

# Flu Vaccination Among Patients with Noncommunicable Diseases: A Survey About Awareness, Usage, Gaps and Barriers in Europe

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**Purpose:** People with noncommunicable diseases (NCDs) have a high risk of contracting flu and suffering from its associated complications; however, in many countries flu vaccine uptake in this group is sub-optimal. This survey assessed the knowledge, attitudes, and gaps toward vaccination in general and flu in particular among adults with NCDs in Europe.

**Patients and Methods:** The survey was conducted in France, Italy, Spain, Germany, Poland, Belgium, Portugal, and the Czech Republic. A structured web-based questionnaire was administered to the subjects.

**Results:** In total, 1106 subjects were enrolled, with 61% aged between 41 and 60 years. The main reasons for getting vaccinated were disease prevention and healthcare practitioner recommendations. Protection against infection and the risks of not receiving a vaccination was the most common vaccine information received, followed by information about possible side effects, duration of protection, and need for a booster dose. In the unvaccinated group, there was a lack of belief in the need for a flu vaccine, with a lack of recommendation from treating practitioners, and the experience of mild severity of flu being the main barriers against the vaccine. The physician remained the most preferred and tapped resource for information followed by dedicated websites. Understanding of flu vaccine benefits was particularly widespread among vaccinated patients, yet >50% wanted to know more about them. There was less clarity of the benefits of flu vaccine among unvaccinated patients; however, approximately 50% of them wanted to know more about it. Between January 2021 and December 2022, about 30% and 36% of the vaccinated and unvaccinated individuals, respectively, reported having suffered from flu.

**Conclusion:** Healthcare practitioners are the key influencers for people to get vaccinated. The dissemination of information about the importance of flu vaccines needs to be increased, and clear and explanatory messaging based on country-specific characteristics is important.

**Keywords:** vaccines, influenza, chronic underlying medical conditions, education

## Introduction

The global burden of non-communicable diseases (NCDs), such as cardiovascular disease, stroke, cancer, diabetes, asthma, chronic obstructive pulmonary disease (COPD), and others, is very high, causing 74% of annual deaths worldwide (41 million people).<sup>1,2</sup> This number is estimated to increase to 52 million deaths by 2030.<sup>3</sup> Since the burden of NCDs is increasing due to aging populations and changing lifestyles,<sup>4</sup> it is important to take measures to prevent worsening of the health of people suffering from these conditions. Statistics have shown that people with NCDs are at increased risk of contracting vaccine-preventable diseases (VPDs).<sup>5</sup> These individuals often have a weakened immune system and are more likely to develop VPD-related complications, leading to prolonged morbidity, hospitalization, and even death. Vaccinations against VPDs can be an important preventive measure in people with NCDs.<sup>6</sup>

Influenza is a common VPD that affects millions of people worldwide every year.<sup>7</sup> Patients with NCDs suffering from influenza are more likely to require hospitalization and have a higher risk of death;<sup>5</sup> moreover, influenza can precipitate



an acute event associated with the NCD. For example, patients with preexisting CVD have a greater risk of acute cardiovascular events and mortality associated with influenza.<sup>8–10</sup> Influenza is an independent predictor of in-hospital mortality, adverse clinical outcomes, and increased length of stay in patients with heart failure<sup>11</sup> and can trigger acute exacerbations of asthma and COPD even in individuals with mild disease under good control.<sup>7</sup> Patients with chronic lung disease and diabetes are at increased risk for hospital admission, intensive care unit admission, and need for ventilator support.<sup>12</sup>

The risk of acute exacerbations of COPD was significantly lower in patients vaccinated against influenza.<sup>13</sup> Similarly, influenza vaccination significantly decreased cardiovascular mortality and composite outcomes of cardiovascular events.<sup>14</sup> Among more than 82,000 patients suffering from HF, those against influenza had a 31% lower risk of all-cause mortality.<sup>15</sup> The influenza vaccine also reduces the risk of stroke by approximately 20%.<sup>16</sup> In patients with diabetes, influenza vaccination is associated with a significant decrease in the risk of all-cause mortality, especially in patients aged >65 years,<sup>17</sup> and significantly lowers hospital admission rates for acute cardiovascular and respiratory diseases.<sup>18</sup>

Various international guidelines, such as those of the World Health Organization (WHO), Global Initiative for Asthma (GINA), Global Initiative for Chronic Obstructive Lung Disease (GOLD), European Society of Cardiology (ESC), American Cancer Society (ACS), Centers for Disease Control and Prevention (CDC), and European Centre for Disease Prevention and Control (ECDC), recommend influenza vaccination for people with NCDs.<sup>5,8,19</sup> The EU target for influenza vaccination for adults with a chronic disease is 75%. However, this target has yet to be achieved.<sup>6</sup>

Some previous studies have found a suboptimal uptake of flu vaccine among adult men and women in the EU having preexisting comorbid conditions. A cross-sectional data of 20,569 men and 28,684 women were obtained from the ninth round of the Survey of Health, Ageing and Retirement in Europe (June – August, 2021). It was found that about 80% of the participants reported taking COVID-19 vaccine but only 39% reported taking the influenza vaccine during the last 12 months. The proportion varied considerably at the country level, ranging from over 90% in Germany, Sweden, Netherlands, Spain, Italy, Denmark, Belgium, Portugal, Finland, and Malta to less than 50% in Bulgaria and Romania. Fear of side effects was the most commonly cited cause of vaccine hesitancy.<sup>20</sup> There might be several other reasons for the poor vaccination uptake. One of them could be a general perception that influenza is “not so dangerous” and will not cause major harm.<sup>6</sup> A previous systemic reviews of studies in the general population reported that concerns over safety, lack of trust, lack of need for vaccination, and not wanting to become habituated to an annual vaccine were among the leading causes for hesitancy in taking the flu vaccine.<sup>21</sup> Sociocultural factors, government policies, the availability of information, and other factors might be additional reasons for vaccine hesitancy; however, limited information is available about these factors.<sup>22</sup> In the post-COVID-19 era, vaccine hesitancy and vaccine fatigue have become more frequent. Hence, we surveyed patients with NCDs in 8 European countries to understand the level of knowledge and awareness about influenza disease and the benefits of influenza vaccine. The aim was to determine the knowledge, attitudes, and gaps toward vaccination in general and flu vaccination in particular, which would provide insights on actions that need to be taken to increase awareness about the need for flu vaccination among patients with NCDs.

