

How has COVID-19 pandemic changed flu vaccination attitudes among an Italian cancer center healthcare workers?

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ABSTRACT

A retrospective study was conducted among Italian cancer healthcare workers (HCWs) to describe how influenza vaccination attitudes have changed during the COVID-19 pandemic. The analysis was conducted on the last three influenza seasons (2018/19, 2019/20 and 2020/21). To account for different relationships and proximity with patients, the study population was grouped into three main professional categories: health personnel, administrative staff and technicians. Moreover, to explore the factors affecting the coverage of influenza vaccine, a multinomial regression analysis was performed.

Over the years, the influenza vaccination uptake showed a gradual increase across the overall staff, the highest coverage (53.8%) was observed in the season 2020/21, in particular, for health personnel (57.7%). In general, males resulted in more adherent to vaccination campaigns; nevertheless, this gap decreased in the last season. A total of 28.6% workers were always vaccinated throughout the past three seasons, a remarkable 25.2% (mainly young and females) received for the first time the influenza vaccination in 2020/21.

In this dramatic health crisis, the attitudes of HCWs toward flu vaccination have changed. The COVID-19 outbreak increased adherence to flu vaccination, reaching the highest coverage in the campaign 2020/21. However, further efforts should be made to achieve greater vaccination coverage.

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Introduction



Influenza is a major contributor to morbidity and mortality in vulnerable populations, especially those immunosuppressed and particularly fragile, such as cancer patients.¹ Vaccination of healthcare workers (HCWs) is the most effective strategy for self-protection and to prevent patients' infection.² For this reason, the WHO recommends annual vaccination for HCWs.³ Since 2002, annual flu-vaccination has been offered free of charge by the Italian Ministry of Health to high-risk categories, including HCWs. Nevertheless, the European rate of influenza vaccination among HCWs is suboptimal, ranging from 15.6% to 63.2%, and the lowest rate was reported in Italy.⁴ To encourage HCWs to receive vaccines, our institution has offered on-site-free vaccination since 2016. Despite the vast literature on HCWs' attitudes toward vaccination and its coverage,^{5–8} few studies were carried out during the COVID-19, and most of them focused on very specific population categories (other than HCWs). For instance, the COVID-19 pandemic has been associated with an increased inclination of parents to vaccinate their children against influenza in four countries.⁹ Two recent papers, based on Italian population's surveys, reported a favorable intention toward vaccination. However, no actual data on 2020/21 vaccination coverage is available.^{10,11} Similar results were reported by another survey of

Maltese HCWs.^{12,13} One study among Hong Kong nurses observed a similar influenza vaccine uptake rate between 2019 and 2020; however, a significant statistical difference was found in the willingness to accept influenza vaccination: many nurses have changed their mind about the possibility of being vaccinated.¹⁴ Another one study in Hong Kong reported that COVID-19 might have increased the flu vaccine uptake rate up to almost 50%.¹⁵ In this last campaign, a significant increase in flu vaccination coverage was recorded by an Italian hospital; however, no confounding factors were controlled in their analysis.¹⁶ The COVID-19 pandemic could have changed the attitude toward influenza vaccination. Consistently, the aim of our study was to compare the influenza vaccination uptake among all HCWs employed in our institute and to explore the effects of COVID-19 on vaccination rate for the influenza season 2020/21.

Materials and methods

Study setting, data sources and participants

We conducted a retrospective, single-center study among HCWs at the IRCCS Istituto Romagnolo per lo Studio dei Tumori (IRST) “Dino Amadori,” an Italian cancer research institute, located in the Emilia-Romagna region. IRST is the “nucleus” of the

