

# Nurses' roles, views and knowledge regarding vaccines and vaccination: A pan-European survey

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International Journal of Care  
Coordination  
2023, Vol. 26(3-4) 129–136  
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DOI: 10.1177/20534345231207527  
journals.sagepub.com/home/icp



## Abstract

**Introduction:** Nurses play a crucial part in responding to pandemics. Not only are they often in direct contact with patients but nurses also can inform and educate the general public regarding vaccination. Mapping nurses' preferences and knowledge on the value of vaccination can contribute to shaping policy, generate support for policy measures and help address vaccination hesitancy.

**Methods:** The present exploratory study was based on an electronic survey distributed amongst nurses working in Europe. Analysis included descriptive statistics to summarize knowledge levels, attitudes and demographics and tests for associations.

**Results:** Of 103 respondents, most assessed their knowledge about vaccines, the immune system and pathogens on a medium level. Most respondents agreed that the best policy is to leave influenza vaccination voluntary for healthcare workers and vulnerable groups, but to make COVID-19 vaccination mandatory. Country of employment of respondents was associated with their preferred policy of influenza- and COVID-19 vaccination. Most needed by nurses in the current study to increase their involvement in vaccination programs were improved perceptions amongst patients and society at large. To perform better in responding to future pandemics, the most needed type of institutional support was continuous free nursing education.

**Discussion:** This study emphasizes a need for more nurse-generated data regarding the value of vaccination. Complexity of vaccine-related decision-making was highlighted by findings that opinions of nurses on (vaccination-) policy differ between influenza- and COVID vaccines and appear to be influenced by the policy environment in their country of employment.

## Keywords

COVID-19, influenza, vaccination, attitude of health personnel, health knowledge

## Introduction

Amidst the SARS-Cov-2 (COVID-19) outbreak, the World Health Organization (WHO) Europe developed several recommendations to enhance a healthcare system's ability to respond to a pandemic. These include training and mobilizing healthcare workers, addressing their mental health needs and ensuring clear roles and coordination mechanisms.<sup>1</sup>

Central to this endeavour is nurses. They play a crucial part in health systems' response to health crises and vaccine-preventable communicable diseases.<sup>2</sup> Not only are nurses valuable assets for a health service since they are often in direct contact with patients but they also play a role in informing citizens and patients about the risks, benefits and value of immunization at the individual and societal levels. Furthermore, they address educational needs and concerns,<sup>2</sup> and consequently can shape vaccination behaviours of patients and their social networks.<sup>3</sup>

Information about vaccination hesitancy amongst healthcare workers in general and nurses in particular is important when making policy for optimal healthcare system responses. Given the frequency of direct contact

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with patients, nurses are a key source of transmission for certain communicable diseases.<sup>4</sup> Preventive measures to protect healthcare workers themselves and reduce transmission to their patients include good hygiene practices and adequate resources. The most effective measure, however, is vaccination.<sup>4,5</sup> This is why the WHO strongly recommends the vaccination of healthcare professionals against designated diseases, including influenza and COVID-19.<sup>5</sup>

Research has shown that factors positively influencing vaccine acceptance by healthcare workers are, amongst others, knowledge about vaccines in general, knowledge about COVID-19 vaccines specifically, previous vaccine acceptance, education level and years of practice.<sup>6-8</sup> On the other hand, factors that hinder vaccine acceptance amongst healthcare workers include lower age, lower general knowledge about vaccines and not being in direct patient contact.<sup>9,10</sup> Further, healthcare workers with vaccination hesitancy more often reported to obtain information about COVID-19 vaccines via messenger services or online video platforms.<sup>3,9</sup>

Most studies on attitudes of healthcare personnel towards vaccination policy refer to healthcare workers,<sup>6,10-13</sup> or healthcare professionals<sup>14</sup> in general and not to nurses specifically. This is relevant considering evidence suggests that type of healthcare worker is related to acceptance of COVID-19 and influenza vaccination and to vaccination policy preferences. Hereby, physicians seem to be more willing to be vaccinated than nurses<sup>6,11</sup> and more often support a mandatory vaccination policy.<sup>10</sup> Mapping nurses' preferences, needs and knowledge can contribute to shaping effective policies, generate support for policy measures and help address vaccination hesitancy. Previous research on nurses' roles and views tends to come from separate countries; data encompassing opinions from multiple countries are scarce.<sup>7,13</sup> This type of data can enhance coordination mechanisms and healthcare governance, in line with the WHO's recommendations.

