Impact of communicative and informative strategies tailored for health care workers to increase influenza vaccination compliance in the major Sicilian University Hospital

Claudio Costantino 1, Vincenzo Restivo 1, Francesca Caracci 1, Stefania Bono 1, Marialuisa Maniglia 1,
Dario Favaro 1, Giusy Russo Fiorino 1, Claudia Emilia Sannasardo 1, Francesco Scarpitta 1, Carlotta Vella 1,
Gianmarco Ventura 1, Maria Valeria Torregrossa 1, Francesco Vitale 1, Alessandra Casuccio 1.

1 Department of Science for Health Promotion and Mother Child Care "G. D'Alessandro" - University of Palermo, Palermo, Italy

Corresponding author:
Alessandra Casuccio,
Department of Science for Health Promotion and Mother to Child Care "G. D'Alessandro" - University of Palermo, Palermo, Italy
e-mail: alessandra.casuccio@unipa.it, tel +39 0916553606
Abstract

About 20% of health care workers (HCWs) acquired influenza every year, continuing to work and encouraging virus spreading. Vaccination coverage during last 11 seasons among HCWs of the University Hospital of Palermo were analyzed, assessing the impact of tailored communicative and informative strategies and evaluating knowledge and attitudes for vaccination acceptance or refusal.

Among initiatives organized to increase HCWs awareness and vaccine acceptance were: dedicated web and social-media informative pages, mandatory informed dissent, “on site” vaccination. Moreover, reasons for influenza vaccination acceptance or refusal were evaluated.

Vaccination coverage raise from a mean value of 5% (from 2010/2011 to 2014/2015) to 27% in 2017/2018 influenza season (chi-square for trend: 857, p < 0.001). Mean age of vaccinated HCWs went down from 48.1 (±15.7) in 2013/2014 to 41.6 (±14.5) in 2017/2018. Risk perception of contracting or transmitting influenza virus were main reasons for acceptance. Otherwise, fear of adverse reaction and a substantial lack of perception of spreading influenza among patients were reported as main refusal motives.

Communicative and informative strategies undertaken at the University Hospital of Palermo produced a significant increase of vaccination adherence, reaching rates consistent with mean European coverages, although still far from 75% recommended by Public Health Authorities.

Key words: influenza vaccination, health care workers, vaccination coverage, medical resident, communication campaign
Introduction

Control of the hospital infections is currently one of the major objectives of Public Health, aimed both to patients’ protection and the reduction of the hospitalization costs [1].

Nosocomial infections caused by Influenza virus are a considerable problem, especially concerning most fragile patients (i.e. immunocompromised hospitalized in Intensive Care Units), associated with a high morbidity and mortality [2].

Patients hospitalized in public structures or assisted at home can be infected by other patients, visitors or health care workers (HCWs) [3].

It has been estimated that about 20% of HCWs contracts influenza during influenza season, often continuing to work, leading not only to nosocomial epidemics, but also to staff’s reduction with consequently disruptions for the medical care [4-6].

International Public Health authorities has clearly affirmed the importance of vaccination as the most effective measure to prevent the Influenza virus spread among the general population, but above among all risk categories, including HCWs [7-9].

Despite recommendations and clarified efficacy and safety of the vaccine, influenza vaccination coverage among European HCWs continues to be less than 75% recommended [10-11].

In Italy were reported very low coverage rates (<30%) among youngest HCWs too[12].

As established by many authors, the most important reasons of vaccination refusal were predominantly attributable to poor knowledge, attitudes and perception of HCWs about influenza vaccination efficacy and safety [13-16].

The present study analyzed the trend of vaccination coverage in the last eleven influenza vaccination campaign among health care workers and medical residents attending University Hospital (UH) of Palermo, Italy evaluating attitudes and behaviors regarding influenza vaccination acceptance and refusal in the last two seasons and assessing the impact of new communicative and informative strategies, tailored to increase low influenza vaccination coverage reported before 2015/2016 season.
Materials and Methods

Influenza vaccination coverages among HCWs of the UH of Palermo from 2007/2008 to 2017/2018 seasons were collected. Furthermore, a cross-sectional study was conducted, through a validated questionnaire, administered during 2016/2017 and 2017/2018 influenza seasons to health care workers that accepted influenza vaccination, by medical residents in Public Health of the University of Palermo (Italy).