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oncologic network on behalf of the Local Health Authority of Romagna (AUSL) and it services more than 27000 patients each year. To date, more than 500 HCWs are employed in IRST. Annual influenza vaccination is offered free of charge during working hours to employees, and the vaccination promotion campaign is performed inviting personnel via e-mail. HCWs with fixed-term, permanent or seconded contracts were included in the analysis. Conversely, HCWs with different contracts, medical residents and consultants were excluded. A preliminary analysis on the IRST's staff, independently on their stable affiliation during the 3-year analysis period (from 2018 to 2021) was conducted. Subsequently, to capture the change in attitude toward flu vaccination, the selection of study population was restricted to HCWs who were employed since 2018 and consecutively up to 2021 regardless of the type of contract. Subjects were enrolled between weeks 47/2018 and 1/2021. Data collection included socio-demographic data, working and contract characteristics (e.g. tenure and type of contract) collected from the human resources (HR) management system. In addition, data on vaccination status for the last three influenza seasons (2018/19, 2019/20 and 2020/21) were retrieved from the workspace surveillance service, i.e. vaccination status (always vaccinated, never vaccinated, first time vaccinated in 2020/21). Finally, data on COVID-19 vaccination were collected from the Romagna Local Health Authority information system.

Moreover, to account for different relations and proximity with patients, the study population was grouped into three main professional categories:

- Health personnel, i.e. those in close contact with patients: MDs, nurses, healthcare assistants, radiology and radiotherapy technicians, nutritionists and psychologists;
- Administrative staff – no direct relationship with patients;
- Technicians (e.g. pharmacists, research coordinators and biologists) – no contacts with patients;

The present study did not require ethical approval for its observational design according to Italian law.¹⁷

Statistical analysis

Descriptive statistics were reported for all collected variables: quantitative variables were summarized with median and interquartile range (25p – 75p), while for describing qualitative variables, absolute and relative (percentage) frequencies were reported.

McNemar's non-parametric test was used to compare the vaccination adherence change between different vaccine campaigns.

Multinomial logistic regression analyses were performed to assess the relationship between flu vaccination behaviors and variables related to HCWs' characteristics (age, gender, tenure, professional role, education level, contract characteristics and Covid-19 vaccination). The outcome was established by clustering participants into three groups: staff always vaccinated (i.e. both at least once during the previous vaccine campaigns and during the current year's campaign), employees who underwent flu vaccination for the first time in 2020/21, and employees never vaccinated during the 3-year study period.

A fourth group, including personnel vaccinated during previous campaigns who did not receive vaccination in 2020/21 was not analyzed as this last campaign was mainly dedicated to healthcare professionals, and some technicians and administrative staff did not have access to the vaccination yet (at the time this study was conducted). Variables showing a slight statistical significance ($p < .10$) for one of the analyzed comparisons in the univariate analysis were included in the multivariate analysis. In order to select the variables in the final multivariate model, a stepwise approach was used.

A two-tailed p -value $< .05$ was considered statistically significant; all statistical analyses were performed using R statistical software version 4.0.4 (www.r-project.org).

Results

Population characteristics

The number of Institute's employees increased over the three-year period examined (+32.5%), especially in the health staff component. The total staff of the Institute was made up of 579 employees in 2020/21 (see supplementary Table 1 for full detail). Of those, 381 employees have been working since 2018 and consecutively up to 2021 without interruption of the service (see supplementary Figure 1). As reported in Table 1, the collective is strongly characterized by young age (median: 39; IQR: 35–45) and female presence (71.7%); the vast majority are graduates (88.7%).

Health personnel represented almost half of employees (47.8%), mainly physicians and nursing staff (19.7% and 15.0% respectively), technicians represented 43.8%, the least numerous category was the administrative component (8.4%).

Vaccination status

Over the years, when considering the whole IRST staff, the flu-vaccination uptake showed a gradual increase (see Supplementary Table 1), reaching +28.1% in the season 2020/21 compared to 2018/19. This trend was observed both for health personnel (+36.1%) and technicians (+23.0%). Conversely, the administrative workers, who had the highest baseline uptake (42.4% in 2018/19), were almost stable, showing a slight decrease (−0.9%) in 2020/21.

A similar trend was observed when analyzing employees who consecutively worked at IRST during the 3-years analysis period permanently employed ($n = 381$) to account for the different composition of the staff during the 3 years of the study for dismissals, retirements, new hires and transfers. The highest vaccine coverage (53.8%) was observed in the season 2020/21, resulting in an increase of +27.0% and +17.1% compared to the season 2018/19 and 2019/20, respectively. For instance, 105 out of 241 subjects who did not receive vaccination in 2019/20, got vaccinated the following year ($p < .0001$).