Therefore, the aim of this study was to gather insight into the patterns of vaccine uptake amongst nurses in Europe and examine their roles and positions regarding vaccination, as well as to explore their knowledge and education about vaccines in general, and influenza and COVID-19 vaccination specifically. This study was based on a survey developed and administered by European Specialist Nurses Organization (ESNO) in 2020, just before the arrival of the COVID-19 vaccine (hereafter referred to as ESNO 2020 study).<sup>15</sup> Replicating and expanding the approach used before allows for comparison of trends on the positions and views of nurses in 2020 and 2022, and to investigate the potential influence of the ongoing COVID-19 pandemic.

## Methods

### Study setting

This study was based on an anonymous internet survey conducted from 25th April to 10th June 2022. An invite with a

link to the survey was made public via the ESNO website, social media platforms (Twitter, Facebook and LinkedIn) and via e-mail to heads of member organizations of the ESNO. These heads were asked to forward the survey link to respective members. Since the study had an exploratory nature, no a priori power analysis was conducted. Data collection was stopped after 10th June 2022. The survey was developed and hosted on SurveyMonkey (SurveyMonkey Inc., San Mateo, CA, USA).

### Survey development

The survey was based on a survey developed and administered by ESNO in 2020.<sup>15</sup> That survey was self-constructed and sent to a subset of ESNO members from eight countries for assessment of its face-validity. The current survey was expanded with questions about nurses' roles, programs, engagements and responsibilities during the COVID-19 vaccination campaign and process. The current survey was made available in eight languages (English, German, Italian, Dutch, Greek, French, Spanish and Polish). It consisted of 33 questions and included categorical responses, open-ended questions and 5-point Likert scales (very likely to very unlikely, with one neutral choice). The survey first asked about participant characteristics (age, gender, country of employment, length of employment, nursing profession and clinical specialty). Other themes included in the survey were: uptake of influenza- and COVID-19 vaccination and likelihood of uptake in 2022; opinion on mandating influenza and COVID-19 vaccination for healthcare workers and specific population groups; likelihood to advise patients against influenza vaccination; responses, requirements and needs for the COVID-19 and potential future pandemic(s); self-assessment of knowledge about pathogens, vaccines, immune system and finally source(s) for obtaining information related to pathogens, vaccines and the immune system. The English version of the questions and answer options (where applicable) can be found in the supplementary data.

### Statistical analysis

Descriptive analysis of the respondents and parametric tests were performed with Rstudio (version 2021.09.1). Associations were tested with Pearson's Chi-squared test of independence<sup>16</sup> or McNemars test for paired data.<sup>17</sup> Contingency tables were drawn up when direction of association was required for analysis. This study is exploratory in nature. Hence, no hypotheses about the direction of associations were drawn up beforehand. We analyzed the following dependent variables: (i) Uptake of influenza- and COVID-19 vaccination in 2020 and 2021, (ii) likelihood of influenza- and COVID-19 vaccination in 2022, (iii) self-assessed knowledge about pathogens, vaccines and the immune system, (iv) preferred influenza- and COVID-19

vaccination policy for healthcare workers (physicians, nurses and other healthcare workers) and (v) preferred influenza- and COVID-19 vaccination policy for vulnerable groups (older people, chronically ill people and immune-suppressed patients). The independent variables analyzed were age, gender, country of employment, years of experience, patient contact, infection with COVID-19 in the past and involvement in vaccination programs. Patient contact was assumed if the respondents indicated their profession was nurse, nurse specialist, nurse practitioner, ward manager or nurse manager. A *p*-value less than 0.05 was considered as statistically significant. All reported values are two-sided.

### Ethical considerations

The study was conducted in compliance with the principles of the General Data Protection Regulation, by strictly safeguarding the anonymity of the participants. Participants in the anonymous internet-based survey granted implied informed consent by submitting the completed survey. Participants were informed about the study objectives including the possibility to withdraw at any time. Since this study falls outside of the Dutch legislation on medical scientific research, no further guidelines for obtaining consent needed to be met.<sup>18</sup> All methods were applied in accordance with relevant guidelines and regulations.<sup>19</sup> Participants were not financially compensated.

