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## Influenza vaccination 2014–2015: Results of a survey conducted among general practitioners in Italy

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### ABSTRACT

**Introduction:** The aim of the present study was to evaluate orientation, organizational procedures implemented and difficulties faced by general practitioners (GPs) during the 2014/15 seasonal influenza vaccination programme, as well as GPs' general attitude towards vaccinations.

**Methods:** An *ad hoc* online survey was developed and administered to general practitioners members of the Italian Federation of GPs (Federazione Italiana Medici di Medicina Generale – FIMMG). Overall, 10,000 survey invitations were sent. Data were analysed with R 3.3.2 software for analyses. Odds ratios (OR) were calculated in univariable and multivariable analyses.

**Results:** A sample of 1,245 GPs participated in the survey. Only slightly more than one third achieved a vaccination coverage comprised between 61% and 75%. In over half of the cases, the local health unit does not allow the GPs to choose the type of vaccine; 8.8% did not receive operational information at the beginning of the vaccination campaign and almost half did not receive feedback information at the end of the campaign. Almost three quarters reported that the vaccination uptake should increase. One tenth of GPs totally disagreed with the statement that vaccinating healthcare workers is crucial to prevent and control infections, and one fifth had not been vaccinated in the prior decade.

**Discussion:** The efforts made to vaccinate elderly individuals did not reach the expected results; still many GPs complained about lack of information by the relevant public health institutions and organizational difficulties. A stronger commitment of public health authorities would entail a higher vaccination uptake.

### ARTICLE HISTORY

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### KEYWORDS

Influenza; vaccination; general practitioner; elderly; Italy

### Introduction

Influenza is a major public health issue. Each year, influenza affects up to 10% of the world's population, and is related to 250,000–500,000 deaths.<sup>1</sup> Vaccination has been recognized as the most effective means for preventing influenza and its complications<sup>2</sup> that is why the vaccination coverage (VC) target set by the Italian Ministry of Health by means of both the 2012–2014 and the 2017–2019 National Vaccination Plans is at least of 75% in the elderly population and among groups at-risk of flu infection and/or complications, on the basis of clinical and professional conditions, with a 95% of VC as optimal goal, in line with WHO recommendations.<sup>3</sup> However, since the 2009–2010 pandemic influenza season, a progressive decline in influenza vaccination coverages (VC) both among the elderly and in the general population is being observed.<sup>4</sup> In Italy, general practitioners (GPs) administer the majority of seasonal influenza vaccines, although also paediatricians and physicians working at the prevention departments of the health care districts, the operative branches of the local health units, are involved in the influenza immunization campaign, often assisted by nurses. GPs have a crucial role in the vaccination

programme, and can positively influence the behaviour of their patients regarding influenza vaccination, as patients have a high value of their GP's attitudes towards vaccinations. As a matter of fact, it was demonstrated that they constitute the most trustworthy source of information on vaccinations for their patients.<sup>5</sup> Furthermore, reaching a high VC against seasonal influenza also among health care workers, who are themselves at high risk of exposure to influenza on account of their profession, can contribute to further reduce the burden of the disease in the community through appropriate vaccination.<sup>6</sup> The aim of the present study was to evaluate orientation, organizational procedures implemented and possible difficulties faced by GPs during the 2014/15 seasonal influenza vaccination programme, as well as attitudes of Italian GPs towards vaccinations, with particular reference to influenza vaccination.

### Results

#### Respondent profile

Overall, a sample of 1,245 GPs participated in the survey (response rate: 12.4%); 69.7% were men and 30.3% women.

Mean age was 56.2 years (SD 8.9, range 26–70). Approximately one third had been practicing for between 30 and 39 years, one quarter for between 20 and 29 years, one fifth for up to nine years, and 15.6% for between 10 and 19 years. Only 2% of the survey participants had been practicing for between 40 and 50 years. One third cared for more than 1500 patients, another third managed between 1201 and 1500 patients, 12.8% managed between 651 and 1000 patients, while the remaining took care of up to 650 patients (Table 1).

## Results of the questionnaire survey

### The effectiveness of the 2014–2015 seasonal influenza vaccination programme

During the 2014–15 immunization campaign, only slightly more than one third of participating GPs (36.4%) achieved a vaccination coverage (VC) comprised between 61% and 75% in the target population (Table 2). The VC reportedly reached by slightly less than one third was between 51 and 60%, and the remaining third vaccinated up to 50% of the elderly registered with their practice (17.9% of GPs reported a VC comprised between 41 and 50%; 15% reached only a 30 to 40% VC).

Overall, reaching a VC >50% was significantly associated with the years of seniority (the Odds Ratio (OR) for being in service between 20 and 29 years was 2.34, 95% CI 1.37–4.00,  $p < 0.01$ ; the OR of having 30–39 years was 3.43, 95% CI 1.97–5.99,  $p < 0.001$ ; the OR of having 40–49 years of seniority was 9.97, 95% CI 2.04–48.79,  $p < 0.01$ ) (Table 3).