Analyzing the staff's different roles, health professionals reached the highest level of vaccination coverage, even starting from the lowest baseline level: the percentage of health personnel vaccination uptake was 57.7% in the season 2020/21, while in 2019/20 and 2018/19 were 33.5% and 22.5%, respectively (see Figure 1). In particular, as shown in Figure 2, nurses experienced a great positive change in vaccination rate

Table 1. Personnel characteristics of permanently* employed (N = 381).

	Personnel (N)	%	% cum.
Gender			
Female	273	71.7	
Male	108	28.3	
Age group at vaccine campaign 2020/21			
[18,25)	1	0.3	0.3
[25,30)	26	6.8	7.1
[30,35)	66	17.3	24.4
[35,40)	110	28.9	53.3
[40,45)	76	19.9	73.2
[45,50)	45	11.8	85.0
[50,55)	26	6.8	91.9
[55,60)	21	5.5	97.4
60+	10	2.6	100.0
Mean (SD)	40.3 (8.4)		
Median (IQR)	39 (35–45)		
Roles			% within the role group
Health personnel	182	47.8	
Nursing staff	57	15.0	31.3
Medical doctors (MDs)	75	19.7	41.2
HC Assistant	12	3.1	6.6
Psychologists	5	1.3	2.7
Radiology Technicians	33	8.7	18.1
Administrative staff	32	8.4	
Technical roles	167	43.8	
Education			
Undergraduate	43	11.3	
Graduate	217	57.0	
Post-graduate	121	31.8	
Covid 19 vaccination			% on available data
Vaccination not planned	63	16.5	17.8
Vaccination planned	8	2.1	2.3
Vaccinated	283	74.3	79.9
Unknown	27	7.1	–

*HCWs who worked consecutively in IRST during the whole analysis period (from 2018/19 to 2020/21).

(+28.1%). However, radiology and radiotherapy technicians were the most likely to change vaccination attitude during 2020/21 as compared with the previous years (+30.3%). In the last year, a decreasing trend was observed for administrative staff (−3.2%). Technicians reported an increase in

vaccination uptake (28.7% in 2018/2019; 52.1% in 2020/21). The proportion of vaccinated among pharmacists and physiotherapists was stable during the last 2 years.

An analysis by age (supplementary material) showed a significant increase in vaccination among under 55 years, especially under 30. In general, males had a higher proportion of vaccination in the seasons 2018/19 and 2019/20. This gap between males and females decreased in the last season.

A total of 109 workers (28.6%) were always vaccinated throughout the analysis-period. The proportion of workers who received for the first time the influenza vaccination in 2020/21 was 25.2% (96 employees). In contrast, 11.5% were vaccinated in the past and were not vaccinated this year. The remaining 132 workers (34.6%) were never vaccinated during the study period.

Analyzing the multiple multinomial logistic regression model (see Table 2), when comparing personnel always vaccinated with those who get the flu vaccine for the first time during the pandemic, younger employees and females, were more likely to change their attitudes (5-years age increase 0.802, 95% CI 0.646–0.946; males 0.347, 95% CI 0.179–0.647). Males and physicians resulted to be more adherent to vaccination campaigns over time, being, respectively, more than twice and three times more likely to get vaccinated when compared with their counterparts (males 2.269, 95% CI 1.193–4.315; MDs 3.186, 95% CI 1.393–7.288). Not surprisingly, staff who decided to get the COVID-19 vaccine resulted in being more likely to receive flu vaccination when considering both first and usual vaccinations (compared with never being vaccinated against flu).

Discussion

Flu vaccination adherence has increased throughout the years among cancer Institute HCWs, reaching the highest coverage during 2020/21, in concomitance with the COVID-19 pandemic.

As in previous works, our findings showed a low coverage, especially among the youngest share of personnel, and the healthiest component of HCWs. However, influenza vaccination rates



Figure 1. Flu vaccine campaigns adherence patterns (by professional categories). Sankey plot. In each panel, data on vaccination uptake by professional categories during the study period. X-axis represents the Vaccination campaign (year); Y-axis represents the number of employees. The branches of the Sankey plot display the flow of employees (between consecutive years) from the Not vaccinated status to the Vaccinated one and vice versa. Note that some employees remained in the same node (i.e. same vaccination status in consecutive years). The height of the bars and the width of the branches are proportional to the group dimension and the vaccination status of employees.