## Materials and Methods

This was a multi-country online survey conducted between February 2023 and March 2023 among patients suffering from NCDs in France, Italy, Spain, Germany, Poland, Belgium, Portugal, and the Czech Republic. Patients were recruited from a nationally representative population panel of each country. Patients were included according to the following criteria: a) Presence of at least one of the following NCDs in the last 12 months: chronic asthma, COPD, type 1 or 2 diabetes, hypertension, cancer, or cardiovascular diseases; b) patients were vaccinated against the flu between January 2021 and December 2022 (vaccinated group), and patients were not vaccinated against the flu in the last 2 years (unvaccinated group). There were no predefined exclusion criteria.

No statistical calculations were performed to determine the sample size. The sample to be recruited was planned as follows: a) ~80% were aged  $\leq 60$  years, ~20% were aged  $> 60$  years (an exception was Germany, where no patients aged  $>60$  years were included); b) A sample size of 150 patients was planned from the larger countries (France, Italy, Spain, Poland, and Germany), while a sample size of 120 was planned from each of the smaller countries (Belgium, Portugal,

and Czech Republic). The final sample achieved was slightly different in some countries - 145 in Poland, 154 in France, 122 in Belgium, and 115 in Portugal. To ensure that both the vaccinated and unvaccinated populations were well represented, the proportion of individuals vaccinated and unvaccinated against flu between January 2021 and December 2022 was defined based on the flu vaccination coverage in the NCD group in each country. In countries with higher flu vaccination coverage (Germany, France), no proportion was predefined. In countries with moderate coverage (Belgium, Portugal, Italy, and Spain), the proportions of vaccinated and unvaccinated individuals were 40% and 60%, respectively. In countries with lower coverage (the Czech Republic and Poland), approximately 30% of vaccinated subjects were planned to be recruited.<sup>23</sup> There was no prespecified proportion of the type of NCDs to be recruited.

Sample size was determined considering several factors such as specific sub-groups needed for comparative analysis (eg vaccinated vs unvaccinated, between countries), combined with timing requirements and cost-effectiveness. The sample was drawn from large national population panels, which are augmented by carefully selected and vetted supplemental permission-based sample sources. All panels use consent or some other legal basis for processing personal data and are operated in compliance with ISO 20252. All participants provided informed consent, in accordance with the Declaration of Helsinki. Before answering the questionnaire, each participant received information explaining the objective of the survey, how data would be handled, and how the results would be used. To proceed with responses to the questionnaire, participants had to provide consent, else they were not allowed to take the survey. The sample was nationally representative based on the gender of the population surveyed as no quota was set on this variable and assumed there was a natural fall-out. The sample of the population to be surveyed was selected from large population panels through specific recruitment questions before qualifying.

The following quotas were applied in building the sample:

- Quota on age: ~80% ≤ 60 years, ~20% > 60 years (except for Germany: no respondents aged >60 years recruited);
- Quota on vaccination status: Belgium, Portugal, Italy, Spain ~60% unvaccinated; ~40% vaccinated, Czech, Poland ~70% unvaccinated, ~30% vaccinated; France, Germany: natural fallout.
- No quota was placed on gender, assuming natural fallout.
- No weighting was applied to the age groups or vaccination status to allow for a robust sample base for the specific sub-groups for further analysis.
- Soft quotas of 10–15% (depending on NCD) were applied to ensure a minimum number of respondents per NCD group.

The primary objectives of the survey were as follows: a) Find out what NCD patients think of vaccines in general and their reasons for getting vaccinated; b) Find out what NCD patients think of flu vaccines, reasons for getting vaccinated, and their experience with the vaccine and flu; c) Measure the level of awareness of the benefits of receiving a flu vaccine and awareness of flu-related risks and complications; d) To understand the different sources of information on flu vaccines, NCD patients are exposed to and reveal any unmet needs. The secondary objective was to understand the above at each country level.

A structured web-based questionnaire with close-ended questions was administered to the subjects included in the survey. Certified translators translated the questionnaire to the local language. The data were collected by third parties and shared in an aggregated way with the study sponsor, maintaining patient confidentiality according to the applicable laws. The study was conducted in line with the market research definition and in accordance with the European Pharmaceutical Market Research Association (EPHMRA) and British Healthcare Business Intelligence Association (BHIBIA) market research code of conducts (<https://www.ephmra.org/sites/default/files/2022-08/EPHMRA%202022%20Code%20of%20Conduct.pdf>). Its only purpose was to capture the opinion of the participants, and no clinical parameter, efficacy or safety endpoints related to any treatment were investigated. Hence, in line with the guidance provided by the EphMRA, BHIBIA, and the National Health Service Health Research Authority (NHS HRA), the research does not qualify as a clinical study, and Research Ethics Committee review and approval was not required. All methods were carried out following the relevant guidelines and regulations.

## Questionnaire

The first part of the questionnaire included demographic variables such as age, sex, country of residence, highest level of education, employment status, income level, marital status, and diagnostic conditions among the main NCDs.

The second part consisted of questions about the following: a) flu vaccination status in the last 2 years, between January 2021 and December 2022 (vaccinated in the last 2 years → vaccinated group; not vaccinated in the last 2 years → unvaccinated group); b) reasons for getting/not getting vaccinated for flu; c) general perception and experience with the flu vaccine; d) level of awareness about flu-related risks; e) patients' direct experience with the flu and its impact on their health; f) level of awareness about the benefits of receiving a flu vaccination; g) intention to get vaccinated in the future, and why/why not; h) the channel types and specific channels from which they prefer to obtain information; i) willingness to receive further information.

## Statistical Analysis

The responses to the questions are presented as frequencies and percentages. All data from the quantitative survey was analyzed through descriptive statistics such as distribution, frequency count, percentages, and mean both on an aggregate as well as on a single country level. Comparative analyses were conducted between sample sub-groups: eg vaccinated vs non-vaccinated and between countries, using *T*-tests to highlight statistically significant differences. Significance was tested at 90% and 95% confidence interval. Data showing statistical significance difference at 95% CI was highlighted and reported. The analyses were also conducted on the total sample as well as on country-wise subgroups and subgroups of subjects vaccinated and unvaccinated against flu.

