (%)			
In any case, (n=71)	26 (68.4)	45 (51.7)	<0.05
Frequently, (n=43)	12 (31.4)	31 (35.6)	
Never, (n=11)	0 (0)	11 (12.6)	
Attitudes to recommend influenza vaccination to their patients, n (%)			
Yes, according to Health Minister guidelines, (n=74)	27 (71.1)	47 (54.7)	0.36
Yes, according my own clinical evaluation, (n=24)	4 (10.5)	20 (23.3)	
No, not recommended, (n=2)	0 (0)	2 (2.3)	
No, leaving patients to their free will, (n=11)	3 (7.9)	8 (9.3)	
No, there was no possibility, (n=13)	4 (10.5)	9 (10.5)	
Main informative sources on influenza vaccination, n (%)			
Mass media, (n=17)	6 (15.8)	11 (12.6)	0.32
Scientific literature, (n=60)	16 (42.1)	44 (50.6)	
Social networks, (n=6)	4 (10.5)	2 (2.3)	
Colleagues, (n=18)	6 (15.8)	12 (13.8)	
Other sources, (n=24)	6 (15.8)	18 (20.7)	

influenza transmission to patients, 55.3% of participants and 59.3% of controls declared they believed to be involved only partially in the transmission process.

The only significant difference between the two groups concerned attitudes in using professional protective equipments, that resulted higher among the intervention group (68.4%) compared to control group (51.7%) (p-value = 0.048).

Overall, 43 HCWs out of 125 (34.4%) of the two groups were vaccinated against influenza during 2016/2017 season. In particular, 42% of HCWs who decided to attend the educational intervention got vaccinated, while vaccination prevalence in the control group was 31%. Moreover, analyzing vaccination adherence during the previous influenza season (2015/2016) significant difference between the two groups (16% among course participants, 13% among controls) were not detected. The vaccination coverage increase observed during the last two seasons corresponded to +24% in the intervention group and to +18% in the control group (Figure 1).

Table 2 shows answers to the questionnaire in relation to vaccination adherence during the influenza season 2016/2017.

The higher perceived risk of contracting influenza or its complications was the only item that differed significantly between the HCWs that underwent vaccination (76.7%) and controls (53.7%) (p-value <0.05). For the remaining three items, no significant differences in attitudes toward influenza vaccination was documented. In particular, the majority of both vaccinated (97.7%) and not vaccinated (98.8%) HCWs enrolled in the study reported to take care of patients with comorbidities or risk factors for influenza (p-value= 0.64). Only 33.3% of HCWs who underwent vaccination and 20.7% of HCWs who refused it, declared to perceive a risk of transmitting influenza to their patients (p-value = 0.30). Lastly, influenza vaccination was reported to have been performed regularly (3-5 times) during the last 5 seasons by 23.3% of vaccinated and by 11.0% of not vaccinated HCWs (p-value = 0.06).

## Discussions and Conclusions

HCWs vaccination is one of the safest and most effective interventions for controlling both pathogens circulation in the general population and healthcare associated

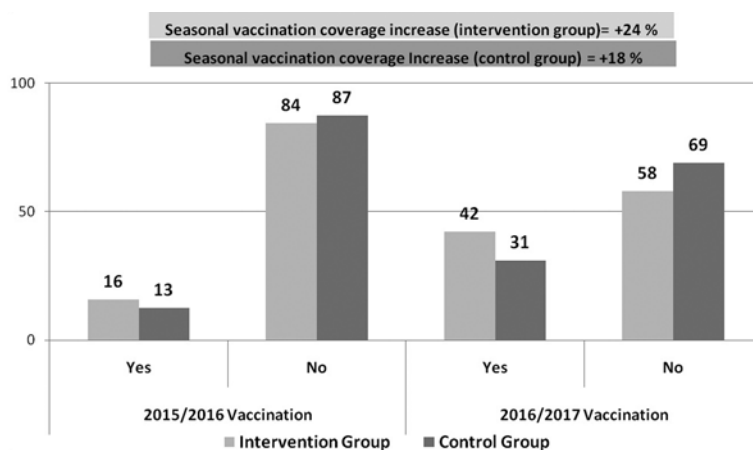


Table 2 - Univariate analysis of risk perceptions and attitudes regarding influenza vaccination of 125 HCWs enrolled in the study, according to influenza vaccination adherence during 2016/2017 season.