## Results

### Demographics

A total of 115 nurses responded. Data from 9 participants were removed due to incomplete information caused by a technical failure. For another 3 participants, data were removed as they reported employment outside Europe, leaving data from 103 participants. Of these responses, 82 were complete and 21 were partial. Of respondents, 16.5% reported completing the previous ESNO survey on vaccination in 2020.

The mean age of respondents was  $46.6 \pm 11.1$ , and most were female (58.8%). Table 1 describes some other characteristics of respondents. Most respondents (35.9%) were nurse specialists, and the majority filled out 'other' as their specialty. Hereby, the most frequently named other specialties were 'operating room' (7.8%) and 'education/university' (6.8%). A third of respondents (29.1%) had more than 24 years of experience. The respondents were mainly from Italy (43.7%).

### Uptake influenza- and COVID-19 vaccination

In 2020, 70.9% of respondents received influenza vaccination. Of these respondents, 81.8% reported getting vaccinated against influenza to protect themselves, their family and their patients. Of respondents who did not get influenza

**Table 1.** Demographic data of respondents (*n* = 103).

Demographic categories	Absolute ( <i>n</i> )	Relative (%)
<b>Profession</b>		
Nurse	22	21.4
Nurse Specialist	37	35.9
Nurse Practitioner	11	10.7
Nurse Educator	8	7.8
Ward/Nurse Manager	12	11.3
Research Nurse	1	1.0
Professor	2	1.9
Chief Nursing Officer	2	1.0
Other	9	8.7
<b>Specialty</b>		
Gastroenterology	3	2.9
Dialysis, Nephrology	5	4.9
Rheumatology	1	1.0
Urology	2	1.9
Medical surgical, Anaesthesia	27	26.2
ICU*, Critical care, Emergency	18	17.5
Oncology	2	1.9
Cardiology	1	1.0
Infection	3	2.9
Other	41	39.8
<b>Work experience (years)</b>		
<2	4	3.9
3–5	13	12.6
6–8	10	9.7
9–11	7	6.8
12–14	12	11.7
15–17	8	7.8
18–20	13	12.6
>24	30	29.1
<b>Country</b>		
Austria	3	2.9
Belgium	2	1.9
Denmark	1	1.0
Estonia	1	1.0
France	10	9.7
Germany	11	10.7
Greece	1	1.0
Ireland	1	1.0
Italy	45	3.7
Kosovo	1	1.0
Malta	3	2.9
Netherlands	14	13.6
Poland	5	4.9
Portugal	1	1.0
Spain	2	1.9
Switzerland	2	1.9

\*ICU: intensive care unit.

vaccination, 42.3% gave as reason that they were healthy, never had influenza or saw no need. In 2021, 62.3% of respondents got vaccinated against influenza, of which 82.5% reported getting the influenza vaccination to protect themselves, their family and their patients. The most cited reason (36.4%) for not getting an influenza

vaccination was the same as in 2020: respondents reported being healthy, never having had influenza, or seeing no need for it. Of respondents, 68.1% reported it (very) likely that they would get vaccinated against influenza in 2022 again, whilst 23.1% would be, on the other hand, (very) unlikely to get vaccinated against influenza in 2022.

More than half of respondents reported having had COVID-19 (56.1%). At the time of responding, almost all respondents in the current study (97.8%) were vaccinated against COVID-19. The most mentioned reason for being vaccinated was that respondents wanted to protect themselves, their family and their patients (80.0%). Of those who did not want to get a COVID-19 vaccination, 40.0% gave as reason that they were healthy. Of the respondents, 81.7% reported it was (very) likely that they would get a COVID-19 vaccination in 2022, whilst 8.5% were (very) unlikely to do so.

### Preferred vaccination policy

Most respondents preferred policies which would leave influenza vaccination as voluntary for other healthcare workers (64.3%), physicians (62.7%) and nurses (59.3%). Most respondents also agreed on keeping influenza vaccination voluntary for chronically ill people (54.9%), older people (54.4%) and immunosuppressed people (50.0%) (see Table 2).