The vaccine more often available to GPs was the conventional subunit vaccine (mentioned by 70.7%); only half of the GPs were provided with the adjuvanted vaccine. Over one

**Table 1.** Demographic characteristics of the GPs participating in the survey.

| Gender  | N (%)      |
|---|------------|
| Female  | 377 (30.3) |
| Male  | 868 (69.7) |
| Geographical distribution                         |            |
| Northwest   | 334 (26.8) |
| Northeast   | 217 (17.4) |
| Centre  | 267 (21.4) |
| South   | 281 (22.6) |
| Islands   | 146 (11.7) |
| Age group   |            |
| <35   | 57 (4.6)   |
| 35–44   | 93 (7.5)   |
| 45–54   | 222 (17.8) |
| 55–64   | 744 (59.8) |
| ≥65   | 129 (10.4) |
| Seniority (years)                                 |            |
| 0–9   | 238 (19.1) |
| 10–19   | 194 (15.6) |
| 20–29   | 341 (27.4) |
| 30–39   | 447 (35.9) |
| 40–50   | 25 (2.0)   |
| Numbers of patients registered at the GP practice |            |
| Less than 300                                     | 40 (3.7)   |
| Between 301 and 650                               | 57 (5.3)   |
| Between 651 and 1000                              | 119 (11.1) |
| Between 1001 and 1200                             | 137 (12.8) |
| Between 1201 and 1500                             | 340 (31.8) |
| Over 1500   | 377 (35.2) |

**Table 2.** Opinions of GPs regarding the effectiveness and possible barriers of the seasonal influenza immunization campaign and GPs' general attitude towards vaccinations.

| Vaccination coverage reached among the elderly*   | Number of Respondents (%) |
|---|---------------------------|
| Between 61% and 75%   | 390 (36.4)                |
| Between 51% and 60%   | 328 (30.7)                |
| Between 41% and 50%   | 191 (17.9)                |
| Between 30% and 40%   | 161 (15)                  |
| Types of seasonal influenza vaccine are available in general practice**   |                           |
| Conventional subunit  | 880 (70.7)                |
| Adjuvanted  | 616 (49.5)                |
| Intradermal   | 370 (29.7)                |
| Quadrivalent split-virus  | 188 (15.1)                |
| The respective local health unit allows general practitioners to choose the type of vaccine to administer to their patients*  |                           |
| True  | 430 (40.2)                |
| False   | 640 (59.8)                |
| Initiatives implemented by GPs to get patients vaccinated**   |                           |
| Opportunistic vaccination at the clinic   | 854 (68.6)                |
| Counselling   | 555 (44.6)                |
| Home visits   | 427 (34.3)                |
| Phone calls   | 256 (20.6)                |
| GPs that received operational information at the beginning of the influenza vaccination campaign from the relevant public health institutions**   |                           |
| Local health unit   | 1033 (83.0)               |
| Scientific societies/trade unions   | 343 (27.6)                |
| Regional public health authorities  | 174 (14.0)                |
| No information received   | 110 (8.8)                 |
| GPs that received feedback information at the end of the influenza vaccination campaign**   |                           |
| No information received   | 590 (47.4)                |
| Local health unit   | 572 (45.9)                |
| Regional public health authorities  | 141 (11.3)                |
| Ministry of Health  | 60 (4.8)                  |
| Opinion regarding the efforts made by the institutions to vaccinate the elderly   |                           |
| The expected results were not met: the vaccination uptake should increase   | 886 (71.2)                |
| The expected results were not met, however efforts made were sufficient   | 261 (21.0)                |
| Efforts were adequate   | 98 (7.9)                  |
| The importance of Influenza vaccination according to general practitioners  |                           |
| It is a priority  | 637 (51.2)                |
| It is important   | 601 (48.3)                |
| It is useless   | 7 (0.6)                   |
| GPs' professional opinion regarding the frequency of adverse events following influenza immunization  |                           |
| Rare  | 819 (65.8)                |
| Occasional  | 410 (32.9)                |
| Common  | 15 (1.2)                  |
| Very common   | 1 (0.1)                   |
| Level of agreement with the statement contained in the National vaccination Plan 2012–2014 that the immunization of the health care personnel is crucial to prevent vaccine-preventable communicable diseases |                           |
| Total agreement   | 888 (71.3)                |
| Partial agreement   | 243 (19.5)                |
| Total disagreement  | 114 (9.2)                 |

\*This question was not asked to GPs usually working in the emergency medical services or (N = 21; 1.7% of the total 1245 physicians who completed the survey) or in the continuity of care services (e.g. physicians working from 8 pm to 8 am every weekday and from 8 am to 8 pm on Saturday and public holidays) (N = 147; 11.8%).

\*\*Respondents could select more than one choice.

**Table 3.** The effectiveness of the 2014–2015 seasonal influenza vaccination program, according to Italian GPs. Multivariate analysis (Intercept being: sex: female, age <35, seniority <10 years).