Recruitment of HCWs was spontaneous among those who have joined the seasonal influenza vaccination campaign.

Moreover, reasons for influenza vaccination refusal were collected during the last two season trough a mandatory online form of informed dissent, that appeared in the personal home page (Intranet) of the UH web site.

Simultaneously and previously the start of vaccination campaigns, a team group consisting of Public health medical researchers and medical residents, in agreement with the Sicilian Health Department Decree on influenza vaccination campaign, has set out initiatives to raise knowledge and awareness on influenza vaccination efficacy and safety among HCWs of the UH of Palermo [17].

In particular, during the last three influenza seasons (2015/2016, 2016/2017 and 2017/2018) were organized the following initiatives:

- Distribution of pins (with the logo “I’m vaccinated”) to vaccinated HCWs, to hang on work clothes after vaccination administration and during all the influenza season (vaccination campaign 2015/2016);
- Creation of dedicated pages on social networks (Facebook) and on institutional web site (UH of Palermo), to promote right information about vaccination offer and campaign, including the publication, behind consent collection, of photos of vaccinated subjects with hashtags created ad hoc (#ivaccine, #ivaccinemyself, #iamvaccinated, #protectyourpatients, #dontbeinginfluenced) to make messages more appealing (vaccination campaign 2015/2016, 2016/2017 and 2017/2018) [18];
- Planning of a dedicated week for vaccination of HCWs of the UH of Palermo directly in hospital units ("in situ" vaccination) to facilitate healthcare staff who were unable to move from wardto usual vaccination places (vaccination campaign 2015/2016, 2016/2017and 2017/2018);
- Creation of a dedicated poster for HCWs and patients that was hanged in every ward of the Palermo UH, with the original slogan of the campaign: "Protect yourself to protect your patients" (vaccination campaign 2016/2017 and 2017/2018);

- Introduction of the informed dissent form for those who refused seasonal influenza vaccination, with mandatory compilation request when opening the personal intranet page (vaccination campaign 2016/2017 and 2017/2018);

- Organization of a dedicated day to the value of influenza vaccine prevention ("Influ day"), in accordance with the Regional initiative of the Sicilian Health Department, with the purpose of sensitize HCWs to vaccination (vaccination campaign 2016/2017 and 2017/2018).

For subjects referring to the vaccine outpatient of the AOUP and those who have been vaccinated in their own ward a study information was provided, signature was required on an informed consent form and finally an anonymous questionnaire, designed by the authors, previously tested and validated, was given [12].

The research project, with the informed consent, dissent form and the questionnaire for vaccinated HCWs, has been previously approved by Ethical Committee of University Hospital of Palermo, Italy in the month of September 2015. All collected data were treated in accordance with Italian legislation on warranty of privacy [19].

Informed consent, dissent form and questionnaire

Informed consent and dissent form collected data on sex, age and role of every HCWs of the UH of Palermo that accepted or refused influenza vaccination campaign.

Moreover, informed dissent online form required the answer at the question examining reason for influenza vaccination refusal.

The questionnaire for vaccinated HCWs consisted of 10 items and was divided into 3 sections, as follows:

- Demographic and academic characteristics: sex, education;

- Attitudes to respiratory illnesses prevention: frequency of hand-washing per day (categorized as “less than 3 times”, “4 to 6 times” and “more than 7 times”), use of personal protective equipment (PPE/DPI);
- Perception and attitudes on influenza infection and vaccination: perspective on personal risk of contracting influenza illness and its complications, perspective on spreading influenza among patients, adherence to influenza vaccination of own unit colleagues, vaccination uptake within the previous five-year period, reasons for influenza vaccination uptake, attitudes to recommend influenza vaccination to patients.

**Statistical analysis**

Questionnaire responses were collected in a database using software EpiInfo 3.5.1. Data were analyzed using statistical software package STATA v14.2. Distribution for age classes, mean age and standard deviation of vaccinated HCWs were analyzed.

Vaccination coverage was obtained considering HCWs who received influenza vaccination during campaign among all HCWs working at the UH of Palermo (including medical residents and administrative personnel). The chi-square for trend of the last seven influenza seasons (from 2011/2012 to 2017/2018) vaccination coverages were calculated through EpiInfo 3.5.1. Absolute and relative frequencies were calculated for qualitative variables. Categorical variables were analyzed using the chi-square test (Mantel–Haenszel).