In contrast, for the majority of respondents, the preferred policy on COVID-19 vaccination was to make it mandatory for nurses (67.1%), physicians (65.4%) and other healthcare workers (65.0%). For a smaller majority, the preferred policy was to mandate it for older people (61.7%), persons with chronic illnesses (61.0%) and immunosuppressed people (60.5%) (see Table 3).

Most respondents were (very) unlikely to advise patients against influenza vaccination in the hypothetical situation where they themselves: 1) had decided to decline influenza

vaccination (64.4%); 2) would have clinical reasons to decline influenza vaccination (58.1%); or 3) would have family members with an allergic reaction to influenza vaccination (63.3%). On the other hand, 13.3%, 25.6% and 23.3% of respondents, respectively, would be (very) likely to advise patients against influenza vaccination in the above situations.

### Roles, needs and requirements in response to a pandemic

In response to the COVID-19 pandemic, respondents engaged in multiple roles. Most provided critical care (17.3%), administered vaccination (8.7%) or had a leadership role (7.2%). To increase the involvement of respondents in vaccination programs, the resources or areas in most need were improved perceptions amongst patients and society at large (20.7%), training (18.7%) and institutional support (17.7%). To better perform in responding to future pandemics, respondents identified continuous free nursing education (22.0%), improved employment and working conditions (21.7%) and personal protective equipment (18.5%) as the vital types of institutional support.

Most respondents assessed their knowledge about vaccines, newly produced messenger RNA (mRNA) COVID-19 vaccines, the immune system and pathogens as medium (68.2%; 62.4%; 61.2% and 60.0% for each of the items, respectively, see Figure 1).

Almost half of information related to mRNA COVID vaccines, vaccines, pathogens and immune system was obtained by respondents from literature (48.0%), followed by education (38.5%), and finally, mass media (13.5%).

### Associations

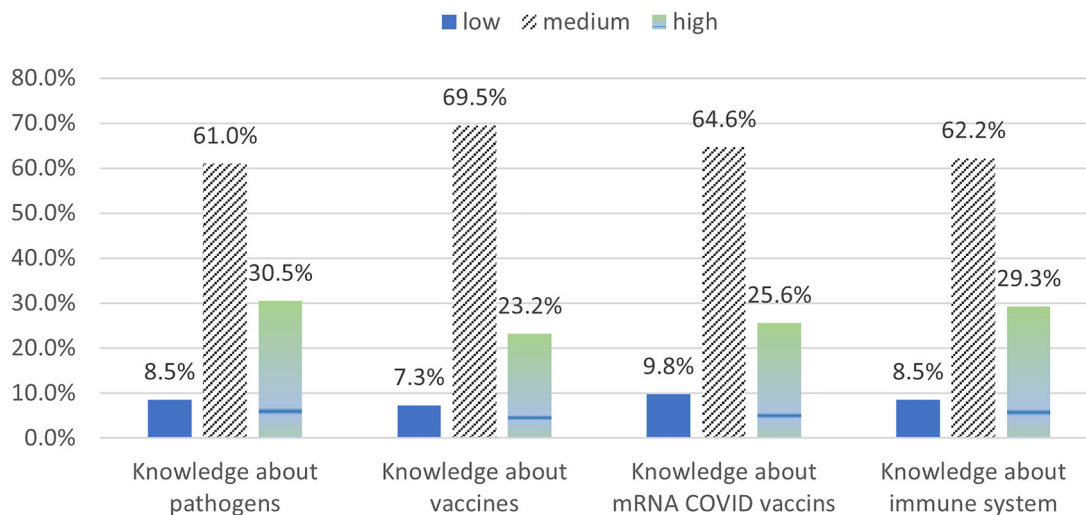
The likelihood of vaccination for influenza in 2022 was positively associated with the likelihood to get vaccinated

**Table 2.** Preferred influenza vaccination policy for specific professions and vulnerable groups (n = 91).

	To make influenza vaccination mandatory n (%)	To leave influenza vaccination voluntary n (%)
<b>Specific professions</b>		
Physicians	31 (37.3)	52 (62.7)
Nurses	37 (40.7)	54 (59.3)
Other healthcare workers	30 (35.7)	54 (64.3)
<b>Specific (patient) groups</b>		
Older people	41 (45.6)	49 (54.4)
Chronically ill people	41 (45.1)	50 (54.9)
Immunosuppressed people	45 (50.0)	45 (50.0)