HCWs n. 125	Adherence to vaccination during the 2016/2017 season n (%)		p-value
	Yes (n. 43, 34.4%)	No (n. 82, 65.6%)	
Risk perception of contracting influenza vaccination compared with general population			
- Higher	33 (76.7)	44 (53.7)	<0.05
- Equal	8 (18.6)	33 (40.2)	
- Lower	2 (4.7)	5 (6.1)	
Take care of patients with comorbidities and/or risk factors for influenza			
- Yes	42 (97.7)	81(98.8)	0.64
- No	1 (2.3)	1 (1.2)	
Risk perception of transmitting influenza to their patients (n.123)			
- Yes	14 (33.3)	17 (20.7)	0.30
- Yes, but not at all	22 (52.4)	50 (61.0)	
- No	6 (14.3)	15 (18.3)	
Influenza vaccination in the last 5 seasons			
- Regularly vaccinated (3-5 times)	10 (23.3)	9 (11.0)	0.06
- Rarely vaccinated (1-2 times)	12 (27.9)	16 (19.5)	
- Never vaccinated	21 (48.8)	57 (69.5)	

infections, with direct benefits for vaccinated subjects and indirect benefits for non-vaccinated ones, by inducing the herd immunity (20). Vaccination also plays a key role in protecting patients, especially those fragile and at high risk.

Earlier studies found low flu vaccine coverage among Italian HCWs, in line with other European Countries such as Germany, Spain, France and the United Kingdom, ranging between 15% and 29% (21, 22). Conversely, in other non-European countries, such as Canada or the US, where mandatory vaccination policies are in place, coverage levels are higher, reaching the target of 75% recommended by the US CDC, the Center for Disease Control and Prevention (2, 23, 24).

According to the literature, factors that positively influence HCWs' vaccination are (a) the awareness of the protective effects of vaccination (9, 13) and (b) the intention to protect

patients, their own family, themselves and other people, being affected by chronic illnesses.

During the last two seasons, our data showed a higher vaccination adherence and a higher increase in coverage of the recruited HCWs in the educational intervention group as compared to the control group (42% vs. 31%; +24% vs +18%), even if this difference was not statistically significant, probably due to the small size of the sample. In fact, despite it was a pilot study, attending the multidisciplinary educational course allowed to partially modify attitudes of the HCWs involved, resulting in a higher vaccination compliance (25). It should also be considered that it is more difficult to change practices and habits in adults after years of work than in the beginners, suggesting to enhance specific training interventions on the issue in the earlier stages of the professional career or even during the university pre- and post-graduated courses (26, 27), as documented also for other topics of public health concern (28).

Although it is well known that HCWs are a source of influenza for patients, a lack of compliance to vaccination raised from our sample: approximately two thirds of participants have never been vaccinated in the previous five years and less than 20% of HCWs have been vaccinated regularly. Moreover, the overall low percentage of vaccinated HCWs is consistent with the evidence that 61.6% of the study sample unjustifiably believed to have a lower risk to contract influenza or its complications, as compared to the general population. This finding are consistent with evidences documented by literature, whereas factors that mainly affect the decision to not vaccinate are (a) the underestimation of the importance of influenza, (b) the believe that the vaccine has poor protective effects, (c) the feeling of influenza as a mild disease, (d) in addition to doubts about the efficacy of the vaccine, the overestimation of the adverse effects of vaccinations (10, 21).

An important issue documented by our study refers to a really low perception of HCWs to be a potential source of transmission for influenza viruses. Of interest, the Law 119/2017 on Vaccine Prevention, recently approved by the Italian Parliament, has implemented the duty for HCWs to declare their own vaccination status in order to inform their employer (29). Even if the enacted Law doesn't introduce for the moment the mandatory vaccination for HCWs, differently from other European and non-European realities where this strategy has demonstrated to be effective (30, 31), this measure strengthens the recommendation of the National Vaccine Prevention Plan 2017-2019 (32) for all HCWs to get vaccinated (also against influenza). Not by chance, it should be highlighted that HCWs are a potential high vulnerable risk group for infectious diseases, as shown by the recent measles epidemic observed in Italy, in the first nine months of 2017, being HCWs 315 (6.5%) of the 4,885 notified cases (33).

The main limitations of the study are due to the small sample size and to the involvement of one only university hospital. Thus, according to the wide heterogeneity of healthcare systems and hospitals' settings, our findings could not be considered fully representative of regional or national scenario. Furthermore, the questionnaire was self-administered and it may suffer from recall bias, as well as voluntary based participation may result in a selection bias.

Finally, a potential selection bias due to voluntary selection of intervention participant among HCWs working in the same wards should be considered.