Flu Vaccines Campaigns adherence

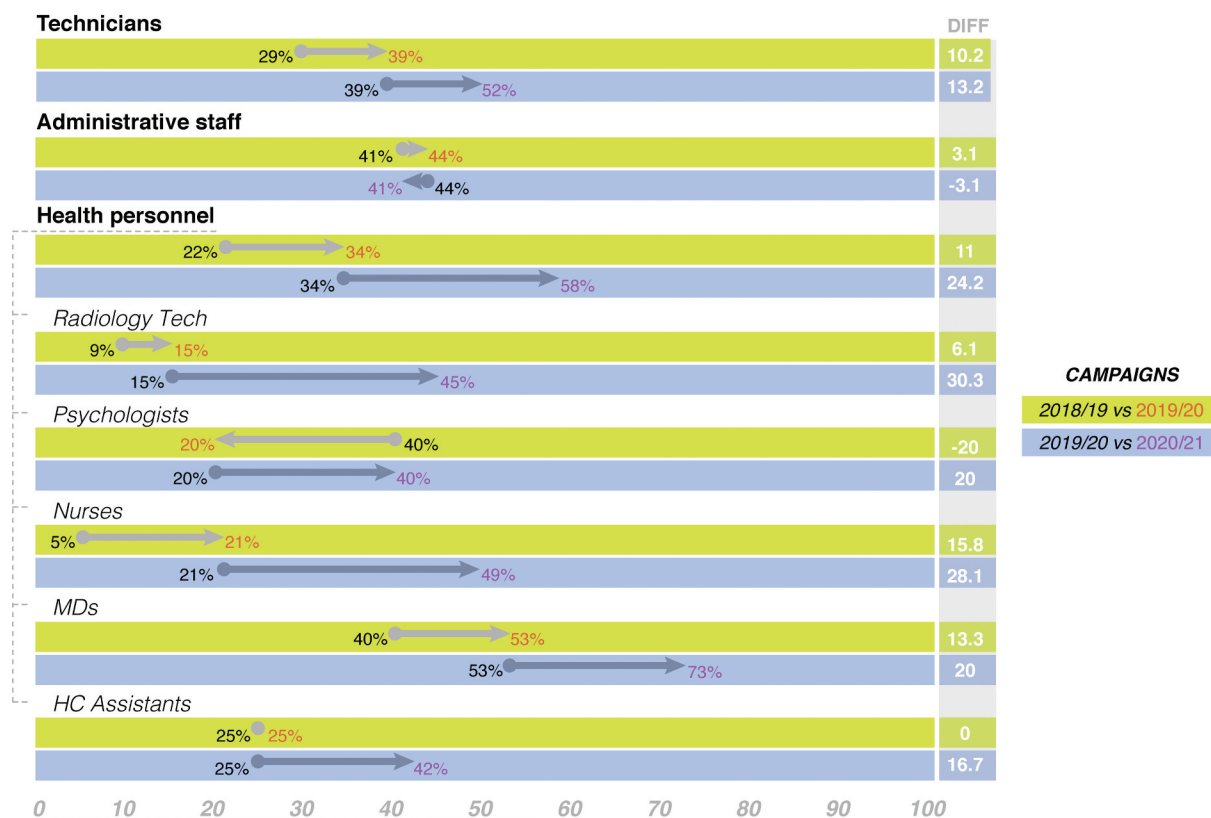


Figure 2. Flu vaccine campaigns adherence by personnel roles and year of campaigns (N = 381 employees). Dumbbell plot. In the left side of the graph, for each category of HCWs, the percentage of vaccination adherence campaigns is plotted. The first row (yellow) displayed for each HCWs group represents the vaccination adherence rate in 2018/19 compared to 2019/20, while in the second one (light blue) percentage of vaccination adherence in 2019/20 and 2020/21 (light-blue) campaigns are displayed. The arrows indicate the direction of change between the consecutive years (i.e. toward right in case of improvement, toward the left otherwise). DIFF columns indicate the percentage change between the two consecutive years. The first three pairs of rows (in bold) indicate the macro groups of employees' roles (Technicians, Administrative staff and Health personnel), while the following ones (italics) detail data on specific categories of health personnel (Radiology technicians, Psychologists, Nurses, Medical Doctors, Healthcare assistants).