## Results

A total of 1106 adult participants were enrolled, 48% of whom were male. The majority (61%) were between 41 and 60 years of age. The most common NCDs were hypertension (58%), type 2 diabetes mellitus (24%), and asthma (21%). Approximately 46% of patients had taken the influenza (flu) vaccine in the last 2 years between January 2021 and December 2022. The baseline characteristics of the subjects are presented in Table 1.

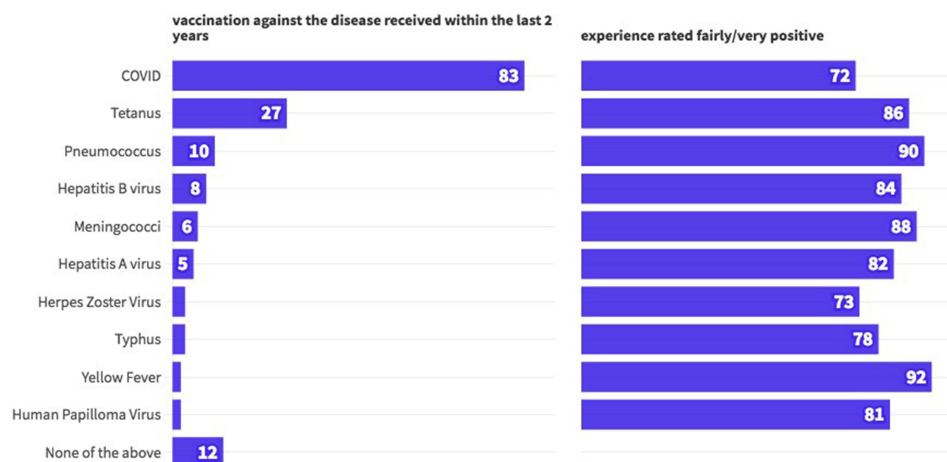
**Table 1** Baseline Characteristics of the Subjects Included in the Survey

	Total	France	Italy	Spain	Germany	Poland	Belgium	Portugal	Czech Republic
Respondents	1106	154	150	150	150	145	122	115	120
Male	48%	41%	51%	53%	53%	42%	44%	50%	48%
Female	52%	59%	49%	47%	47%	58%	56%	50%	52%
18 to 40 yrs.	22%	21%	22%	29%	15%	20%	28%	24%	18%
41 to 60 yrs	61%	59%	57%	51%	85%	59%	52%	59%	62%
>61 yrs	17%	20%	21%	20%	–	21%	20%	17%	20%
Vaccinated against the flu within the last 2 years	46% (n= 507)	58%	41%	41%	75%	30%	40%	46%	30%
Never been vaccinated against the flu	54% (n=599)	42%	59%	59%	25%	70%	60%	54%	70%
Hypertension	58%	49%	55%	51%	58%	67%	59%	63%	62%
Type 2 Diabetes	24%	27%	19%	25%	35%	27%	15%	17%	28%
Chronic Asthma	21%	18%	23%	23%	17%	15%	24%	28%	24%
Cardiovascular Disease (CVD)	10%	11%	5%	8%	16%	16%	10%	6%	10%
Type 1 Diabetes	7%	5%	10%	10%	8%	6%	8%	4%	6%
Chronic Obstructive Pulmonary Disease (COPD)	7%	8%	5%	5%	15%	6%	3%	9%	5%
Cancer	6%	6%	5%	5%	7%	8%	7%	4%	5%

**Abbreviations:** CDC, Centers for Disease Control and Prevention; COPD, Chronic obstructive pulmonary disease; COVID-19, Coronavirus disease 2019; GPs, General Physicians; HCP, Healthcare practitioner; HF, Heart failure; IVR, influenza vaccination rate; NCDs, noncommunicable diseases; VPDs, Vaccine-preventable diseases; WHO, World Health Organization.

### Excluding flu vaccines, in the last two years, have you been vaccinated against any of the following infections or diseases? Overall, how would you rate your experience with getting these vaccinations?

(Proportion of subjects)



**Figure 1** Vaccinations received in the last 2 years and overall experience with them.

Approximately 98% of individuals vaccinated for flu had also taken other vaccines in the last 2 years between January 2021 and December 2022; however, among those unvaccinated for flu, this proportion was only 80%. The vaccination rates for individual diseases in the overall sample ranged between 2% and 27%, except for coronavirus disease 2019 (COVID-19) (83%). (Figure 1).

## Sources of Information and Types of Information Received About Vaccines in General and About Flu Vaccines

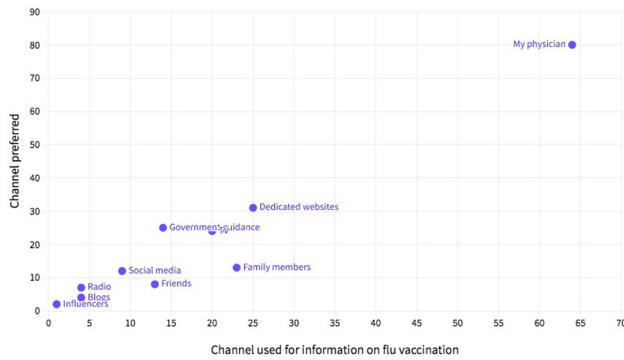
### Sources of Information

Physicians remained the most preferred and most common resource for accessing information on flu vaccines, followed by dedicated websites (Figure 2A). Among those vaccinated for the flu, 84% received information from their physician, whereas only 47% of those unvaccinated did. In Portugal, 91% of patients vaccinated for flu had received information from their physician; however, in Poland, this proportion was 66%. Among patients unvaccinated against flu, the highest proportion of patients who received information from their physician was 58% in Belgium vs only 42% in Poland. Patients primarily received/looked for information on efficacy and side effects.