Despite these limitations, to our knowledge this study is one of the few trying to investigate the effectiveness of specific education and training, tailored for HCWs, on influenza vaccination coverage.

In conclusion, our experience documented that an educational intervention could slightly improve adherence to vaccination in a sample of HCWs. Nevertheless, vaccination coverage achieved in the intervention group, which is one of the highest recorded in Europe during recent years without the support of a mandatory vaccination strategy, still remains below the recommended levels, and below levels needed to reduce the spread of influenza virus between HCWs and their patients. Therefore, our study supports the need (a) to enforce mandatory vaccination policy for all HCWs in contact with fragile patients or with patients particularly at risk to contract influenza, and (b) to adopt strict limitations at workplace for HCWs not vaccinated for any reason during the influenza season (34, 35).

## Riassunto

*Efficacia sull'incremento delle coperture vaccinali antinfluenzali stagionali di un intervento formativo condotto tra operatori sanitari dell'Azienda Ospedaliera Universitaria Policlinico di Palermo*

*Introduzione.* Gli operatori sanitari sono continuamente esposti ai virus influenzali durante la loro attività

lavorativa, rappresentando una minaccia soprattutto per i pazienti fragili. Nonostante il Ministero della Salute raccomandi fortemente la vaccinazione antinfluenzale per tutti gli operatori sanitari, i livelli di copertura osservati in Italia sono ben al di sotto di quanto richiesto. Tra le strategie riportate in letteratura in grado di aumentare le coperture vaccinali tra gli operatori sanitari vi sono specifici corsi di formazione sulla tematica. Il presente studio ha lo scopo di valutare l'efficacia di un intervento formativo condotto prima dell'inizio campagna di vaccinazione antinfluenzale stagionale 2016/2017 tra alcuni operatori sanitari dell'Azienda Ospedaliera Universitaria Policlinico "Paolo Giaccone" di Palermo.

**Materiali e metodi.** Gli interventi formativi sono stati condotti presso le Unità Operative con pazienti a maggiore rischio di complicanze nel caso contraessero la patologia influenzale. Gli operatori sanitari che hanno deciso volontariamente di frequentare il corso sono stati considerati gruppo di intervento, mentre due controlli per ciascun caso sono stati selezionati nella stessa Unità Operativa tra i non partecipanti al corso. Prima dell'intervento è stato somministrato un questionario per indagare l'attitudine e i comportamenti nei confronti della vaccinazione antinfluenzale, mentre i dati sulla copertura vaccinale sono stati ottenuti successivamente attraverso il sistema informativo Aziendale.

**Risultati.** Complessivamente hanno partecipato allo studio 125 operatori sanitari, di cui 38 (30.4%) hanno seguito il corso (gruppo d'intervento) e 87 (69.6%), che non lo hanno seguito, affiancati loro come gruppo di controllo. Successivamente, solo 43 dei 125 (34.4%) hanno effettuato la vaccinazione antinfluenzale a fine stagione. In particolare, il 42% degli Operatori Sanitari del gruppo d'intervento è stato vaccinato, contro il 31% del gruppo di controllo. Gli Operatori Sanitari che si sono vaccinati hanno dichiarato una più elevata percezione del rischio di contrarre l'influenza rispetto ai non vaccinati ( $p < 0,05$ ), mentre non è stata riportata alcuna differenza significativa nella percezione del rischio di trasmettere l'influenza ai loro pazienti.

**Discussione.** Nonostante l'intervento formativo abbia migliorato le coperture vaccinali negli Operatori Sanitari coinvolti, la copertura ottenuta è stata inferiore a quella raccomandata per ridurre la diffusione dell'influenza nei contesti sanitari. I dati suggeriscono che la formazione ha un ruolo nel miglioramento dell'aderenza alla vaccinazione antinfluenzale, ma dovrebbe essere integrata da ulteriori e più stringenti misure di sanità pubblica, quali la vaccinazione obbligatoria.