**Table 3.** Preferred COVID-19 vaccination policy for specific professions and vulnerable groups (n = 82).

	To make COVID-19 vaccination mandatory n (%)	To leave COVID-19 vaccination voluntary n (%)
<b>Specific professions</b>		
Physicians	53 (65.4)	28 (34.6)
Nurses	55 (67.1)	27 (32.9)
Other healthcare workers	52 (65.0)	28 (35.0)
<b>Specific (patient) groups</b>		
Older people	50 (61.7)	31 (38.3)
Chronically ill people	50 (61.0)	32 (39.0)
Immunosuppressed people	49 (60.5)	32 (39.5)



**Figure 1.** Knowledge self-assessment of respondents about pathogens, vaccines, mRNA COVID vaccines and immune system ( $n = 82$ ).

for COVID-19 in 2022 ( $p < 0.001$ ) and with previous influenza vaccination uptake in 2020 ( $p < 0.001$ ) and 2021 ( $p < 0.001$ ).

Furthermore, respondents' preference for influenza vaccination policy for other healthcare workers was associated with likelihood of COVID-19- ( $p = 0.046$ ) and influenza ( $p = 0.028$ ) vaccination. If respondents were (very) unlikely to get an influenza- or COVID-19 vaccination in 2022, they preferred a voluntary influenza vaccination policy for other healthcare workers. An association between higher level of self-assessed knowledge about mRNA COVID vaccines and higher level of likelihood to get vaccinated for COVID-19 was significant ( $p = 0.043$ ); however, removing the three non-European respondents resulted in non-significance ( $p = 0.170$ ).

Age and years of experience were positively associated with preferred influenza vaccination policy for healthcare workers. Hereby, a higher age was associated with a preference for mandatory influenza vaccination policy for physicians ( $p = 0.042$ ), nurses ( $p = 0.020$ ) and other healthcare workers ( $p = 0.016$ ). Similarly, more years of professional experience were associated with a preference for mandatory influenza vaccination policy for physicians ( $p = 0.030$ ), nurses ( $p = 0.031$ ) and other healthcare workers ( $p = 0.044$ ).

The country of employment of respondents was statistically significantly associated with the preferred policy of influenza- and COVID-19 vaccination for nurses ( $p = 0.047$ ,  $p = 0.039$ , respectively) and other healthcare workers ( $p = 0.044$ ,  $p = 0.037$ , respectively). Respondents from Italy and France mostly preferred a mandatory COVID-19 but voluntary influenza vaccination policy for healthcare workers. This, or a reverse, trend was not observed for other countries, possibly due to a lack of data. Since responses from nurses in

Italy were dominantly represented in the data, these could be responsible for the observed associations.

## Discussion

The COVID-19 vaccine coverage amongst nurse respondents was well above the 70% target threshold advocated by WHO.<sup>20</sup> (Intended) influenza vaccine uptake amongst nurses in this study is slightly higher compared to other research findings from the same period.<sup>21</sup> The most stated reason to get vaccinated was to protect nurses themselves, their family and their patients. This differs from earlier research, where the main reason for influenza vaccination uptake was personal protection.<sup>21</sup> This could indicate an increased sense of ethical or professional obligation of nurses in this study to minimize the risk of harming patients in their care.<sup>22</sup> The motivation to decline influenza vaccination points to a low-risk perception of influenza, something which is reported in other research as well.<sup>21</sup> These findings show that when framing vaccine-related messages, professional responsibility of nurses to the patients in their care could be emphasized.

Most respondents were (very) unlikely to advise patients against influenza vaccination if respondents themselves had decided to decline influenza vaccination. However, 13.3% of respondents would be (very) likely to advise patients against influenza vaccination based on their own personal preference to avoid having this vaccine. Earlier research on COVID-19 vaccination similarly found that vaccination-hesitant healthcare workers were more likely not to recommend vaccination to their patients or relatives.<sup>11</sup> These are important findings, given that the opinion and advice of nurses regarding vaccination is highlighted by patients as a vital determinant for their vaccination behaviours,<sup>3,23</sup>

and thus a crucial component of an optimal pandemic response.