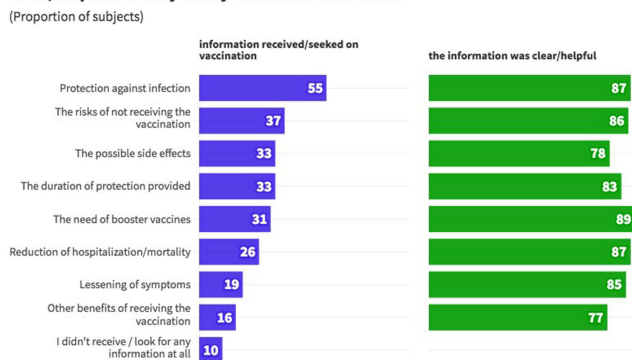
### Information Received About Vaccines in General

Among patients who received at least one vaccine in the last 2 years (excluding COVID-19 only, flu only or flu and COVID only), protection against infection and risks of not receiving vaccination, such as getting the infection and worsening of comorbidities, was the most common information about the vaccines received, followed by information about possible side effects, duration of protection, and need for a booster dose. Most patients were clear about the information they received. Overall, the unvaccinated group reported receiving less information than the vaccinated group did (Figure 2B). In Germany, 50% of all patients (vaccinated and unvaccinated) received information about possible side effects, and 48% did not receive information about the risk of vaccination, such as getting infected, worsening of comorbidities and the need for booster vaccination. This was not statistically different from the data of most of the countries. In contrast, in the Czech Republic, the risk of not receiving a vaccination was explained to only 12% of patients, and only 15% of patients received information about possible side effects.

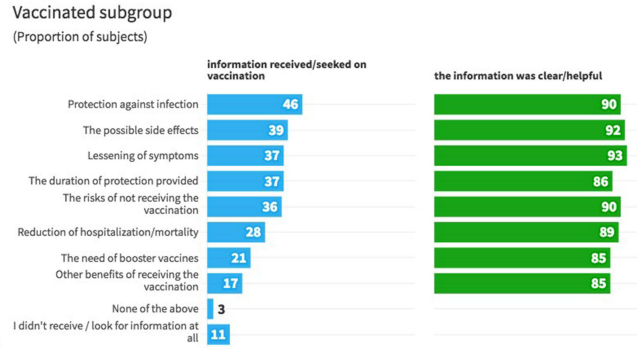
**A. What are the most important channels that have you received or sought information from on flu vaccination? What are the most important channels that you would prefer to receive information concerning flu from?**



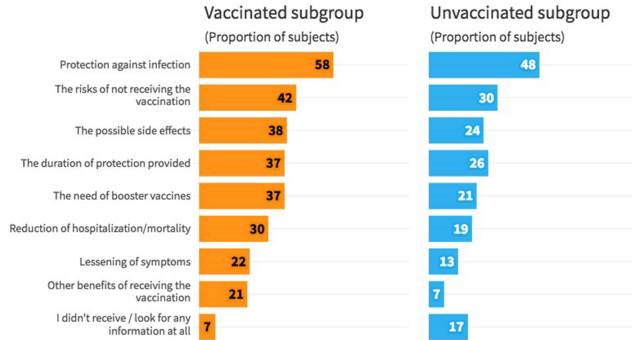
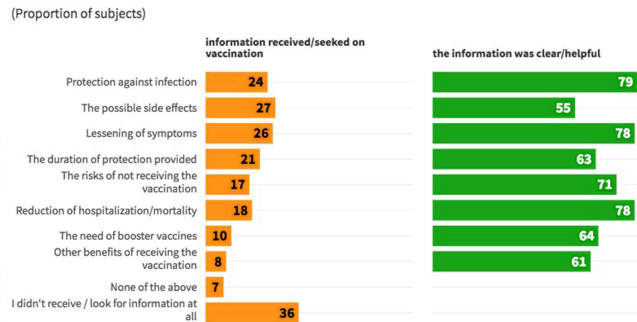
**B. Which of the following information, if any, did you receive or look for regarding the vaccination(s) you received, excluding COVID? Overall, how clear/helpful would you say this information was?**



**C. Which of the following information, if any, have you received or looked for regarding flu vaccinations? Overall, how clear would you say this information was?**



**Unvaccinated subgroup**



**Figure 2** Information about the flu vaccine. (A). Sources from which information about flu vaccination was received and channels preferred for receiving information. (B). Information about the vaccines administered in the last 2 years. (C). Flu vaccination information received/looked for and clarity on information received.

**Information Sought on the Flu Vaccine**

Most subjects vaccinated for flu sought information on its efficacy (protection against infection, duration of protection provided, and risk of not receiving the vaccination) (Figure 2C). The majority of the unvaccinated patients did not receive or look for information on flu vaccines (36% overall).

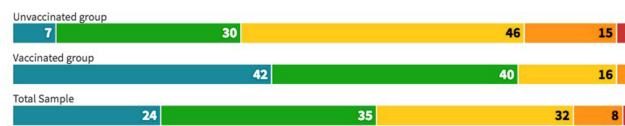
**Satisfaction with the Information Received About the Flu Vaccine**

Respondents claimed to be largely satisfied with the information received about the flu vaccine; the satisfaction was much greater for subjects vaccinated for the flu (Figure 3A). The satisfaction levels were high in France and Germany and much lower in the Czech Republic. In contrast, patients who were unvaccinated against the flu were only moderately

**A. How satisfied are you with the information you have received so far for flu vaccination?**

(proportion of subjects)

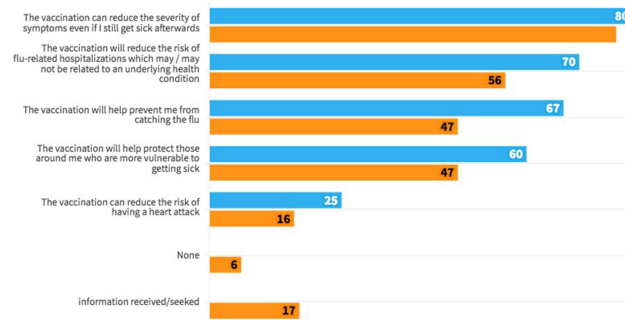
Very positive Fairly positive Neither negative or positive Not very positive Not at all positive



**B. Which flu vaccination benefits are you aware of?**

(Proportion of subjects)