| GPs' characteristics                | >50% Vaccination coverage achieved |                                      | Perception of influenza vaccination as a priority |                                      | Efforts by public health authorities perceived as improvable |                                      | Being in agreement with the statement contained in the nvp on the importance of the immunization of the health care personnel |                                     |
|-------------------------------------|------------------------------------|--------------------------------------|---|--------------------------------------|--|--------------------------------------|---|-------------------------------------|
|                                     | % (n = 1070)<br>§                  | OR (95% CI)*<br>p value              | % (n = 1245)                                      | OR (95% CI)*<br>p value              | % (n = 1245)   | OR (95% CI)*<br>p value              | % (n = 1245)  | OR (95% CI)*<br>p value             |
| <b>Sex (N = 1245)</b>               |                                    |                                      |   |                                      |  |                                      |   |                                     |
| Female                              | 61.81                              | —                                    | 40.32   | —                                    | 61.19  | —                                    | 65.25   | —                                   |
| Male                                | 69.05                              | 1.13 (0.83–1.53)<br>p = 0.44         | 55.88   | <b>1.76 (1.35–2.28)</b><br>p < 0.001 | 74.19  | <b>1.77 (1.34–2.33)</b><br>p < 0.001 | 73.96   | <b>1.49 (1.13–1.96)</b><br>p < 0.01 |
| <b>Age groups (N = 1245)</b>        |                                    |                                      |   |                                      |  |                                      |   |                                     |
| <35 years                           | 50.00                              | —                                    | 40.35   | —                                    | 68.42  | —                                    | 54.39   | —                                   |
| 35–44                               | 46.67                              | 0.65 (0.14–3.08)<br>p = 0.59         | 45.16   | 1.12 (0.56–2.22)<br>p = 0.75         | 75.27  | 1.40 (0.78–2.94)<br>p = 0.37         | 75.27   | <b>2.49 (1.22–5.09)</b><br>p = 0.01 |
| 45–54                               | 63.48                              | 1.00 (0.22–4.49)<br>p = 0.99         | 46.85   | 0.69 (0.35–1.37)<br>p = 0.28         | 67.57  | 0.99 (0.48–2.03)<br>p = 0.98         | 70.72   | 2.01 (0.99–4.09)<br>p = 0.05        |
| 55–64                               | 67.51                              | 0.69 (0.15–3.15)<br>p = 0.64         | 53.23   | 0.74 (0.36–1.50)<br>p = 0.41         | 72.98  | 1.42 (0.67–3.02)<br>p = 0.36         | 72.18   | <b>2.50 (1.18–5.26)</b><br>p = 0.02 |
| ≥ 65                                | 78.40                              | 0.81 (0.17–3.98)<br>p = 0.80         | 55.81   | 0.81 (0.36–1.82)<br>p = 0.62         | 65.12  | 0.81 (0.34–1.90)<br>p = 0.62         | 72.09   | <b>2.78 (1.19–6.53)</b><br>p = 0.02 |
| <b>Seniority (years) (N = 1245)</b> |                                    |                                      |   |                                      |  |                                      |   |                                     |
| <10                                 | 47.62                              | —                                    | 41.60   | —                                    | 71.85  | —                                    | 72.27   | —                                   |
| 10–19                               | 61.64                              | 1.69 (0.98–2.91)<br>p = 0.06         | 50.00   | 1.61 (1.01–2.59)<br>p = 0.05         | 72.68  | 1.03 (0.61–1.72)<br>p = 0.92         | 72.16   | 0.76 (0.44–1.30)<br>p = 0.31        |
| 20–29                               | 65.74                              | <b>2.34 (1.37–4.00)</b><br>p < 0.01  | 56.60   | <b>2.03 (1.26–3.27)</b><br>p = 0.004 | 68.04  | 0.66 (0.39–1.11)<br>p = 0.12         | 71.55   | 0.67 (0.38–1.16)<br>p = 0.15        |
| 30–39                               | 74.49                              | <b>3.43 (1.97–5.99)</b><br>p < 0.001 | 51.90   | 1.53 (0.93–2.49)<br>p = 0.09         | 72.93  | 0.82 (0.48–1.41)<br>p = 0.48         | 70.69   | 0.58 (0.33–1.02)<br>p = 0.06        |
| 40–49                               | 90.91                              | <b>9.97 (2.04–48.79)</b><br>p < 0.01 | 64.00   | 2.31 (0.88–6.05)<br>p = 0.09         | 64.00  | 0.79 (0.30–2.13)<br>p = 0.65         | 64.00   | 0.41 (0.15–1.13)<br>p = 0.08        |

NVP: 2012–2014 National Vaccination Plan.

\*significant odds ratios are shown in bold.

§ This question was not asked to GPs usually working in the emergency medical services or (N = 21; 1.7% of the total 1245 physicians who completed the survey) or in the continuity of care services (e.g. physicians working from 8 pm to 8 am every weekday and from 8 am to 8 pm on Saturday and public holidays) (N = 147; 11.8%), who, however were asked the other questions contained in the questionnaire.

quarter mentioned the availability of the intradermal, whereas the quadrivalent split-virus influenza vaccine was available for one sixth of respondents.

According to three-fifths (59.8%), the respective local health unit does not allow the GPs to choose the type of vaccine to be administered to their patients (Table 2).

The initiatives implemented by GPs to get patients vaccinated were: counselling (44.6%), home visits (34.3%), phone calls (20.6%); two thirds (68.6%) vaccinated at suitable moments on patient contacts with the general practice service. The implementation of counselling was significantly higher in GPs belonging to the oldest age groups (ORs ranging from 6.28 to 18.36) (Table 4). A statistically significant higher percentage of GPs implementing home visits was observed among those older than 35, especially among those having between 20 to 29 (OR was 1.85, 95% CI 1.10–3.11,  $p = 0.02$ ) or 30 to 39 (OR was 2.08, 95% CI 1.22–3.55,  $p < 0.01$ ) years of service. Waiting for a suitable occasion on patient's contact with the GP service was associated with being male (OR = 1.44, 95% CI 1.07–1.93,  $p = 0.02$ ), being at least 35 years old and having at least 10 years of seniority (Table 4).

Almost three quarters (71.2%) deemed that the efforts made by the public health institutions to reach individuals aged ≥65 years had not achieved the expected results and the vaccination uptake should increase, as opposed to 7.9% who reported the vaccine coverage achieved to be adequate. The

remaining fifth believed that even if the expected results had not been met, the efforts made had been sufficient. The perception of efforts made by public health institutions to reach the elderly as improvable was significantly associated with being male (OR = 1.77, 95% CI 1.34–2.33,  $p < 0.001$ ) (Table 3).