**Results**

Influenza vaccination coverages among HCWs of UH, from 2007/2008 to 2017/2018 seasons, were showed in figure 1. During the 2017/2018 influenza season, vaccination coverage reached 27%, even higher than 2009/2010 season, during which a peak of 25% was observed (considering to the sum of AH3N2 and AH1N1 influenza vaccination adherence). After 2009/2010 season, a negative trend of vaccination coverage was registered until 2014/2015, with a mean value of 5%. From the beginning of communicative and informative strategies in 2015/2016 season it was observed a significant increasing trend of vaccination adherence with a value of 17%, 24% and 27% reported during the last three seasons. The chi-square for trend from 2011/2012 to 2017/2018 seasons had a value of 857 and it was statistically significant (p<0.001).
In Figure 2 the age group distribution of vaccinated HCWs during the last five influenza vaccination seasons (2013/2014 - 2017/2018) was shown. In particular, in the last three seasons the consistent increase of adherence were mostly attributable to HCWs aged from 21 to 30 years, that during 2016/2017 season represented 40.8% of all HCWs vaccinated (29.5% in the last influenza season). Furthermore, since 2013/2014 influenza season HCWs from 31 to 40 years, were progressively increased, reaching 25% coverage during 2017/2018 season. Consequently, the mean age of vaccinated HCWs had a progressive decreasing trend from $48.1 \pm 15.7$ in 2013/2014 season to $41.6 \pm 14.5$ in 2017/2018 season.

Reasons for not receiving seasonal influenza vaccination, reported in the dissent form, were showed in Figure 3. During 2016/2017 season, main reason reported was: fear of adverse reaction (32%), followed by lack of perception of own risk to have influenza (24%) and by a lack of perception to spread influenza among patients (15%). During 2017/2018, fear of adverse reaction and lack of perception of own risk to have influenza were both more relevant (33%) reasons of vaccination refusal.
Figure 2. Age distribution of vaccinated HCWs during the last five influenza vaccination seasons (2013/2014 - 2017/2018)

Figure 3. Reason for not receiving seasonal influenza vaccination reported in the informed vaccination dissent, collected at the UH of Palermo, in the last influenza seasons (2016/2017 and 2017/2018).
During 2016/2017 and 2017/2018 seasons of 1,155 (69%) HCWs vaccinated participated to the survey on knowledge and attitudes on influenza vaccination and infection, as reported in Table 1. Among respondents HCWs, 418 (52.4%) were male, and 346 (43.4%) medical residents, while medical doctor were 236 (29.6%) and health care professionals 106 (13.3%).

A majority of participants reported a higher risk perception of contracting influenza than general population (64.9%), and more than 80% of HCWs interviewed considered themselves as a possible source to spread influenza virus among patients. The main reasons for influenza vaccination uptake were: "considering themselves at higher risk of contracting and spreading influenza or its complications" (34.6%; n=274), “to avoid spreading influenza among general population” (25.2%; n=200), and "to avoid influenza infection" (20.4%; n=162). Meanwhile, only 15.9% of HCWs vaccinated during the last two influenza seasons reported “to avoid spreading influenza among patients” (n=126) as the main reason for vaccination adherence. Influenza vaccination adherence among own ward colleagues was at least acceptable (someone of them) for 2/3 of respondents. A regular influenza vaccine administration during the last five seasons was declared by 36.8% of HCWs interviewed. On the other hand, 34.2% (n=265) were not never vaccinated during the last five seasons.