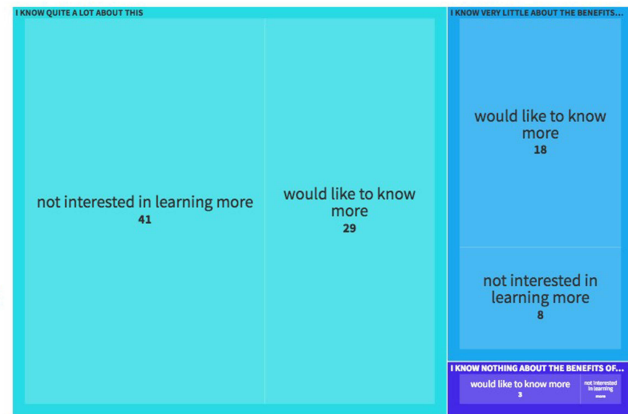
vaccinated subgroup unvaccinated subgroup



**C. Which of the following best applies to your understanding of the benefits of receiving a flu vaccination?**

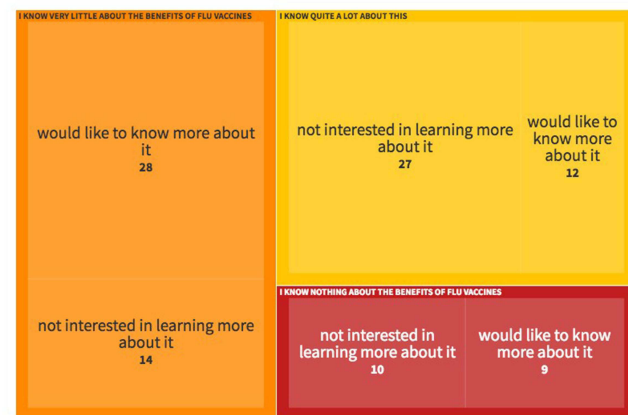
Vaccinated subgroup

Proportion of subjects



Unvaccinated subgroup

Proportion of subjects



**Figure 3** Information about the flu vaccine - part 2. (A). Satisfaction with the information received on flu vaccines. (B). Awareness about the benefits of the flu vaccine. (C). Understanding of flu vaccine benefits and willingness to learn more.

satisfied (46% overall) or not satisfied (17%) with the information. The highest level of dissatisfaction with information among patients unvaccinated against flu was in the Czech Republic (79%), followed by the level in Italy (69%).

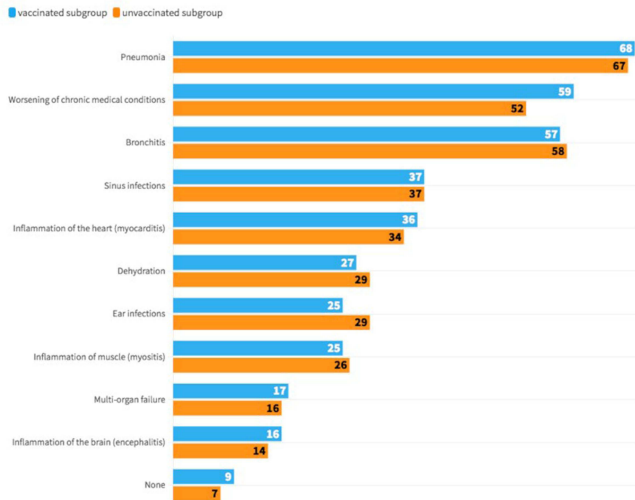
**Awareness About the Benefits of the Flu Vaccine**

Reduced symptom severity and risk of hospitalization were the most common benefits of the flu vaccine, followed by prevention of the flu, which thereby reduced the risk of transmitting the infection to vulnerable people around them (Figure 3B). Understanding the benefits of the flu vaccine was widespread among patients who received it, unlike in unvaccinated patients; however, in both groups, more than 50% wanted to know more (Figure 3C). The unvaccinated subjects were more aware of the possible adverse effects of the vaccine than of the protection it offers. Both vaccinated and unvaccinated patients with NCD were most aware of complications such as pneumonia and bronchitis (Figure 4A). Complications such as myocarditis, myositis, multiorgan failure, and encephalitis are more commonly mentioned in Poland, while pneumonia is more commonly mentioned in Portugal and the Czech Republic.

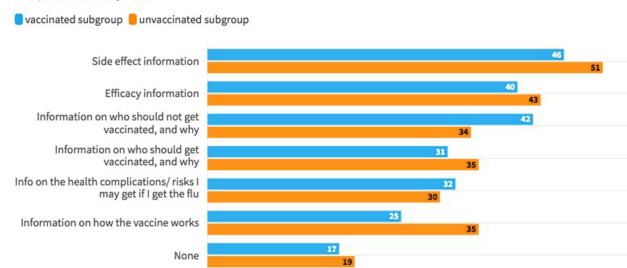
In addition, more than half of the patients who had received the flu vaccine still wanted to know more about the vaccine; this proportion slightly decreased to approximately half among unvaccinated patients (Figure 4B). Additional information that patients like to receive flu vaccination includes side effects (49%), efficacy (42%), and flu-related complications (38%). These percentages were 46%, 40%, and 42% in the vaccinated group and 51%, 43%, and 34% in the unvaccinated group, respectively (Figure 4C). More than 40% of the unvaccinated individuals in Poland, the Czech Republic, and Spain were keener at receiving information about who should not get vaccinated and why.

**A. Which flu-related risks / complications are you aware of?**

(Proportion of subjects)

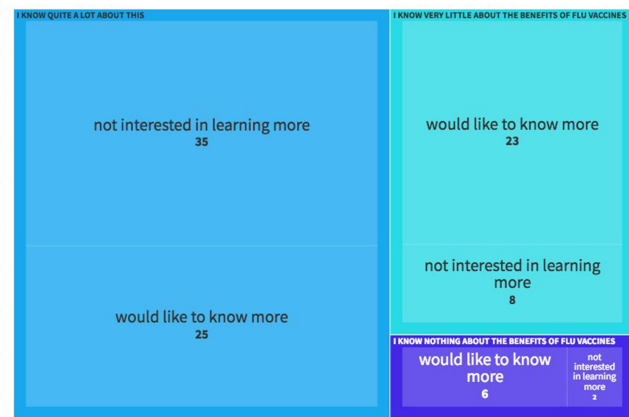
**C. What further information, if any, concerning flu vaccination would you like to receive?**

(Proportion of subjects)

