



Influenza immunization of healthcare personnel in the post-COVID-19 pandemic era: Still a lot to do!

Caterina Ledda^{a,*}, Giuseppe Motta^b, Venerando Rapisarda^{a,c}, Helena C. Malteizou^d

^a Occupational Medicine Unit, Department of Clinical and Experimental Medicine, University of Catania, Catania, Italy

^b Occupational Medicine Unit, "Garibaldi" Hospital of Catania, Catania, Italy

^c Occupational Medicine Unit, "G. Rodolico – San Marco" University Hospital, Catania, Italy

^d Directorate for Research, Studies and Documentation, National Public Health Organization, Athens, Greece

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ABSTRACT

Healthcare-associated influenza is frequently encountered in healthcare settings with significant morbidity and mortality among vulnerable patients, absenteeism among healthcare personnel (HCP), and interruption of healthcare services. Numerous investigations indicate that nosocomial outbreaks are often traced to HCP. Despite the international and national endorsements, seasonal influenza vaccine acceptance among HCP continues suboptimal worldwide. Infection control is the major objective for healthcare risk management in order to guarantee patient safety, limit the cost of hospitalization and assurance health management in controlling influenza seasons. Vigilance and anticipation are required as globally we are moving from a reactive COVID-19 pandemic response phase to one of planning for the co-circulation of viral respiratory infections. Declining to understand HCP perception of influenza risk and acceptance of vaccination might have impact patient safety as well as healthcare services.

Introduction

Healthcare personnel (HCP) are at increased risk for occupational exposure to influenza. A *meta*-analysis over 97 influenza seasons estimated an annual incidence rate of influenza infection of 18.7 % [95 % confidence interval (CI): 15.8–22.1 %] among unvaccinated HCP compared with 6.5 % (95 % CI: 4.6–9.1 %) among vaccinated HCP [38]. Influenza virus can be shed and transmitted by symptomatic, as well as asymptomatic and presymptomatic infected HCP [28,45,69,73]. Influenza outbreaks in healthcare facilities are often traced to unvaccinated HCP and can cause serious morbidity and mortality in high-risk patients and containment costs [18,26,48,73,80,79,95]. In addition, influenza is a significant cause of HCP absenteeism and disruption of healthcare services. For instance, up to 10,000 days of absence per year were estimated in an Italian hospital with 5,544 HCP of whom less than 3 % were vaccinated against influenza [22]. A review of healthcare-associated outbreaks over a 40-year period estimated that influenza/parainfluenza outbreaks had a 38.5 % mean closure rate of affected departments [26]. Lastly, the attitudes of HCP towards vaccinations influence their vaccination recommendations [44,61]. A 2019 French study of 1,795 hospital-based physicians found that vaccine-hesitant

physicians were less proactive to recommend vaccinations to patients compared with non vaccine-hesitant physicians [94].

Increased influenza vaccination rates of HCP leads to significant reduction of disease burden among HCP and patients and decreased HCP absenteeism [39,49,54,76,83]. A multi-faceted influenza vaccination program in healthcare facilities in The Netherlands during two influenza seasons ended with a lower risk for healthcare-associated influenza and/or pneumonia in patients admitted in the internal departments of healthcare facilities with higher HCP vaccination rates compared with the control healthcare facilities (3.9 % versus 9.7 %, respectively; *p*-value = 0.015) [76]. A *meta*-analysis of the impact of influenza vaccination of HCP demonstrated a significant reduction of infections, absenteeism, and absenteeism-related costs which outweighed the expenditures of vaccination [31]. Similarly, a United States (US) study showed that a mandatory influenza vaccination policy for HCP in ambulatory settings significantly reduced their risk for influenza Odds ratio (OR): 0.17; 95 % CI: 0.13–0.22 [87]. Yet, influenza vaccination rates among HCP are almost globally well below the 75 % target set by the World Health Organization (WHO) [8,13,34,41,98].

The COVID-19 pandemic had a considerable impact on healthcare facilities and HCP. Interestingly, emerging research has shown potential

* Corresponding author.

E-mail address: caterina.ledda@unict.it (C. Ledda).

cross-protective effects of the influenza vaccine against severe outcomes of COVID-19, emphasizing the need for dual vigilance in respiratory infection prevention [100]. Furthermore, during the pandemic, HCP influenza vaccination was encouraged as a strategy to differentiate between influenza and COVID-19 cases due to symptom similarity, thus facilitating timely and accurate diagnosis and management [10,71]. Increased vaccination rates not only have the potential to lessen the burden on already strained healthcare systems but also reduce the overall respiratory infection rates in facilities [13,77]. Given the compounding risks of influenza during the COVID-19 era, it is crucial to implement the best practices for the prevention of both respiratory infections [11,93,97].