Comparisons between findings of the ESNO 2020 and 2022 surveys also indicate a potential role of the ongoing COVID-19 pandemic on nurses' attitudes towards vaccination. In the ESNO 2020 survey, only a minority of respondents (strongly) agreed to make COVID-19 vaccination mandatory for vulnerable (patient) groups and for healthcare workers, in contrast with the majority in this study. The vaccination uptake in 2020 as gathered from this study was higher than intention to get vaccinated in 2020 (ESNO 2020 study) for both influenza (+10.1%) and COVID-19 (+30.0%). Alternatively, this could point towards the increased pressure to be vaccinated from society and/or towards governmental vaccination regulations made during that period for COVID vaccination.<sup>24</sup> The increase in influenza-vaccination, during the course of the pandemic, could in turn be a consequence of higher awareness for vaccine-preventable diseases. This trend has also been reported in other literature.<sup>11,25</sup> Taken together, timing is of importance for health policy making and should be taken into account when mobilizing the healthcare workforce to increase their support for policy implementation.

The roles and positions taken on by nurses in this study, in response to the COVID-19 pandemic, were centred around the so-called 'front-line'. Just like in other research, clinical skills and roles have been predominant,<sup>26</sup> together with the administration of vaccinations once available. Research shows that these extreme clinical roles, with the acute and specialist intensive and critical care, and the essential public protection afforded by vaccinations, have generally not been coupled with responsibility for the organization of service. Neither have they been coupled with the design and implementation of immunization programs.<sup>27</sup> Some respondents referred to their leadership role during the initial pandemic response, but the design of the survey did not allow any clarification of what such leadership entailed. Globally, nursing leadership during the pandemic has been problematic,<sup>28</sup> with a lack of visibility. Public views and perceptions, an area highlighted by respondents as vital to increase nursing involvement in future vaccination programs, reflect that notion of nurses as dedicated and heroic workers at the bedside, yet out of place leading health services.<sup>29</sup> Additional research is recommended to investigate optimal approaches enabling nurses to improve social views on the profession and grant clarity on nurse leadership roles.

There is room for improvement to increase the knowledge of nurses about mRNA COVID vaccines, and vaccines, pathogens and the immune system in general, which most respondents assessed as medium. In our initial analysis, a higher level of knowledge about mRNA COVID vaccines was associated with likelihood to get vaccinated for COVID-19. This is in line with the ESNO 2020

survey and other research.<sup>6,7,14,30</sup> Studies on vaccination intentions amongst healthcare workers have found that a greater knowledge about vaccines, beliefs aligned with scientific evidence and favourable attitudes towards vaccines are associated with a higher intention to vaccinate.<sup>6,7,30</sup> With the positive connotation between knowledge and attitude towards vaccination found in the literature, this study reiterates the importance of continuous (free) nursing education in preparing for future health crises. Since variations amongst different countries have been identified, education should recognize cultural idiosyncrasies, as well as differences in legislation relevant to nursing. A need for knowledge is further emphasized by the finding that free nursing education was the most needed asset by respondents to perform better in responding to future pandemics, with one in five respondents asking for training to increase their involvement in vaccination programs. Moving forward, customized training programs to address cultural nuances, knowledge-sharing initiatives and country-specific strategies to empower nurses in vaccine advocacy and administration could be developed.

The associations found in this study reflect the coherence in influenza- and COVID-19 vaccination behaviour found in earlier research.<sup>6,7,30</sup> As found in other research, a preference for mandatory influenza vaccination for healthcare workers was associated with higher age.<sup>13</sup> This could indicate the influence of (perceived) increased vulnerability, generally associated with higher age, on vaccination decisions. More years of nursing experience was associated with a preference for mandatory vaccination as well. It can be hypothesized that nurses with more experience have observed and appreciated the effects of vaccination more. However, more research is needed to establish whether more professional experience is of influence on opinions of nurses on vaccination policy, and to investigate the underpinning reasons.

Respondents from Italy and France mostly preferred a mandatory COVID-19 – but voluntary influenza vaccination – policy for healthcare workers. Such views were previously reported in Italy,<sup>11</sup> where a substantial number of respondents in our study were employed. However, other studies in France and the UK arrived at different findings, with 18%–30% of healthcare workers supporting a generalized, mandatory COVID-19 vaccination for all healthcare workers.<sup>12</sup> In both France and Italy, the COVID-19 pandemic has had a significant impact on the healthcare system, and both countries had a mandatory vaccination policy for healthcare workers.<sup>14</sup> More extensive cross-national studies are needed to understand the underlying factors contributing to the observed variations. These insights may have implications for healthcare policy development, healthcare education and addressing vaccine hesitancy.