**B. Which of the following best applies to your understanding of the complications related to getting the flu?**

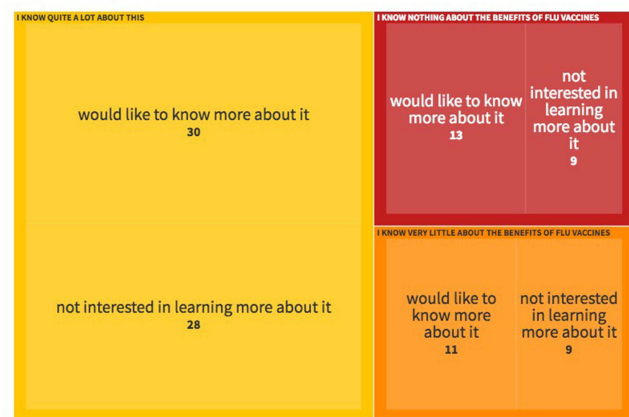
Vaccinated subgroup

Proportion of subjects



Unvaccinated subgroup

Proportion of subjects



**Figure 4** Knowledge about the flu vaccine. (A). Awareness about flu-related risks/complications (B). Willingness to know more about the flu vaccine. (C). Additional information on the desired flu vaccines.

## Barriers and Drivers in General and for Flu Vaccination

Among those who had taken at least one vaccine in the last 2 years, excluding COVID-19 and/or flu, the main reasons for getting vaccinated were disease prevention and healthcare practitioner (HCP) recommendations (Figure 5A). Notably, in Belgium, almost one out of every four subjects took the vaccine because it was mandatory for their job.

In the vaccinated group, the key drivers for receiving the flu vaccination were recommended by general physicians (GPs) (61% overall; particularly high in Spain at 79%), patient initiatives (31% overall, particularly high in Poland and the Czech Republic, at 52% and 47%, respectively), and the presence of underlying conditions (18%) (Figure 5B).

In the unvaccinated group, lack of belief in the need for a flu vaccine (40%), absence of a GP recommendation (39%), and mild severity of flu (30%) were the main barriers to getting vaccinated against flu (Figure 5C). The lack of recommendation from a specialist was an important factor for 25% of the respondents in Portugal and Spain.

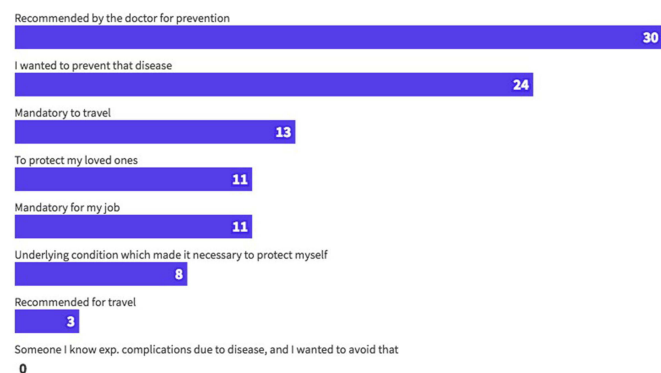
Almost 92% of flu-vaccinated patients said that they are likely or extremely likely to receive a flu vaccine in the future. However, only 33% of the unvaccinated individuals were willing to be vaccinated in the future (Figure 6A and B). This percentage was lowest in Germany.

Physician recommendations, beliefs about the efficacy of flu vaccines and positive personal experience are the main drivers of future vaccination against the flu. The main reasons for the unlikeliness of receiving the flu vaccine in the future include the belief in low possibility of contracting the flu and the inefficacy of the vaccine.



**A. Which of the following statements best describes why you received the vaccine(s)?**

(Proportion of subjects)



**B. Which of the following statements best describes how you got to being vaccinated against the flu?**

Vaccinated subgroup

(Bubble size is proportional to proportion of subjects)

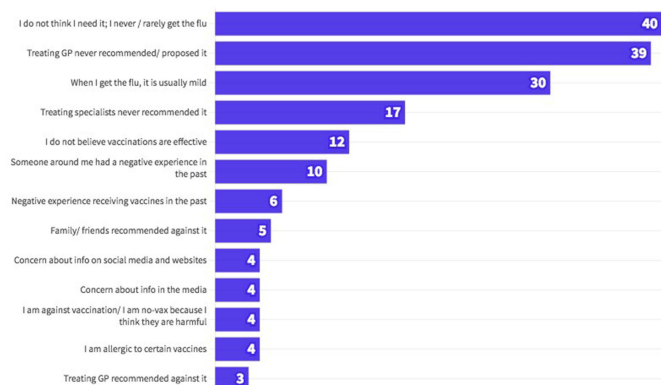
■ HCP recommendation ■ Personal reason ■ Family & friends ■ Other reasons



**C. Which of the following statements best describes why you have never been vaccinated against the flu?**

Unvaccinated subgroup

(Proportion of subjects)



**Figure 5** Motivators and barriers to vaccination (A). Main reasons for getting vaccinated. (B). Reasons for getting vaccinated against flu. (C). Reasons for not getting vaccinated against flu.

## Attitudes Toward Vaccination in General and Toward the Flu Vaccine

In general, most respondents positively perceived vaccinations overall (74%). The perception was particularly positive in Portugal (92%). However, there was a considerably greater positive perception of vaccines in general among those vaccinated for the flu (90% in the overall sample) than among those unvaccinated for the flu (61%) (Figure 7A).

Overall, 60% of the subjects had a positive opinion about flu vaccines (Figure 7B). The percentage was the lowest in the Czech Republic (46%) and highest in Portugal (74%). The Czech Republic also had the highest percentage of negative opinions (20%). Those vaccinated against the flu had the strongest positive opinion of flu vaccines (89%). A high proportion of those unvaccinated were mostly indifferent about the vaccine (42%) (Figure 2A); among Germans, this proportion was 58%, and in other countries, it was usually between 40% and 50%.

## Experience of Suffering from Flu in the Last 2 Years

In the last 2 years, 30% and 36% of the vaccinated and unvaccinated individuals, respectively, self-reported having suffered from flu. This proportion was lowest in France and Germany, while it was highest in Italy, Poland and Portugal. In Spain and Poland, the unvaccinated population self-reported a greater incidence of infection than did the vaccinated population. Nonetheless, these data should be considered with caution because it is based on self reporting and lack of medical or laboratory confirmation of the infection.

