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Influenza vaccination coverage rates in the general population and risk groups: A review of the current international situation

Wyszczepialność przeciwko grypie populacji ogólnej oraz grup ryzyka – przegląd aktualnej sytuacji na świecie

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Summary

Although several national and international recommendations have been published, influenza vaccinations are carried out too rarely and thus vaccine coverage rates, both in the general population and in risk groups, remain at an unsatisfactorily low level. The paper presents the current data describing influenza vaccine coverage rates in different countries, in the general population and risk groups (including patients with chronic diseases, pregnant women, children the elderly) and health care workers. It is emphasized that there are many limitations related to the estimation of coverage rates. Methods that are currently used for the assessment of influenza vaccination coverage rates include the following: an analysis of data from health care facilities or providers, from national health insurance records, from well-documented national or private vaccine programs targeting at specific smaller groups, evaluation of national vaccine register, and national surveys of individuals. The establishment of coverage rates among specific groups usually requires another approach with the use of individual web – or telephone – based surveys, which is why selection bias and recall bias should be taken into consideration while discussing the results. The most common drivers and barriers for influenza vaccination are also identified and presented in the review.

Keywords: **influenza • hesitancy • vaccine • coverage rate • drivers • barriers**

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Abbreviations: **AMRO** – WHO's Regional Office for the Americas, **BRFSS** – Behavioral Risk Factor Surveillance System, **CDC** – Centers for Disease Control and Prevention, **ECDC** – European Centre for Disease Control and Prevention, **EU** – European Union, **HCP** – health care personnel, **HCWs** – health care

workers, **HIS-Flu** – National Immunization Surveys-Flu, **IFPMA IVS** – International Federation of Pharmaceutical Manufactures and Associations Influenza Vaccine Supply, **NHIS** – National Health Interview Survey, **PAHO** – Pan-American Health Organization, **USA** – United States of America, **VCRs** – vaccine coverage rates, **VENICE** – Vaccine European New Integrated Collaboration Effort, **WHO** – World Health Organization.

INTRODUCTION

No other topic raises as many questions and controversy among patients and medical staff as influenza vaccines.

Although various national and international experts (World Health Organization (WHO), European Centre for Disease Control and Prevention (ECDC), Centers for Disease Control and Prevention (CDC)) recommend influenza vaccines, coverage rates for this vaccine in the general populations and in the risk groups in many countries are still below the recommended values. WHO recommends that > 75% of the elderly at the age above 65 should be vaccinated [52]. Healthy People 2020 program in the US assumes that > 90% of health professionals, adults in the risk group and senior citizens at the age of > 65, as well as 70% of children and adults without risk factors should be vaccinated [47].

In the scientific literature there are a lot of publications that describe influenza vaccine coverage rates (VCRs) in general populations and in risk groups. However, it is often difficult to compare the data between countries or regions due to the methodology differences and limitations connected with them. Methods that are currently used for the assessment of influenza VCRs include the following: an analysis of data from health care facilities or health care providers, analysis of data from national health insurance records, analysis of administrative data from well-documented national or private vaccine programs targeting at specific smaller groups, evaluation of national vaccine register, and national surveys of individuals [51]. Establishment of VCRs among specific groups (such as health care workers, residents of long-term care facilities, pregnant women, risk group patients with chronic diseases) usually requires a slightly different approach with the use of individual web – or telephone – based surveys, which is why selection bias and recall bias should be taken into consideration when discussing the results [51]. Globally, certain seasonal influenza VCRs data are available from Pan-American Health Organization (PAHO) for the states located in the region of the WHO's Regional Office for the Americas (AMRO). In Europe, data is available from the Vaccine European New Integrated Collaboration Effort (VENICE) and ECDC [37]. In 2008 the International Federation of Pharmaceutical Manufactures and Associations Influenza Vaccine Supply (IFPMA IVS) developed a survey methodology to assess the global distribution of influenza vaccine doses (dose distribution can serve as a proxy for VCRs when there is no coverage) [37].