Table 2. Factors influencing flu vaccine campaigns adherence.

Factors	First-time vs Never vaccinated			First-time vs Always vaccinated			Always vs Never vaccinated		
	OR	95%CI	p	OR	95%CI	p	OR	95%CI	p
Age(5 y incremental step)	0.919	0.763; 1.105	.368	0.802	0.646; 0.946	.012	1.174	0.980; 1.407	.081
Gender (male)	0.772	0.387; 1.542	.464	0.347	0.179; 0.647	.001	2.269	1.193; 4.315	.012
Professional Role									
Medical staff(vs non-health personnel)	2.209	0.920; 5.307	.076	0.595	0.342; 1.407	.311	3.186	1.393; 7.288	.006
Other health personnel(vs non-health personnel)	0.862	0.452; 1.643	.652	1.691	0.691; 2.929	.338	0.606	0.299; 1.227	.164
Covid-19 vaccine	8.149	3.757; 17.675	<.0001	0.563	0.181; 1.703	.303	14.684	5.704; 37.802	<.0001

Multivariable multinomial logistic regression. OR: Odds ratio. Each column represent a 2-group comparison.

were substantially higher than those published in the literature,¹⁸ and in line with the recent paper by Di Pumpo et al.¹⁶ for the 2020/21 campaign, revealing greater attention to infection prevention by both Healthcare Administration and employees in our center, much characterized by highly specialized staff. Moreover, the average age of HCWs is estimated to be around 50 years in Italy,¹⁵ while in our Institute it is noticeably lower (40.3 y).

The increased proportion of HCWs who received the influenza vaccine this last season was probably due to COVID-19 pandemic,¹⁶ suggesting a change in the HCWs attitude toward influenza vaccination, particularly among young people.

Among older employees, men were more prone to get vaccinated during the years before the COVID-19 outbreak.¹⁶ Increasing age and male gender were predictive variables associated with increased influenza vaccination compliance. However, during the last vaccination campaign, females' vaccinations increased at all ages, with the only exception to women older than 60. Nevertheless, the greatest advance in vaccination adherence during the pandemic has been observed among the youngest men (i.e. 25–35 y). These latest results suggest a paradigm shift in vaccination attitudes after the pandemic outbreak: the vaccination campaign resulted in

surprisingly effective for women and younger staff. This may suggest the need to protect family members, which was less perceived before COVID-19. Protection against COVID-19 through vaccines seems to be strongly associated with flu vaccination when considering both first and usual vaccinations (compared with never vaccinated against flu), confirming the impact of the pandemic situation on the objective of our study.

This increase in the flu vaccination uptake rate among HCWs was the result of a triple incentive effect: firstly, the need for HCWs to protect both themselves and their patients against infections. Secondly, the strong commitment of the Healthcare Administration in promoting vaccination among personnel with close contacts with patients. Finally, to mitigate the similitude of COVID-19 and influenza symptoms, facilitating differential diagnosis. As a consequence, in the years to come, it will be important to change vaccination promotion efforts toward new targets (e.g. healthcare assistants and psychologists, who still showed lowest adherence among HC roles), as those who already had access to vaccination are unlikely to refuse vaccination in the future.

Our study had some limitations: the analysis did not account for lifestyles, comorbidities or marital status data. Furthermore, the last vaccination campaign in IRST was primarily devoted to health professionals, assigning administrative staff and technicians a lower priority. Therefore, a share of non-health staff was supposed to get vaccinated in concomitance with COVID-19 vaccine and, consequently, most opted to get the latter.

To the best of our knowledge, this is the first study exploring the factors affecting the coverage of influenza vaccines during the so-called second wave of the COVID-19, assessing how the pandemic has changed the attitude toward influenza vaccination. Our study shows the COVID-19 pandemic contribution to increase adherence to flu vaccination among our HCWs. However, further efforts should be made to achieve greater vaccination coverage. Furthermore, considering that COVID-19 vaccination is likely to be needed in the coming years, the propensity for dual vaccination could be a problem in the near future.

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No potential conflict of interest was reported by the author(s).

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