**A. What is the likelihood that you will receive a flu vaccination in the future?**

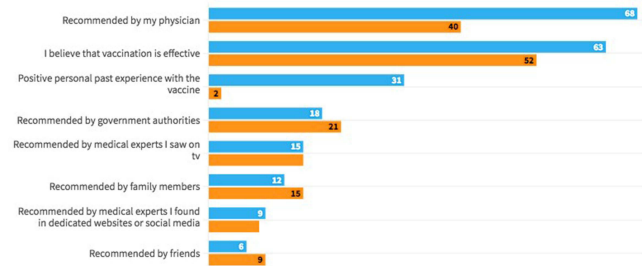
(proportion of subjects)

Very positive Fairly positive Neither negative or positive Not very positive Not at all positive

**B. Which of the following statements best describes the most important reasons for not getting vaccinated in the future?**

(Proportion of subjects)

Vaccinated group Unvaccinated group

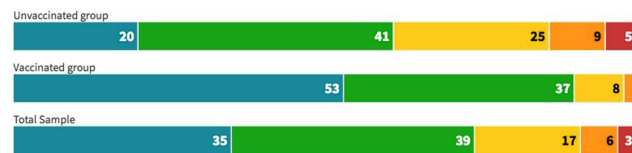


**Figure 6** Likelihood of receiving vaccination against influenza in the future. (A). Likelihood of receiving the flu vaccination in the future. (B). Reasons for not receiving the flu vaccine in the future.

**A. Generally speaking, what is your general opinion about vaccinations?**

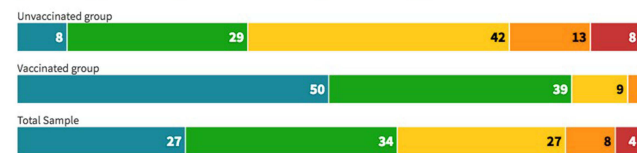
(proportion of subjects)

Very positive Fairly positive Neither negative or positive Not very positive Not at all positive

**B. Overall, what is your general opinion about flu vaccinations?**

(proportion of subjects)

Very positive Fairly positive Neither negative or positive Not very positive Not at all positive



**Figure 7** Attitudes and perceptions about vaccines. (A). General perception about vaccinations. (B). Attitude toward vaccination against flu.

Fever, sore throat, runny nose, and muscle aches were the most common symptoms experienced, and dry cough was the most impactful perceived symptom. Approximately 21% of vaccinated individuals reported to have been hospitalized for flu, compared to 35% of those unvaccinated against flu. Nonetheless, this result should be taken carefully because of the small sample size. Patients whose health was moderately to severely affected by flu also reported a worsening or onset of a complication of one or more of their underlying conditions. Getting the flu also led to reduced compliance with pharmacological treatment of other comorbid conditions, missed visits or medical assessments, and permanent physical decline/loss of independence.

## Discussion

The results of the present survey showed that vaccination uptake between January 2021 and December 2022 was very low, despite an overall positive attitude toward vaccines. It is evident that the recall of messages about information related to vaccines was not very strong. GP recommendations were the main driver of receiving the flu vaccine among 60% of the respondents, reinforcing the role of GPs as key influencers. Other reasons for not receiving the vaccine were the perception that flu is a mild disease, lack of belief in the safety of vaccinations, concerns about adverse effects, and previous negative experiences with vaccines.

Our findings are similar to those of previous studies about the causes of vaccine hesitancy. A study by the WHO and United Nations International Children's Emergency Fund (UNICEF) conducted from 2015 to 2017 reported that the major reasons for vaccine hesitancy, in general, were safety concerns or fear of side effects; lack of knowledge of vaccination; and its importance, in addition to religious, cultural, gender, and socioeconomic issues.<sup>6</sup> A systematic review of 470 studies investigating influenza vaccine hesitancy reported that the absence of reminders for action, low perceived benefit of vaccination, negative outlook toward influenza vaccines, and misunderstandings about the flu itself or the flu vaccine were the most frequent and consistent barriers to vaccination.<sup>24</sup>

Factors associated with influenza vaccine uptake are also influenced by cultural background, level of government support, medical resources, and acceptance of the influenza vaccine in the general population.<sup>25</sup> This was evident in our results where the uptake of flu vaccine was higher in some countries due to various factors. For eg, in Belgium, almost one out of every four subjects took the vaccine because it was mandatory for their job, and patient initiatives influenced the flu vaccine uptake in Poland and the Czech Republic. The WHO has suggested that influenza vaccination rates (IVRs) should reach 75% among older adults and individuals with chronic diseases. However, European Union Member States have been far from the 75% target. In Dec 2018, 75% of the states achieved the target IVR for vulnerable groups.<sup>23</sup> In Germany, people aged  $\geq 60$  years reached the highest IVR rates in 2018–2019. The rates were greater for those aged 70–79 years than for those aged 60–69 years. However, the IVR in people aged  $< 60$  years was very low.<sup>26</sup> The incidence of IVRs in Portugal, Spain, and Italy in 2017 among the elderly population was 60.8%, 55.7%, and 52%, respectively.<sup>27</sup> There was some progress in 2021–2022, with Portugal achieving 83.9% IVR among people aged  $\geq 65$  years and Spain achieving 62.4%.<sup>28</sup>

Globally, vaccination uptake among healthcare professionals is also quite low. The barriers include fear of vaccination leading to influenza, perception of low risk to self, belief in the capability of their immune system, laziness, and false beliefs.<sup>29,30</sup> Physicians who are not convinced about the need for a flu vaccine are unlikely to be able to effectively convince patients to take the vaccine. The CDC has suggested various measures to increase awareness among healthcare professionals and influenza vaccine uptake.<sup>31</sup> In Poland, vaccination coverage among healthcare workers is only 5%. Lack of time and laziness are the most common reasons for refusal of the vaccine among physicians (45% and 15%, respectively).<sup>32</sup> If physicians do not believe vaccines are effective, they are unlikely to recommend them to their patients, as seen in the low level of GP recommendation for flu vaccines in Poland observed in our survey.