INFLUENZA VACCINE COVERAGE RATES – GENERAL POPULATION

For many years, the highest VCRs have been observed in the US. The CDC estimates the annual influenza vaccination coverage for the United States using the data from several nationally representative surveys: the Behavioral Risk Factor Surveillance System (BRFSS), the National Health Interview Survey (NHIS), and the National Immunization Surveys-Flu (NIS-Flu). Internet panel surveys of adults, health care personnel, and pregnant women are also used [8]. In the 2015/2016 season, 45.6% of the general population (all persons were 6 months old or older) were vaccinated against influenza [8]. The VCRs for influenza was similar to the coverage reported at the same time in the previous influenza season and no racial/ethnic differences were reported. The influenza VCRs for the adult population (> 18 years) was 41.7% in the 2015/2016 season, so there was a slight decrease compared with the previous seasons (41.5% in 2012/2013, 42.2% in the 21013/2014 and 43.6% in 2014/2015 season). The coverage among adults (> 18 years) increased with older age (32.7% for people aged 18-49 years, 43.6% for people aged 50-64, 63.4% for people aged > 65 years) [8].

In Canada the seasonal influenza VCRs was essentially stable in the age group 12-64 years with no chronic conditions between the 2006/2007 (23%) and 2013/2014 season (22%), except for a dip during the 2009 A/H1N1 pandemic (17%) [4].

In recent years, a decreasing trend of influenza VCRs has been observed in European countries, with the coverage rates in the general population ranging from 0% (Lithuania) to 33% (Germany) [45]. Table 1 presents data referring to median VCRs in the general population [45]. Although Poland was excluded from the analysis provided by Spruijt et al. (2016), the decreasing trend in influenza vaccination is observed with stagnating low VCRs (3.4-3.8%) in the total VCRs in the 20016/2017 and 2016/2016 season [30]. Some European countries (England and Ireland) do not assess influenza VCRs for the general population, focusing on risk groups mentioned below [45].

INFLUENZA VACCINATION COVERAGE RATES – RISK GROUP PATIENTS

Vaccination is especially important for people at higher risk of serious influenza complications, and for people who live with or care for high risk individuals. WHO recommends seasonal influenza vaccinations for pregnant women (highest priority), children aged 6-59 months,

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Table 1. Influenza vaccine coverage rates for the total population in selected European countries [45]

Country	Season included	Median vaccination coverage (%) (min-max)
France	2001/2002 – 2011/2012	21 (18-24)
Germany	2001/2002 – 2012/2013	27 (17-33)
Hungary	2006/2007 – 2013/2014	10 (9-12)
Italy	1999/2000 – 2013/2014	18 (11-20)
Latvia	2003/2004 – 2013/2014	1 (0-14)
Lithuania	2005/2006 – 2012/2013	6 (2-8)
the Netherlands	1991/1992 – 2013/2014	18 (7-22)
Portugal	2001/2002 – 2013/2014	17 (14-20)
Romania	2004/2005 – 2012/2013	8 (3-17)
Slovakia	2006/2007 – 2013/2014	10 (5-13)
Spain	2002/2003 – 2012/2013	23 (14-24)

elderly people, individuals with specific chronic medical conditions, health care workers (HCWs) [52]. With regard to these risk groups, available data on vaccination coverage levels for influenza is presented below.

PREGNANT WOMEN

In the 2016/2017 season, VCRs among pregnant women before and during pregnancy in the US was 46.6% as compared with 40.2% in the previous season [7].

In the EU, the influenza vaccine is recommended for pregnant women in the majority of countries (28/31 Member States in the 2012/2013 season); however, there are certain differences related to the recommendations for vaccination in the second or third trimester of pregnancy or in any period of pregnancy for all pregnant women or only for pregnant women with chronic diseases [14]. Data concerning implementation of recommendations in European countries is incomplete due to the fact that not all countries collect and analyze such data (in the 2014/2015 season only 5 countries reported VCRs in pregnant women as compared with 7 countries in the previous seasons) [13, 14]. The highest rates were observed in the UK (44.1% in England and 56.1% in the Northern Ireland) and the lowest in Lithuania (0.2%). The mean VCRs for the EU amounted to 23.6% (the 2014/2015 season) [13].

There are single reports in the scientific literature on the influenza VCRs in other regions. Yamada et al. stated that 51% of pregnant women were vaccinated against influenza in the 2013/2014 season in Japan (there were significantly more vaccinations among women at the age > 25) [54]. Kim et al. reported VCRs in pregnant women in Korea to be at the level of 16% (the year 2012) [20]. VCRs in pregnant women in Melbourne (Australia) oscillated at the level of 30-40% (the years 2010-2011) [27]. In Thailand influenza VCRs among women in current pregnancy was 1% in the 2010-2012 period [36].