Reasons of low influenza vaccine uptake among HCP

Gaps in knowledge about influenza and attitudes toward influenza vaccines are among the most frequent factors for vaccination refusal by HCP [33,52,63,85,101]. These include mainly low-risk perception, concerns about influenza vaccine efficacy and side effects, and misperception that influenza vaccine can cause influenza [17,18,23,33,35,52,50,58,63,82,85,88,96,101]. A study found that vaccine-hesitant physicians in French hospitals less frequently trusted vaccination information sources or took a course about vaccinations, and more frequently questioned vaccines' safety, compared to non vaccine-hesitant physicians [94]. On the other hand, increased occupational risk perception may also influence HCP knowledge and vaccination practices. Ledda et al. found in Italy that the level of knowledge of hospital-based HCP about vaccinations including influenza vaccination, increased significantly during the first year of the COVID-19 pandemic [40]. Influenza vaccination coverage among HCP in an Irish hospital raised from 78 % to 94 % during the COVID-19 pandemic; particularly, more than half of HCP who refused vaccination in the past stated that their vaccination attitudes changed during the pandemic [35].

While there have been observable improvements in vaccination rates through voluntary policies, these efforts have not consistently achieved the desired high vaccination rates.

Voluntary influenza vaccination policies for HCP have largely failed to achieve and sustain high vaccination rates almost universally. For instance, after decade-long efforts, influenza vaccination rates increased from 18.1 % in 2011–2012 to 58.9 % in 2019–2020 in Irish hospitals, and from 17.8 % to 45.5 % in long-term care facilities [66]. These figures highlight the gradual progress made, but they remain short of optimal levels, underscoring the limitations of voluntary approaches.

Organizational, administrative, and financial barriers also impact influenza vaccination rates of HCP [50]. These include among others limited accessibility to vaccination services (e.g. site, time and shift restrictions, inadequate reminding systems), lack of leadership, administrative, and financial support, and gaps in estimating vaccination rates [4,5,17,29,30,35;50,86]. As of early 2020, only half of low- and middle-income studies had influenza vaccination policies for HCP [46]. Most of these countries had no mechanisms to estimate vaccination rates of HCP, which indicates gaps in translating policies to actions [46].

Interventions to increase influenza vaccination rates and their effect

Educational campaigns have been shown to positively impact the HCP knowledge, attitudes, and practices toward influenza vaccination [30,63]. For instance, an educational intervention in an Australian hospital raised influenza vaccination rates from 33 % to 61 % [63]. Strategies to overcome accessibility barriers (e.g. on-site vaccination, mobile vaccination carts), mass vaccination events, support by leaders, declination declarations by vaccination refusers, and incentives also have yielded positive results. On-site influenza vaccination is cost-effective, increases productivity, and reduces absenteeism [2,7,9,16,19,27,30,35,42,43,57,70,74,75,78,81,94]. Interventions have

been bundled rendering difficult to estimate the impact of each [9,57,81]. Nevertheless, even with multifaceted interventions and close monitored targets, it took five seasons (2014–2019) to increase influenza vaccination rates from 72.2 % to 87.7 % in public healthcare facilities in Victoria, Australia [6].

The past two decades many US healthcare facilities adopted mandatory influenza vaccination policies with excellent results [7,99]. Finland was the first European country to mandate healthcare facilities to employ vaccinated HCP only [25]. After switching to the mandatory vaccination policy, vaccination rates among HCP in a Finnish hospital raised from 59.5 % during 2015–2016 to 99.6 % during 2018–2019 [25]. Increase of HCP influenza vaccination rate above 99 % along with a reduction in healthcare-associated influenza was recorded in a US pediatric hospital over ten years after the implementation of a mandatory vaccination policy [36]. Nevertheless, a “vaccinate-or-wear-a-mask” policy may also raise vaccination rates and patients' safety. A significant reduction of healthcare-associated influenza by nearly 50 % (OR: 0.40, 95 % CI: 0.28–0.56; p-value < 0.001) and mortality by 85 % (OR: 0.15; 95 % CI: 0.02–0.70, p-value = 0.007) was recorded in a German hospital during the adoption of a strict mask policy for HCP in 2015–2019, despite the low influenza vaccination rates among physicians and nurses before (42 % and 17 %, respectively) and after the intervention (53 % and 19 %, respectively) [3].