While 8.8% did not receive operational information at the beginning of the influenza vaccination campaign, almost half of the respondents (47.4%) reported that no feedback information from the relevant institutions was received at the end of the campaign.

### Attitude towards immunizations

Influenza vaccination is considered a priority according to half (51.2%) of respondents, it is nonetheless important according to the other half (48.3%), whereas 7 out of 1245 primary care physicians (0.6%) deemed this specific immunization to be “useless” (Table 2). The perception of the influenza vaccination as a public health priority was significantly associated with being male (OR = 1.76, 95% CI 1.35–2.28,  $p < 0.001$ ) and with having between 20 and 29 years of service (OR = 2.03, 95% CI 1.26–3.27,  $p = 0.004$ ) (Table 3).

Adverse events following influenza immunization are rare according to two thirds, whereas occur occasionally according to one third.

**Table 4.** Initiatives implemented by GPs to get their patients vaccinated, Italy, 2014–2015 seasonal influenza vaccination program. Multivariate analysis (Intercept being: sex: female, age <35, seniority <10 years).

| GPs' characteristics                | Counselling |   | Phone call |                                     | Home visit |   | Waiting for suitable occasion on patient'S contact with the GP |   |
|-------------------------------------|-------------|---|------------|-------------------------------------|------------|---|--|---|
|                                     | %           | OR (95% CI)*<br>p value                       | %          | OR (95% CI)*<br>p value             | %          | OR (95% CI)*<br>p value                       | %  | OR (95% CI)*<br>p value                       |
| <b>Sex (N = 1245)</b>               |             |   |            |                                     |            |   |  |   |
| Female                              | 38.20       | —   | 22.55      | —                                   | 32.89      | —   | 59.15  | —   |
| Male                                | 47.35       | 1.25 (0.96–1.64)<br><i>p</i> = 0.09           | 19.70      | 0.79 (0.58–1.07)<br><i>p</i> = 0.13 | 34.91      | 0.92 (0.70–1.22)<br><i>p</i> = 0.58           | 72.70  | 1.44 (1.07–1.93)<br><i>p</i> = 0.02           |
| <b>Age groups (N = 1245)</b>        |             |   |            |                                     |            |   |  |   |
| <35 years                           | 5.26        | —   | 0.00       | 0 (0–Inf)                           | 1.75       | —   | 8.77   | —   |
| 35–44                               | 24.73       | <b>6.28 (1.78–22.12)</b><br><i>p</i> < 0.01   | 16.13      | 1§                                  | 20.43      | <b>14.49 (1.88–111.86)</b><br><i>p</i> = 0.01 | 36.56  | <b>6.36 (2.28–17.73)</b><br><i>p</i> < 0.001  |
| 45–54                               | 44.59       | <b>18.36 (5.33–63.23)</b><br><i>p</i> < 0.001 | 22.52      | 1.63 (0.80–3.32)<br><i>p</i> = 0.18 | 33.78      | <b>23.25 (3.06–176.94)</b><br><i>p</i> < 0.01 | 63.96  | <b>16.29 (5.88–45.11)</b><br><i>p</i> < 0.001 |
| 55–64                               | 49.33       | <b>17.42 (4.98–61.01)</b><br><i>p</i> < 0.001 | 23.39      | 1.81 (0.86–3.81)<br><i>p</i> = 0.12 | 39.25      | <b>22.98 (2.99–176.66)</b><br><i>p</i> < 0.01 | 76.88  | <b>22.52 (7.95–63.79)</b><br><i>p</i> < 0.001 |
| >= 65                               | 48.84       | <b>14.52 (3.92–53.79)</b><br><i>p</i> < 0.001 | 13.18      | 1.01 (0.40–2.56)<br><i>p</i> = 0.98 | 31.01      | <b>16.60 (2.07–132.99)</b><br><i>p</i> < 0.01 | 78.29  | <b>18.76 (6.02–58.43)</b><br><i>p</i> < 0.001 |
| <b>Seniority (years) (N = 1245)</b> |             |   |            |                                     |            |   |  |   |
| <10                                 | 28.15       | 1   | 15.97      | 1                                   | 18.07      | 1   | 36.55  | —   |
| 10–19                               | 38.14       | 0.78 (0.48–1.26)<br><i>p</i> = 0.32           | 22.16      | 0.88 (0.51–1.54)<br><i>p</i> = 0.66 | 34.54      | 1.54 (0.92–2.57)<br><i>p</i> = 0.10           | 68.56  | <b>1.86 (1.15–3.01)</b><br><i>p</i> = 0.01    |
| 20–29                               | 50.15       | 1.19 (0.74–1.92)<br><i>p</i> = 0.48           | 24.93      | 1.02 (0.58–1.77)<br><i>p</i> = 0.96 | 39.30      | <b>1.85 (1.10–3.11)</b><br><i>p</i> = 0.02    | 75.66  | <b>2.02 (1.23–3.33)</b><br><i>p</i> < 0.01    |
| 30–39                               | 52.13       | 1.28 (0.78–2.10)<br><i>p</i> = 0.32           | 19.24      | 0.83 (0.46–1.48)<br><i>p</i> = 0.52 | 40.04      | <b>2.08 (1.22–3.55)</b><br><i>p</i> < 0.01    | 80.09  | <b>2.46 (1.47–4.13)</b><br><i>p</i> < 0.001   |
| 40–49                               | 40.00       | 0.99 (0.38–2.61)<br><i>p</i> = 0.99           | 16.00      | 0.99 (0.28–3.46)<br><i>p</i> = 0.99 | 16.00      | 0.76 (0.23–2.56)<br><i>p</i> = 0.66           | 72.00  | 2.25 (0.78–6.48)<br><i>p</i> = 0.13           |