The current study has several limitations. Firstly, the number of respondents is limited, with 103 responses to the survey. Survey fatigue may have played a role here. It

is a common phenomenon amongst healthcare workers, especially since the COVID-19 pandemic.<sup>31</sup> Additionally, respondents were recruited via the ESNO network, limiting the potential pool of respondents to ESNO members. Consequently, opinions and positions presented in this manuscript may not fully represent the broader nurse population. Secondly, the distribution of nationality of respondents is skewed. This is important, for factors such as vaccination policy in the respondents' country of employment and the impact of COVID-19 on the healthcare system could have influenced respondents' answers. The limited number of responses from some countries further limits associations between countries and other variables under study. Thirdly, the questionnaire used in this research has been assessed for face validity only.<sup>15</sup> Since this was a cross-sectional study, it should be mentioned that causal inferences cannot be made. Lastly, comparisons with the 2020 survey should be interpreted with caution since the respondents were chiefly not the same (only 16.5% of respondents in this study had completed the 2020 survey). Instead, our results could be interpreted as a reflection of the opinion of nurses across the European region before and after the availability of the first COVID-vaccine.

However, to our best knowledge, this is one of the first studies exploring factors that influence nurses' preferences, needs and knowledge on the value of influenza- and COVID-19 vaccination in multiple European countries, after the introduction of the COVID-19 vaccine. Moreover, obtaining a significant portion of this data during the pandemic offers a unique vantage point into nurses' authentic preferences, precisely at a time when these perspectives bear the highest relevance. This study identifies key factors that should be addressed to increase response to future pandemics. These results could assist policy makers in developing vaccine promotion strategies and improving the work environment for European nurses. Achieving these goals is not only a worthy endeavor in itself but also a critical factor for retaining healthcare personnel in the future.

In conclusion, it was found that most nurses assess their knowledge of mRNA COVID vaccines, vaccines, pathogens and the immune system to be on a medium level, and most needed by nurses in responding to a pandemic is continuous free nursing education, in line with the WHO recommendation to train and mobilize the workforce according to priority service.<sup>1</sup> Further, opinions of nurses on (vaccination-) policy differ between influenza- and COVID vaccines and appear to be influenced by the policy environment of their country of employment, highlighting the complexity of vaccine-related decision-making. This should be taken into account when coordinating a Europe-wide health system pandemic response. Most needed by nurses in the current study to increase their involvement in vaccination programs were improved perceptions amongst patients and society at large. This study

emphasizes a need for more nurse-generated data about their opinions and contributions regarding vaccination.

### Acknowledgements

The authors thank all the nurse participants who donated their time contributing to this study.

### Author contributions

Conceptualization, HV and YG; methodology, HV and YG; software, N.A.; validation, BO, JV, ECS, HV and YG.; formal analysis, HV and YG; investigation, HV and YG.; resources, BO; data curation, HV and YG; writing—original draft preparation, HV and YG; writing—review and editing, BO, JV, ECS; visualization, YG; supervision, HV; project administration, HV and YG.; funding acquisition, BO and HV. All authors have read and agreed to the published version of the manuscript.

### Declaration of conflicting interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: HV was involved in conceptualization, analysis, investigation, writing, data-curation and supervision for this article. HV is the Editor-in-Chief of the International Journal of Care Coordination and confirms he did not handle the editorial processing of this article in any way.

### Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was funded by Vaccine Europe, and the APC was funded by Viatrix.


### Institutional review board statement

Ethical review and approval were not required for this study due to the applicable Dutch legislation on medical scientific research: participants were not subjected to procedures and were not required to follow rules of behaviour. The study was conducted in compliance with the principles of the General Data Protection Regulation (GDPR), by strictly safeguarding the anonymity of the participants.

### Informed consent statement

Informed consent was obtained from all subjects involved in the study: participants in the anonymous internet-based survey granted implied informed consent by submitting the completed survey.

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### Data availability statement

Research data are archived by ESNO and can be obtained upon request.

## Supplemental material

Supplemental material for this article is available online.

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