Finally, the large majority (84.4%) of HCWs participants to the survey, reported an attitude to recommend influenza vaccination to their patients.
Table 1. Socio-demographics characteristics, attitudes and behaviours regarding influenza vaccination of HCWs vaccinated and surveyed during 2016/2017 and 2017/2018 influenza seasons at Palermo University Hospital (n=797)

<table>
<thead>
<tr>
<th>Gender, (n=797)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- male</td>
<td>418 (52.4)</td>
</tr>
<tr>
<td>- female</td>
<td>379 (47.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Role, (n=797)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- medical doctor</td>
<td>236 (29.6)</td>
</tr>
<tr>
<td>- medical residents</td>
<td>346 (43.4)</td>
</tr>
<tr>
<td>- health care professionals (nurses, health care assistant, ...)</td>
<td>106 (13.3)</td>
</tr>
<tr>
<td>- others (administrative personnel)</td>
<td>109 (13.7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived risk of contracting influenza compared to general population, (n=793)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- higher</td>
<td>515 (64.9)</td>
</tr>
<tr>
<td>- comparable</td>
<td>240 (30.3)</td>
</tr>
<tr>
<td>- lower</td>
<td>38 (4.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived risk of spreading influenza among your own patients, (n=716)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- yes, absolutely</td>
<td>245 (34.2)</td>
</tr>
<tr>
<td>- yes, partially</td>
<td>348 (48.6)</td>
</tr>
<tr>
<td>- no</td>
<td>123 (17.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reasons for influenza vaccination uptake, (n=792)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- influenza vaccination was recommended from own health care institution (Palermo University Hospital)</td>
<td>30 (3.8)</td>
</tr>
<tr>
<td>- to avoid influenza infection</td>
<td>162 (20.4)</td>
</tr>
<tr>
<td>- to avoid spreading influenza among patients</td>
<td>126 (15.9)</td>
</tr>
<tr>
<td>- to avoid spreading influenza among general population</td>
<td>200 (25.2)</td>
</tr>
<tr>
<td>- considering themselves at higher risk of contracting and spreading influenza or its complications</td>
<td>274 (34.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adherence to influenza vaccination of your own unit colleagues, (n=775)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- yes, most of them</td>
<td>273 (35.2)</td>
</tr>
<tr>
<td>- yes, someone</td>
<td>237 (30.6)</td>
</tr>
<tr>
<td>- no/I don't know</td>
<td>265 (34.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vaccination adherence in the last five influenza seasons, (n=790)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- regularly (3 to 5 times)</td>
<td>291 (36.8)</td>
</tr>
<tr>
<td>- rarely (1 or 2 times)</td>
<td>227 (28.7)</td>
</tr>
<tr>
<td>- never</td>
<td>272 (34.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attitude to recommend influenza vaccination to patients, (n=727)</th>
<th>HCs surveyed during 2016/2017 and 2017/2018 influenza seasons, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- yes</td>
<td>614 (84.4)</td>
</tr>
<tr>
<td>- no, leaving patients to their free will</td>
<td>48 (6.7)</td>
</tr>
<tr>
<td>- no, there was no occasions for recommending vaccination</td>
<td>65 (8.9)</td>
</tr>
</tbody>
</table>
**Discussion**

The study analyzed influenza vaccination adherence of HCWs of the major teaching Hospital of Sicily from 2006/2007 to 2017/2018 seasons. In particular, was evaluated the impact of informative and communicative public health strategies adopted during the last three influenza seasons on vaccination coverage increase, mean age and age group distribution changes. Moreover were reported the main reasons for influenza vaccination refusal and knowledge and attitudes of vaccinated HCWs at the University Hospital of Palermo. Considering the significant increase in vaccination coverage at the UH of Palermo, from the lower values observed from 2010/2011 to 2014/2015 seasons with a mean 5% coverage, were certainly demonstrated a good efficacy of strategies adopted. Contextually, the age group distribution and the mean age observed among vaccinated HCWs of the last five seasons, demonstrated an higher efficacy of informative and communicative campaign, based mainly on social networks and new social media, especially among younger HCWs, as previously reported in other experiences [20 - 22].

Vaccination coverage reached in 2017/2018 season represent the best value obtained in the last ten years, overtaking adherence observed during 2009/2010 "pandemic season". In particular, coverage observed among HCWs in 2009/2010 were overestimated because two different influenza vaccinations were available and administered to HCWs at the same time (pandemic and trivalent inactivated influenza vaccines) [23]. Furthermore, the consistent collapse of vaccination adherence, during following seasons, were probably due to doubts about vaccine efficacy and safety, rising after "pandemic season" among general population and also HCWs [24]. In addition, the "fluad case" occurred during November 2014 and a not appropriate and prompt response from Public Health Authorities, contributed to the general lack of confidence and adherence to influenza vaccination [25, 26]. The organization of informative and communicative intervention on influenza vaccination represented an undisputable need for HCWs of the UH of Palermo at the beginning of 2015/2016 influenza season.