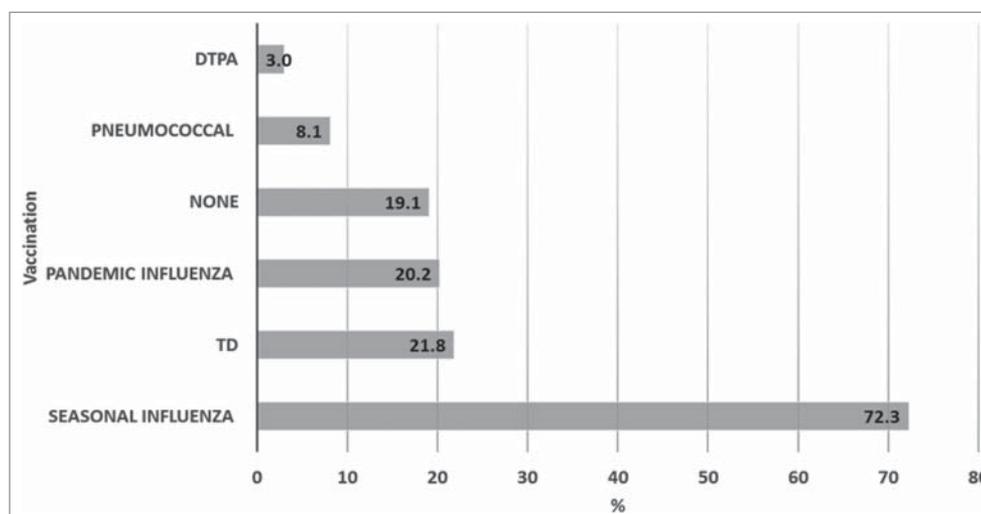
\*significant odds ratios are shown in bold.

§ For models involving Phone Call as response, the reference category for Age was shifted to 35–44 years due to the lack of affirmative responses among GPs <35 years.

More than two thirds (71.3%) totally agreed with the statement contained in the 2012–2014 National Vaccination Plan (NVP) that the immunization of the health care personnel is crucial to prevent vaccine-preventable communicable diseases, however, 19.5% agreed only partially and 9.2% were in total disagreement with such a statement. Being in agreement with the statement contained in the NVP was strongly associated with being male (OR = 1.49, 95% CI: 1.12–1.96, *p* < 0.01), and with being older than 35 years (Table 3).

Almost three-fourths (72.3%) were vaccinated at least once against influenza over the last 10 years, however one fifth (19.1%) of GPs declared that they had not been vaccinated in the last decade; in Figure 1 the proportions of primary care physicians that underwent selected vaccinations over the last 10 years are shown.

Males were more likely to have been vaccinated against all vaccinations specified in the questionnaire (seasonal and pandemic influenza, tetanus toxoid and reduced diphtheria toxoid vaccine, tetanus toxoid, reduced diphtheria toxoid and acellular



**Figure 1.** Proportion of GPs who have been vaccinated with seasonal influenza, tetanus and diphtheria toxoids (Td), pandemic influenza, pneumococcal, tetanus toxoids, reduced diphtheria toxoid or acellular pertussis (Tdap) vaccines, or who have not been vaccinated (none) in the preceding ten years.

**Table 5.** GPs who underwent selected vaccinations in the 10 years prior to the study period. Multivariate analysis with sex, age group, and seniority as independent variables (Intercept: Sex F, age <35, seniority <10 years).