## References

1. Costantino C, Vitale F. Influenza vaccination in high-risk groups: a revision of existing guidelines and rationale for an evidence-based preventive strategy. *J Prev Med Hyg* 2016; **57**: E13-E18.
2. Centers for Disease Control and Prevention (CDC). Immunization of Health-Care Personnel Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2011; **60** (No. SS-7).
3. Nokleby H, Nicoll A. Risk groups and other target groups – preliminary ECDC guidance for developing influenza vaccination recommendations for the season 2010-11. *Euro Surveill* 2010; **15**(12): pii=19525.
4. Ministero della Salute. Circolare Ministeriale del 02/08/2016. "Prevenzione e controllo dell'influenza: raccomandazioni per la stagione 2016-2017". Available from: [http://www.trovanorme.salute.gov.it/norme/renderNormsanPdf;jsessionid=KBKUFL2yRvbjasUn+Ju83w\\_\\_.sgc3-prdsal?anno=2016&codLeg=55586&parte=1%20&serie=null](http://www.trovanorme.salute.gov.it/norme/renderNormsanPdf;jsessionid=KBKUFL2yRvbjasUn+Ju83w__.sgc3-prdsal?anno=2016&codLeg=55586&parte=1%20&serie=null) [Last accessed: 2018 Jan 8].
5. Carman WF, Elder AG, Wallace LA, 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**: 93-7.
6. Restivo V, Costantino C, Mammina C, Vitale F. Influenza like Illness among Medical Residents Anticipates Influenza Diffusion in General Population: Data from a National Survey among Italian Medical Residents. *PLoS One* 2016; **11**(12): e0168546.
7. Salgado CD, Giannetta ET, Hayden FG, Farr BM. Preventing nosocomial influenza by improving the vaccine acceptance rate of clinicians. *Infect Control Hosp Epidemiol.* 2004 Nov; **25**(11):923-8
8. Wilde JA, McMillan JA, Serwint J, Butta J, O'Riordan MA, Steinhoff MC. Effectiveness of influenza vaccine in health care professionals: a randomized trial. *JAMA* 1999; **281**(10): 908-13.
9. Maltezou HC, Maragos A, Katerelos P, et al. Influenza vaccination acceptance among health-care workers: a nationwide survey. *Vaccine* 2008; **26**(11): 1408-10.
10. Mannocci A, Ursillo P, Bontempi C, Sferrazza A, La Torre G. Prevalence of influenza vaccination among physicians and related enhancing and preventing factors in Italy. *Rev Health Care* 2010; **1**: 23-30.
11. Esposito S, Bosis S, Pelucchi C, et al. Influenza