According to a meta-analysis of 23 studies, perceptions such as vaccine efficacy and safety and adverse events were more influential than the level of knowledge on influenza and its vaccination. Advice from doctors, health professionals, family, and friends, as well as free vaccinations, motivated people to take the flu vaccine.<sup>33</sup> Another meta-analysis of 522 studies from 68 countries/regions reported similar findings.<sup>25</sup> A systematic review of 36 studies among patients aged  $\geq 60$  years suggested that vaccination campaigns focusing on the protection of the family might increase vaccination uptake among elderly people. Elderly people look up to medical personnel as authorities, and acceptance of vaccination could be greater if healthcare staff promoted vaccination. Peer education can be another useful tool for increasing vaccine uptake in elderly people. A lack of convenient transport options and financial burdens were the leading barriers for elderly people.<sup>22</sup> Some of the best practices of other countries might help increase IVR. These include an extension of the influenza vaccination campaign until the end of February in France, the administration of the flu vaccine to everyone older than 50 years (rather than only those aged  $> 65$  years) in Ireland, and the recommendation of the flu vaccine to the entire population in the 2021–2022 season by the government.<sup>28</sup> A decision-analytic model in 2012 showed that IVRs could increase from 13.5–40% among people aged  $\geq 65$  years in Poland under a free vaccination policy.<sup>34</sup> Thus, increasing vaccination access might increase IVR. Two studies used tools for behavioral nudges to increase influenza vaccination among patients with NCDs and the elderly. During the 2022/2023 influenza season, Denmark conducted the NUDGE-FLU (Nationwide Utilization of Danish Government Electronic Letter System for Increasing InFLUenza Vaccine Uptake) trial to test the effect of electronic letters on influenza vaccination uptake among older adults aged  $\geq 65$  years. The study randomized 964,870 Danish citizens  $\geq 65$  years to receive an electronic letter highlighting the cardiovascular benefits of flu vaccine. It increased the influenza vaccination rates by 0.92%.<sup>35</sup> On similar lines, the Danish government has now initiated the NUDGE-FLU-CHRONIC and NUDGE-FLU-2 trials to evaluate the effectiveness of nudges delivered via the Danish governmental electronic letter system in increasing influenza vaccination among patients with chronic diseases and older adults, respectively.<sup>36</sup> In France, a prospective QR code-based information campaign was implemented in 2022–2023 to assess the impact on influenza vaccine perception using a digital tool among outpatients and healthcare workers. QR (Quick Response) codes were displayed on posters for patients and their companions, as well as in the letters sent to healthcare workers. On scanning the code, users could anonymously access a web application (ELEFIGHT<sup>®</sup>), which provided information on influenza and encouraged them to discuss influenza prevention with their physicians. Patients were also invited to complete a questionnaire regarding their perception of the influenza vaccine. Responses to the questionnaire showed that 90.7% of patients maintained the same position (neutral,

favorable, or unfavorable) about the flu vaccine before and after consulting the application. The relative variations in favor of vaccination were + 7.2% (unfavorable then favorable) and + 19.8% (neutral then favorable). The study thus showed the positive impact of an electronic nudge to improve the perception of influenza vaccination among patients and/or their families during outpatient consultation.<sup>37</sup>

The following additional measures have been suggested to be effective. For medical personnel, training programs on vaccines alone had limited influence. Instead, training courses for office teams oriented toward the management of a particular disease increased flu vaccination rates by 22%. Standardized checklists to assess the indication for vaccination were also effective.<sup>32</sup> Another approach being explored is training HCPs for motivational interviewing (MI). MI is a framework that can be used by clinicians in busy practices to guide vaccination conversations. It is an evidence-based communication style to support HCPs in their dialogue with vaccine-hesitant patients by cultivating trust.<sup>38</sup>

For patients, text-message reminders to remind patients about vaccination had no advantage over letters or postcards. However, written reminders addressed directly to patients were more effective. The use of financial incentives was most effective. Another successful touchpoint might be the emergency room, where the proportion of patients at risk is much greater than that of the total population.<sup>32</sup> Pharmacists can be useful resources to improve flu vaccination uptake. During the COVID-19 pandemic, many pharmacists around Europe were involved as vaccine administrators and showed a positive impact in improving vaccine uptake. They played an important role in the education and training of HCPs and patients, facilitation of routine clinical services, vaccine logistic support, and administration of COVID-19 vaccines. This positive experience with pharmacists in influencing vaccine uptake gained during the COVID-19 pandemic can be leveraged to increase the uptake of vaccines for preventable diseases among patients with NCDs.<sup>39</sup> Some experts in Italy have proposed Immunization Information Systems (IISs) to address vaccine hesitancy. They recommend developing an Italian National Vaccination Registry, to facilitate real-time tracking of individuals' vaccination status.<sup>40</sup> Nevertheless, drivers and barriers to vaccination might vary by country, and a uniform strategy cannot be adopted. Strategies need to be customized according to the challenges in each country and aligned with the respective cultural factors.

There were several limitations to our survey. The sample size for the survey was not based on statistical calculations, but only as a meaningful number in the field research for opinions. Assessing attitudes and perceptions by age group or disease status at the country level was not planned and could not be conducted post-hoc due to limited sample size. We also did not investigate whether specific country-level policies were barriers or drivers of flu vaccine uptake. This could be an interesting objective for future research. Furthermore, the proportion of vaccinated and unvaccinated patients, as well as the prevalence of each NCD do not reflect actual epidemiological data. Another limitation is that the survey covered only one season. It was conducted immediately after the COVID-19 pandemic when many people were likely to be suffering from vaccine fatigue. This could have impacted the flu vaccine uptake.

## Conclusion

People with NCDs are at risk of being infected by the flu virus, with consequent worsening of the underlying NCD. However, flu vaccination coverage remains far below the target of 75% in this population. The major reasons for low coverage seem to be the perception of flu being a mild disease without serious consequences. The survey results showed that HCPs are the key influencers for people to take the vaccine. Hence, sensitizing HCPs to propagate this message is crucial. Implementing and expanding vaccine literacy among HCPs is the key driver for flu vaccination uptake among people with NCDs. Strategies such as the MI framework could help HCPs address vaccine hesitancy among patients. The dissemination of information about the importance of flu vaccines among patients with NCDs needs to be increased, and clear and explanatory messaging based on country-specific cultural factors is important. Tools such as electronic nudges have shown promise in increasing the uptake of flu vaccines. The use of technology, such as the creation of national vaccination registries can help in tracking non-vaccinated individuals with NCDs who can then be counselled about the importance of taking the vaccine. Multidisciplinary approaches such as involving pharmacists are other useful approaches in encouraging people to take the vaccine.

## Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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