| GPs' characteristics                | Seasonal influenza vaccine |  | Pandemic influenza vaccine |                                       | Td vaccine |                                       | Being vaccinated with tdap vaccine |                                | Pneumococcal vaccine |                                       | None of these vaccines |  |
|-------------------------------------|----------------------------|--|----------------------------|---------------------------------------|------------|---------------------------------------|------------------------------------|--------------------------------|----------------------|---------------------------------------|------------------------|--|
|                                     | %                          | OR (95% CI)*<br>p value                | %                          | OR (95% CI)*<br>p value               | %          | OR (95% CI)*<br>p value               | %                                  | OR (95% CI)*<br>p value        | %                    | OR (95% CI)*<br>p value               | %                      | OR (95% CI)*<br>p value                |
| <b>Sex (N = 1245)</b>               |                            |  |                            |                                       |            |                                       |                                    |                                |                      |                                       |                        |  |
| Female                              | 58.09                      | —                                      | 14.85                      | —                                     | 26.26      | —                                     | 5.57                               | —                              | 3.98                 | —                                     | 27.05                  | —                                      |
| Male                                | 78.46                      | <b>2.55 (1.93 – 3.38)</b><br>p < 0.001 | 22.58                      | <b>1.57 (1.12 – 2.2)</b><br>p < 0.01  | 19.93      | 0.87 (0.64 – 1.19)<br>p = 0.39        | 1.84                               | 0.55 (0.27 – 1.11)<br>p = 0.09 | 9.91                 | <b>2.09 (1.16 – 3.76)</b><br>p = 0.01 | 15.67                  | <b>0.47 (0.35 – 0.65)</b><br>p < 0.001 |
| <b>Age groups (N = 1245)</b>        |                            |  |                            |                                       |            |                                       |                                    |                                |                      |                                       |                        |  |
| <35 years                           | 43.86                      | —                                      | 12.28                      | —                                     | 47.37      | —                                     | 15.79                              | —                              | 1.75                 | —                                     | 15.79                  | —                                      |
| 35–44                               | 75.27                      | <b>3.82 (1.84 – 7.95)</b><br>p < 0.001 | 15.05                      | 1.24 (0.46 – 3.33)<br>p = 0.67        | 32.26      | 0.53 (0.27 – 1.08)<br>p = 0.08        | 7.53                               | 0.37 (0.12 – 1.11)<br>p = 0.08 | 6.45                 | 2.77 (0.31 – 25.00)<br>p = 0.36       | 15.05                  | 1.05 (0.41 – 2.64)<br>p = 0.92         |
| 45–54                               | 75.68                      | <b>2.79 (1.35 – 5.76)</b><br>p < 0.01  | 20.72                      | 2.24 (0.88 – 5.68)<br>p = 0.09        | 21.17      | 0.48 (0.23 – 1.01)<br>p = 0.05        | 3.15                               | 0.28 (0.07 – 1.12)<br>p = 0.08 | 7.21                 | 1.15 (0.13 – 10.12)<br>p = 0.90       | 18.47                  | 1.57 (0.64 – 3.86)<br>p = 0.32         |
| 55–64                               | 73.12                      | 1.98 (0.93 – 4.20)<br>p = 0.07         | 20.70                      | 2.13 (0.81 – 5.59)<br>p = 0.12        | 18.95      | <b>0.44 (0.20 – 0.96)</b><br>p = 0.04 | 1.88                               | 0.21 (0.04 – 1.03)<br>p = 0.05 | 8.60                 | 1.1 (0.12 – 9.83)<br>p = 0.93         | 19.76                  | 2.12 (0.84 – 5.36)<br>p = 0.11         |
| >=65                                | 72.09                      | 1.834(0.77 – 4.37)<br>p = 0.17         | 24.03                      | 1.64 (0.56 – 4.75)<br>p = 0.36        | 20.93      | 0.42 (0.17 – 1.04)<br>p = 0.06        | 0.00                               | 0 (0 – inf)<br>p = 0.98        | 10.85                | 1.85 (0.19 – 18.12)<br>p = 0.60       | 20.09                  | 2.58 (0.91 – 7.35)<br>p = 0.07         |
| <b>Seniority (years) (N = 1245)</b> |                            |  |                            |                                       |            |                                       |                                    |                                |                      |                                       |                        |  |
| <10                                 | 68.07                      | —                                      | 18.49                      | —                                     | 30.67      | —                                     | 7.98                               | —                              | 4.20                 | —                                     | 16.81                  | —                                      |
| 10–19                               | 73.20                      | 1.12 (0.65– 1.95)<br>p = 0.68          | 17.53                      | 0.64 (0.36 – 1.14)<br>p = 0.13        | 19.59      | 0.76 (0.42 – 1.37)<br>p = 0.36        | 2.06                               | 0.41 (0.09 – 1.77)<br>p = 0.23 | 9.79                 | <b>2.76 (1.10 – 6.92)</b><br>p = 0.03 | 21.13                  | 1.01 (0.56 – 1.84)<br>p = 0.96         |
| 20–29                               | 71.85                      | 1.10 (0.63 – 1.92)<br>p = 0.72         | 18.48                      | 0.67 (0.38 – 1.18)<br>p = 0.17        | 18.48      | 0.70 (0.38 – 1.28)<br>p = 0.25        | 3.23                               | 0.87 (0.21 – 3.56)<br>p = 0.84 | 8.80                 | <b>2.69 (1.04 – 6.99)</b><br>p = 0.04 | 20.82                  | 0.94 (0.51 – 1.73)<br>p = 0.85         |
| 30–39                               | 75.39                      | 1.24 (0.70 – 2.19)<br>p = 0.47         | 22.15                      | 0.82 (0.46 – 1.47)<br>p = 0.51        | 20.81      | 0.79 (0.43 – 1.47)<br>p = 0.46        | 0.67                               | 0.24 (0.04 – 1.39)<br>p = 0.11 | 8.95                 | 2.40 (0.91 – 6.30)<br>p = 0.08        | 17.67                  | 0.81 (0.43 – 1.52)<br>p = 0.52         |
| 40–49                               | 56.00                      | 0.48 (0.18 – 1.29)<br>p = 0.15         | 48.00                      | <b>3.38 (1.25 – 9.10)</b><br>p = 0.02 | 20.00      | 0.79 (0.24 – 2.55)<br>p = 0.69        | 0                                  | 0 (0 – inf)<br>p = 0.99        | 8.00                 | 1.51 (0.251 – 9.21)<br>p = 0.65       | 28.00                  | 1.46 (0.49 – 4.34)<br>p = 0.49         |

Td = tetanus toxoid and reduced diphtheria toxoid vaccine.

Tdap = Tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine.