- vaccination among healthcare workers in a multidisciplinary University hospital in Italy. *BMC Public Health* 2008; **23**; 8: 422.
12. Costantino C, Battaglia A, D'Asta M, et al. Knowledge, attitudes and behaviors regarding influenza vaccination among hygiene and preventive medicine residents in Calabria and Sicily. *EuroMediterranean Biomed J* 2012; **7**(17): 77-83.
  13. Costantino C, Mazzucco W, Azzolini E, et al. Influenza vaccination coverage among medical residents: An Italian multicenter survey. *Hum Vaccin Immunother* 2014; **10**(5): 1204-10.
  14. Costantino C, Amodio E, Vitale F, et al. Attitudes, behaviours and perceptions of Italian General Practitioner trainees towards influenza vaccination in Western Sicily (Italy). *Ital J Public Health* 2012, **9**(1): 33-9.
  15. 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.
  16. Amodio E, Tramuto F, Maringhini G, et al. Are medical residents a "core group" for future improvement of influenza vaccination coverage in health-care workers? A study among medical residents at the University Hospital of Palermo (Sicily). *Vaccine* 2011; **29**(45): 8113-7.
  17. AOU Policlinico "P. Giaccone" di Palermo. Delibera n. 161 del 20/02/2017 - Modifica Atto Aziendale 2016 e ricodificazione della Struttura Organizzativa. Available from: [http://www.policlinico.pa.it/portal/index.php?option=displaypage&Itemid=302&op=page&SubMenu=\[Last accessed: 2018 Jan 9\]](http://www.policlinico.pa.it/portal/index.php?option=displaypage&Itemid=302&op=page&SubMenu=[Last accessed: 2018 Jan 9]).
  18. Parlamento della Repubblica Italiana. D.lgs. 30 giugno 2003, n. 196. Codice in materia di protezione dei dati personali" Available from: [http://www.camera.it/parlam/leggi/deleghe/03196dl.htm \[Last accessed: 2018 Jan 9\]](http://www.camera.it/parlam/leggi/deleghe/03196dl.htm [Last accessed: 2018 Jan 9]).
  19. Regione Siciliana, Assessorato Regionale della Salute. D.A. n°: 1849/2016. "Campagna di vaccinazione antinfluenzale 2016/2017-Coinvolgimento MMG e PLS". Available from: [http://pti.regione.sicilia.it/portal/page/portal/PIR\\_POR-TALE/PIR\\_LaStrutturaRegionale/PIR\\_AssessoratoSalute/PIR\\_Decreti/PIR\\_Decreti2016/PIR\\_DecretiAssessoriali2016/DA%20N.%201849%20SERV%204.pdf \[Last accessed: 2018 Jan 9\]](http://pti.regione.sicilia.it/portal/page/portal/PIR_POR-TALE/PIR_LaStrutturaRegionale/PIR_AssessoratoSalute/PIR_Decreti/PIR_Decreti2016/PIR_DecretiAssessoriali2016/DA%20N.%201849%20SERV%204.pdf [Last accessed: 2018 Jan 9]).
  20. Restivo V, Costantino C, Bono S, et al. Influenza vaccine effectiveness among high-risk groups: A systematic literature review and meta-analysis of case-control and cohort studies. *Hum Vaccin Immunother* 2018; **14**(3): 724-35.
  21. Di Gregori V, Franchino G, Marcantoni C, Simone B, Costantino C. Logistic regression of attitudes and coverage for influenza vaccination among Italian Public Health medical residents. *J Prev Med Hyg* 2014; **55**: 152-7.
  22. Blank PR, Schwenkglens M, Szucs TD. Influenza vaccination coverage rates in five European countries during season 2006/07 and trends over six consecutive seasons. *BMC Public Health* 2008; **8**: 272.
  23. Baron G, De Wals P, Milord F. Vaccination practices of Quebec family physicians. Influenza vaccination status and professional practices for influenza vaccination. *Can Fam Physician* 2001; **47**: 2261-6.
  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. Costantino C, Amodio E, Calamusa G, Vitale F, Mazzucco W. Could university training and a proactive attitude of coworkers be associated with influenza vaccination compliance? A multicentre survey among Italian medical residents. *BMC Med Educ* 2016; **16**: 38.
  26. Marotta C, Raia DD, Ventura G, et al. Improvement in vaccination knowledge among health students following an integrated extra curricular intervention, an explorative study in the University of Palermo. *J Prev Med Hyg* 2017; **58**(2): E93-E98.
  27. Amodio E, Tramuto F, Costantino C, et al. Diagnosis of influenza: only a problem of coding? *Med Princ Pract* 2014; **23**(6): 568-73.
  28. Iannuale C, Leoncini E, Mazzucco W, et al. Public Health Genomics education in post-graduate schools of hygiene and preventive medicine: A cross-sectional survey. *BMC Med Educ* 2014; **14**: 213.
  29. Ministero della Salute. Decreto Legge 07 giugno 2017, n. 73. Available from: [http://www.trovanorme.salute.gov.it/norme/dettaglioAtto?id=59548 \[Last accessed: 2018 Jan 9\]](http://www.trovanorme.salute.gov.it/norme/dettaglioAtto?id=59548 [Last accessed: 2018 Jan 9]).
  30. Wicker S, Rabenau HF, Kempf VA, Brandt C. Vaccination against classical influenza in health-care workers: self-protection and patient protection. *Dtsch Arztebl Int* 2009; **106**(36): 567-72.

31. Wang TL, Jing L, Bocchini JA Jr. Mandatory influenza vaccination for all healthcare personnel: a review on justification, implementation and effectiveness. *Curr Opin Pediatr* 2017; **29**(5): 606-15.
32. Ministero della Salute. Piano Nazionale Prevenzione Vaccinale 2017-2019. Available from: <http://www.trovanorme.salute.gov.it/norme/renderPdf.spring?seriegu=SG&datagu=18/02/2017&redaz=17A01195&artp=1&art=1&subart=1&subart1=10&vers=1&prog=001> [Last accessed: 2018 Jan 9].
33. Epicentro. Istituto Superiore di Sanità. Morbillo in Italia: bollettino settimanale del 13/12/2017. Available from: <http://www.epicentro.iss.it/problemi/morbillo/Infografica2017.asp> [Last accessed: 2018 Jan 9].
34. Mena G, Llupia A, García-Basteiro AL, et al. Educating on professional habits: attitudes of medical students towards diverse strategies for promoting influenza vaccination and factors associated with the intention to get vaccinated. *BMC Med Educ* 2013; **13**: 99.
35. Maltezou HC, Poland GA. Immunization of Health-Care Providers: Necessity and Public Health Policies. *Healthcare (Basel)* 2016; **4**(3). pii: E4

Corresponding author: Claudio Costantino, MD, PhD, Department of Science for Health Promotion and Mother to Child Care “G. D’Alessandro”, University of Palermo, Via del Vespro 133, 90127, Palermo, Italy  
e-mail: [claudio.costantino01@unipa.it](mailto:claudio.costantino01@unipa.it)