Every single intervention conducted during the past years in other setting, was associated with modest increases in vaccination coverage [27]. Using multiple interventions could determine a larger increase as supported by other authors.
A study conducted in US showed that vaccination coverage among HCWs who reported at least two workplace interventions was about twice than HCWs without any intervention at workplace [28]. These results were similar to others of recent review articles on interventions to increase influenza vaccination coverage among HCWs which reported that vaccination uptake increases with an increasing number of intervention program in health care settings [29, 30].

Coverage raised during the last three influenza season was similar to what observed in other Italian context, but remained still lower than reported in other European Countries [31, 32].

To effectively address vaccination gaps, it is necessary to understand the main barriers, at different levels, in order to design evidence-based informed for HCWs.

In particular, among HCWs of the UH of Palermo, the main reasons for influenza vaccination refusal were, according with literature data, focused on personal issues of HCWs (fear of adverse reaction, misperception of risk to had influenza) rather than considered the effectiveness of influenza vaccination for patients protection [13, 33, 34].

Furthermore, the majority of HCWs adherent to influenza vaccination are medical doctor or medical residents regardless of health professionals. This data is consistent with other experience that demonstrated the impact of educational program on influenza vaccination adherence increase particularly among physicians [34].

Among vaccinated HCWs of the UH of Palermo, a large majority were vaccinated during the last five seasons, reported high vaccination adherence among own ward colleagues and recommended influenza vaccination to patients. Usually, vaccinated physicians could promote influenza vaccination among other health care professionals and patients in future [35 - 37].

Institutional informative and communicative strategies at the UH of Palermo contributed to a substantial increase in vaccination coverage. Only with an adequate information and a better university training, false perceptions on influenza vaccination could be modified over time [28].

However, influenza vaccination coverage among HCWs of the University Hospital of Palermo at the end of the informative and communicative interventions were still below than recommended from International health authorities.
Worldwide, only the introduction of mandatory vaccination for HCWs was associated with 75% or higher vaccination coverage [38]. This approach, borrowed from numerous experiences in the USA, but also in Germany where the mandate to wear the protective mask during the work shift was introduced for non-vaccinated health care workers in direct contact with patients, causing consistent and fast increase in vaccination coverage [39, 40].

Recently, the Italian legislator tried to address the question of poor HCWs vaccination coverage approving the "Law on Prevention and Vaccination" at the end of 2017. This decree required a compulsory declaration of health-care and socio-sanitary professionals and also of school-workers proving their "vaccination situation", in order to inform their employer [41]. This measure integrated the recent National Vaccination Plan 2017-2019, in which a set of vaccinations were strongly recommended for HCWs, including influenza vaccination [42].

Finally, a mandatory vaccination policy for health care workers should be supported by adequate communicative and informative strategies that could improve influenza vaccination knowledge and perceptions of HCWs. The satisfactory effectiveness of these strategies limited to a selected groups of young HCWs could forecast additional increase of influenza vaccination coverage in future health care professionals.

**Author Contributions**

Costantino C, Restivo V, Casuccio A and Vitale F conceived and designed the experiments; Caracci F, Maniglia ML, Favaro D, Russo Fiorino G, Sannasardo CE, Scarpitta F, Vella C and Ventura G performed the interventions; Costantino C, Caracci F and Restivo V analyzed the data; Costantino C, Casuccio A, Restivo V, Vitale F, Torregrossa MV wrote the paper.

**Conflicts of Interest**

The authors declare no conflict of interest
References


22. Marotta C.; Raia D.D.; Ventura G.; Casuccio N.; Dieli F.; D'Angelo C.; Restivo V.; Costantino C.; Vitale F.; Casuccio A. 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.


24. Giannattasio A.; Mariano M.; Romano R.; Chiatto F.; Liguoro I.; Borgia G.; Guarino A.; Lo Vecchio A. Sustained low influenza vaccination in health care workers after H1N1 pandemic: a cross


32. Jorgensen P.; Mereckiene J.; Cotter S.; Johansen K.; Tsolova S.; Brown C. How close are countries of the WHO European Region to achieving the goal of vaccinating 75% of key risk groups against