\*significant odds ratios are shown in bold.

pertussis vaccine and pneumococcal vaccine) than their female colleagues (Table 5). While age correlated with being vaccinated against seasonal influenza, it was significantly inversely associated with having received the tetanus and reduced diphtheria toxoids (Td) vaccine, as far as GPs aged between 55 and 64 were concerned (OR = 0.44, 95% CI 0.20–0.96,  $p = 0.04$ ). The length of service was significantly associated with having received the pneumococcal vaccine, and those with more than 40 years of service at the GP practice had a significantly higher vaccine uptake of the pandemic influenza vaccine (OR = 3.38, 95% CI 1.26–9.10,  $p = 0.02$ ) (Table 5).

## Discussion

To the best of our knowledge, this is the first study conducted in Italy in order to assess GPs' opinion regarding the results obtained during a seasonal influenza vaccination campaign. Previously, Massin et al. conducted a study to assess attitudes and practices among primary care physicians in France<sup>7</sup>; our findings are consistent with those found in such study, in that more than two thirds of the participating GPs reported that they were very favourable towards vaccinations, in general. In the study by Massin et al, self-reported vaccination coverage was 78% for 2009/2010 seasonal influenza, and risk-averse GPs perceived the risks of influenza to outweigh the potential risks related to the vaccine. In our study, more than two thirds of survey participants were vaccinated against seasonal influenza at least once over the previous ten years, and adverse events following influenza immunization were generally deemed to occur rarely or occasionally.

Data on influenza vaccination coverage (VC) released by the Italian National Health Institute, showed that the overall VC in people aged  $\geq 65$  years in the influenza season 2014–2015 decreased by 12.3% with respect to the previous one (when the VC was 55.4%), falling to 48.6%, below the levels achieved in the 2000–2001 national influenza campaign.<sup>4</sup> A communication crisis on alleged safety issues, proven unfounded over time, was the main reason for the decreased immunization coverage registered that season.<sup>8</sup> However, the findings from the present study highlighted the existence of organizational barriers that hampered the success of the immunization campaign. First of all, not always GPs are allowed by the respective local health units to choose the type of vaccine which is to be administered to their patients. This represents an important issue, since, according to the Circular released each year by the Ministry of Health and containing updated recommendations for influenza prevention and control, each type of vaccine is recommended to a specific target group<sup>9</sup> (e.g., while the conventional subunit vaccine is indicated for use in adults, the use of an adjuvanted subunit vaccine is a valid option to increase the effectiveness of influenza vaccines in the elderly, and the intradermal vaccine is preferably recommended for individuals who do not respond fully to vaccines administered via intramuscular injection).<sup>10–12</sup> In Italy, starting from the influenza season 2014–2015, a split inactivated quadrivalent influenza vaccine, with both expected B-strains included in its composition, is also available, its use being indicated in adults and children since 3 years of age.

The fact that too often, as our survey showed, GPs are not allowed to administer the more suitable vaccine to their

patients starkly contrasts with the principle of appropriateness, on which the strategic direction indicated in the Italian National Prevention Plan 2014–2018 for the promotion and the prevention of human health is based, in order to ensure the optimal use of the health care resources.<sup>13</sup> GPs need to be provided with the best available vaccines in order to increase individual protection of their patients as well as indirect protection of the general population through herd immunity. Furthermore, the fact that one third of GPs who participated in our survey declared to have reached a vaccination coverage  $\leq 50\%$  can be at least partially explained by the insufficient influenza vaccines distribution among GPs by their respective local health unit (LHU): as a matter of fact, the number of doses GPs receive is often not proportional to the number of their patients, but is decided *a priori* by the LHU.

Another barrier is represented by an inadequate communication by the public health institutions throughout the immunization campaign. In fact, while a sizeable segment of survey participants did not receive operational information at the beginning of the influenza vaccination campaign, even more regrettably, almost half of them reported that no feedback information was received at the end of the campaign from the relevant institutions. It is evident that a stronger commitment of public health authorities would entail, in turn, a higher vaccination uptake. It is therefore important to rapidly provide GPs with clear evidence-based information on which GPs may base critical decisions at the beginning of the annual influenza immunization programme. As Eilers et al. suggested,<sup>14</sup> the supply of information facilitates GPs in caring out their advisory role in the decision-making process of the elderly. Providing GPs with an assessment and feedback on the vaccination campaign at the end of the immunization programme has also been shown to be effective in improving VC.<sup>15</sup> A recent study conducted to explore vaccine hesitancy among primary care physicians in France, showed that GPs recommendation behaviours, besides their perception of the benefits and risks of vaccines, and their comfort in explaining them to patients, depend on their trust in authorities.<sup>16</sup> Furthermore, transparency is prerequisite in maintaining public trust in immunisations.<sup>17</sup> While, currently, the main feedback information regarding the results achieved regard the coverage rate reached and is disseminated by the health authorities only at the end of the immunization programme, it should be ensured that accurate information is easily accessible for primary care physicians, and more in general to the public, before and throughout each immunisation programme.