In the realm of public health, vaccination strategies are instrumental in preventing widespread outbreaks and ensuring the overall health of a population. Central to the success of these strategies is an in-depth understanding of the factors that influence individuals' decisions about vaccination. [77]. Among these, cultural and behavioral dimensions surrounding vaccination hesitancy play a pivotal role. For instance, deeply rooted cultural beliefs or historical events can significantly sway perceptions of vaccinations, either endorsing or undermining their acceptance [65]. Behavioral aspects, such as how individuals perceive risk or how they respond to peer behaviors, can also heavily influence their stance on vaccination. Moreover, these factors might not be uniform across different sectors of healthcare. Variances in attitudes and behaviors have been observed across various healthcare professional categories [14]. For instance, physicians might have a different rate of vaccination acceptance compared to nurses or allied health professionals, influenced by their training, professional experiences, or even peer dynamics within their specific fields. These differences are essential to consider when devising and implementing vaccination campaigns [1]. The absence of a comprehensive discussion on these nuances, particularly the disparities among healthcare professionals, can lead to a skewed or incomplete perspective. By delving deeper into these facets, strategies can be tailored more effectively, ensuring broader acceptance and higher vaccination rates, essential for public health success [37,72].

What is needed in the post-COVID-19 era?

Achieving and sustaining high influenza vaccination rates among HCP remain a challenge for healthcare facilities and should be regarded as a key component of infection control programs in the post-pandemic era. Existing vaccination strategies and interventions should be reviewed and modified accordingly, annual vaccination targets should be set, and the results disseminated to HCP and stakeholders [15,47,50,51,53]. Long-term commitment and funding sustainability are also critical [46].

To our knowledge, there is no policy or strategy other than vaccine mandates for skyrocketing influenza vaccination rates of HCP in the short term. Mandatory influenza vaccination policies emerge as ethical and necessary to promote safety in healthcare facilities [12,86]. Nonetheless, the selection of a mandatory vaccination policy should be regarded as a means and not an end in itself, and this should be communicated to HCP, along with the expected benefits [64]. A recent meta-analysis estimated a pooled acceptance rate of mandatory vaccinations of 61 % (95 % CI: 53–68 %), with significant variations by region

and HCP group [24]. In many countries, mandatory vaccination policies would be a challenge to implement, in light of concerns about HCP autonomy and the questioning of trust to the authorities. If this is the case, a “vaccinate-or-wear-a-mask” policy could be more easily supported by HCP in the post-COVID-19 pandemic era [55,84,90].

Overall, influenza-risk reduction strategies are essential at the local (healthcare facility) and the national level. This involves integrating lessons from the COVID-19 pandemic, building resilient healthcare systems, robust surveillance mechanisms, early warning systems to promptly detect healthcare outbreaks, and effective communication channels [21,56,91]. Particularly in healthcare settings, the co-circulation of SARS-CoV-2, influenza and other respiratory viruses renders the use of rapid multi-target diagnostic tests necessary to guide infection control [11]. Paid sick leave may reduce ill presenteeism among HCP due to healthcare-associated influenza and other respiratory infections [62].

The simultaneous risk posed by both the influenza epidemic and the COVID-19 pandemic represents a significant global public health challenge. Given the unpredictable nature of influenza circulation during the upcoming winter, especially in the context of ongoing COVID-19 transmissions, the situation becomes even more complex. Several epidemiological observational studies have delved into the effects of co-circulation of SARS-CoV-2 and influenza viruses, specifically examining prevalence rates, clinical outcomes, and the consequent burden on health systems [20,67,68].

Lastly, international collaboration is crucial for the success of influenza vaccination programs worldwide. Sharing knowledge, technologies, and best practices can strengthen vaccination programs and build capacity for the next pandemic [32,59]. In countries with no influenza vaccination programs for HCP, a mixture of already proven effective policies and interventions can be implemented. The WHO may coordinate collaborative efforts and support the equity of vaccinations, particularly in low-income countries [60,89,92].

Data Statement

The data that support the findings of this study are available on request from the corresponding author, [CL]. The data are not publicly available due to [restrictions e.g. their containing information that could compromise the privacy of research participants].

CRedit authorship contribution statement

Caterina Ledda: Conceptualization, Methodology, Validation, Formal analysis, Writing – original draft. **Giuseppe Motta:** Investigation, Data curation. **Venerando Rapisarda:** Investigation, Data curation, Visualization. **Helena C. Maltezos:** Methodology, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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