Our study also highlighted that in-service training courses on vaccinations for GPs are needed: more than one quarter agreed only partially or totally disagreed with the statement contained in the National vaccination Plan 2012–2014 that the immunization of the health care personnel is crucial to prevent vaccine-preventable communicable diseases. Furthermore, although three-quarters had been vaccinated at least once against influenza, one fifth of GPs had not received any immunization in the prior decade. Younger professionals have higher rates of vaccination uptake as far as the diphtheria tetanus and diphtheria tetanus-acellular pertussis vaccines are concerned, and, overall, the proportion of those who received a Tdap booster is surprisingly low, especially when considering that pertussis has been observed to be 1.7 times higher among

health care workers than in the general population,<sup>18</sup> and therefore at increased risk of transmitting such disease to new-borns' household contacts. These findings confirm the generally unsatisfactory influenza vaccination uptake among health care workers in Italy<sup>19</sup> and highlight the need to improve the knowledge about vaccinations among the health care personnel, as it has been shown that improving provider education may positively impact physicians' vaccine uptake,<sup>15,20</sup> and also that a vaccine-hesitant GP might spread unsubstantiated concerns about vaccines and reduce vaccine confidence and uptake by their patients.<sup>21</sup> Implementation of education and training, both pre-service and in-service, for general practitioners (e.g., strengthening the vaccinology content and introducing vaccination policy courses in the medical curriculum, implementing continuing medical education programs), could contribute to a more homogenous application of the recommendations regarding immunizations and may result in fewer missed vaccination opportunities, and, therefore, a greater proportion of patients being immunized.

A limitation of the study is the relatively low response rate, which could limit the generalizability of our findings. However, it has been observed that a representative sample is not necessarily guaranteed by a high response rate<sup>22</sup> and our response rate is still higher or comparable to other studies that made use of online platforms as a distribution mode among primary care physicians.<sup>23,24</sup> Responding GPs were those who volunteered to participate in the survey, so selection bias cannot entirely be ruled out: it is possible that the responses given do not reliably represent the views of the majority of primary care physicians in Italy. Nonetheless, most of our questions investigated factual data rather than opinions and therefore if this bias is present it is likely to be limited.

In conclusion, overall, our study revealed a generally positive attitude toward immunizations among Italian GPs. More than two thirds vaccinated at suitable moments on patient contacts with the general practice service: this finding is in line with previous study conducted in the UK that demonstrated that GPs have the tendency to opportunistically vaccinate, as this is considered by GPs to be the most successful strategy to increase vaccination uptake, especially among hesitant patients.<sup>25</sup>

One of the reasons of the low vaccination uptake observed was the inadequate communication from the relevant public health institutions, and the consequent lack of information both at the beginning and at the end of the vaccination campaign. A stronger commitment of public health authorities would entail a higher vaccination uptake. GPs may play a crucial role to restore confidence and increase patients' adherence to the national flu immunization programme: their ability to promote the vaccination among their patients should be further emphasised, if we are to reduce further illness and deaths caused by the influenza virus each year.

## Materials and methods

An online 18-item multiple-choice questionnaire was developed and administered, between October 31<sup>st</sup>, 2015 and November 30<sup>th</sup>, 2015, to a large convenient sample ( $n = 10,000$ ) of GPs: all members of the Italian Federation of General Practitioners (Federazione Italiana Medici di

Medicina Generale – FIMMG) were invited to the survey. GPs were recruited to participate in the study via an invitation email that contained information about the study and a link to the online survey. The email was sent via the Italian Federation of GPs to its mailing lists. Ethical approval was not required. All survey recipients received written information about the project and its aims, and were subsequently invited to participate. It was stressed that participation in this study was voluntary and withdrawal from the study was possible at any time. The anonymity of participants was maintained throughout. All data were acquired and analysed anonymously.

Summaries for quantitative variables were expressed as mean  $\pm$  SD; categorical variables were analysed through relative frequencies and/or contingency tables; proportions were calculated excluding missing values. In the survey we aimed to find out, using a three- or four-point Likert scale for each question, how important seasonal influenza vaccination is for GPs, and the results obtained by GPs in terms of vaccination coverage among the target population (all patients aged 65 years old and over). GPs opinions regarding the effectiveness and possible barriers of the seasonal influenza immunization campaign were also gathered. Finally, GPs' general attitudes towards vaccinations were explored, by assessing their opinion on the frequency of occurrence of adverse events following influenza immunization and the vaccinations received by GPs themselves in the previous decade.

Reported vaccination coverage, importance of influenza vaccination, the perceived effectiveness of the efforts made by the public health authorities during the 2014–2015 national immunization campaign, the level of agreement with the statement contained in the 2012–2014 National Vaccination Plan on the importance of immunizing health care workers (HCWs) for the prevention and control of infectious diseases, and past immunizations received by GPs were analysed using logistic regression, coding the following as binary variables (yes/no): vaccination coverage > 50%; influenza vaccination perceived as a priority; efforts made by the public health authorities perceived as not able to achieve the expected results and in need of improvement; agreement with the statement contained in the 2012–2014 National Vaccination Plan regarding the importance of immunizing HCWs; specific vaccinations received.

For each of the above dichotomous variables, univariable logistic regression models were estimated with sex, age group, seniority and number of patients' as predictors. Multivariable logistic regression models were estimated, with sex, age group, and seniority as predictors; since the number of patients was highly associated with both age group and seniority, and therefore it was a possible source of multicollinearity,<sup>26</sup> the variable "number of patients" was excluded from the multivariable analysis. Odds ratios, confidence interval and significance were fully reported for multivariable logistic regression in Tables 3 to 5. All statistical tests were considered statistically significant when the *p*-value was less than 0.05. Data were exported from Metis-FIMMG platform to Microsoft Excel and then imported into R 3.3.2 software for analyses.

## Declarations

**Ethical approval:** Ethical approval was not required. All health professionals identified to taking part in the survey received written information about the project and its aims, and were subsequently invited to participate. We stressed that participation in this study was voluntary and withdrawal from the study was possible at any time. The anonymity of participants was maintained throughout.

## Disclosure of potential conflicts of interest

There are no potential conflicts of interest to disclose.

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