THE ELDERLY

According to CDC data, VCRs for influenza vaccine among the elderly (> 65 years) was 63.4% in the 2015/2016 season (a decrease of 3.3 percentage points compared to the previous season) [8]. In Canada a substantial drop in the coverage rates among those older than 65 was observed (69% in 2006/2007 and 60% in 2013/2014 [4].

Influenza VCRs among 'older age groups' (as defined in accordance with country recommendations, e.g. ≥55, ≥59, ≥60 or ≥65 years of age) for influenza seasons 2013-2014 and/or 2014-2015 were reported by 25 EU countries [14]. Although vaccination is recommended for older age groups in all countries, five of them (Austria, Bulgaria, Cyprus, Greece, and Liechtenstein) were not able to provide VCRs for older age groups. Belgium and the Czech Republic, for the first time in the 2014/2015 season, provided VCRs for people of 65 years of age and older who also suffered from a chronic medical condition [14].

In the European Union (EU) the overall VCRs among the elderly decreased from 57.4% in 2004 to 53.5% in 2014. Spectacular drops were seen in Slovenia (from 30% to 11%), Slovakia, Luxemburg, France, Croatia and Italy (decrease of over 20%). It is suspected that these declines may be related to changing vaccination behaviors and beliefs following the 2009 flu pandemic: the increased rates of vaccination across European countries during the pandemic, and the decrease in overall rates to the level below the pre-pandemic levels in subsequent years. A significant increase was reported in the Czech Republic, Denmark and Portugal (over 30% in the time period 2004-2014). The largest increase was noticed in Lithuania (from 1.8% to 21.1%).

VCRs varied from 1.1% to 76.3% in 2014-2015; the median VCRs for the same season was 45.5% for the EU countries [35]. The highest VCRs were reported by the United Kingdom, which achieved (United Kingdom – Scotland) or almost achieved (United Kingdom – England, United Kingdom – Northern Ireland) the EU target of 75% [13, 14, 35]. There was a high variation across countries with over a 50-fold difference between the highest and the lowest rates (Estonia 1.4%, Latvia 2.8%) [14].

In some countries, influenza VCRs among the elderly are low but still remain higher than compared to the general population rates. A good example of this phenomenon is Poland where VCRs among the elderly is 14%, while in a general population it is even 4 times lower (3.4% in the 2015/2016 season) [30]. This may be explained by the fact that free of charge influenza vaccines for the elderly are offered by some local governments, but not at the national level (generally, influenza vaccination is recommended but no reimbursement is provided) [33].

Influenza VCRs among the elderly in previous seasons in selected European countries are presented in Table 2 [45].

CHILDREN

Influenza vaccinations are recommended for children under 59 months of age due to the high risk of complications and hospitalization. Children represent the main reservoir of the influenza virus; therefore, it is recommended to vaccinate them in order to reduce the transmission of the virus in the population. Data concerning the vaccination coverage among children in many countries vary and they are often incomplete, which results, e.g., from the differences in the reporting methodology and age ranges, for which the data is collected and analyzed.

In the 2015/2016 season in the USA, 59.3% of children 6 months through 17 years were vaccinated against influenza (a result that is similar to the previous season) [8]. An increasing trend in the VCRs in this group had been reported since the 2009/2010 season (43.7%) [8]. Contrary to the adult population, the influenza VCRs in children decreased as the age increased: 75.3% for the children of 6-23 months, 66.8% for the children at the age of 2-4 years, 61.8% for the children aged 5-12 years and 46.8% for adolescents of 13-17 years of age [8].

Data regarding influenza VCRs in Europe are limited. VCRs are rather low or even extremely low in young children (0.1% in Latvia in the 2010/2011 season among children aged 6-24 months, 1% in children younger than 5 years in Poland in the 2010/2011 season, 0.9% in Estonia among children and adolescents below the age of 14 years), while higher rates were reported among school children (16.7% in France among children aged 10-19 years in the 2010/2011 season) [28].

PATIENTS WITH CHRONIC DISEASES

Influenza VCRs among individuals with chronic medical conditions (e.g., pulmonary diseases, cardiac diseases, renal diseases, metabolic disorders and immunosuppression due to the disease or treatment) in influenza seasons 2013/2014 and/or 2014/2015 were reported by seven Member States of the EU. The remaining 23 countries were not able to report VCRs for individuals with chronic medical conditions [14]. The influenza VCRs in the European risk group patients ranged from 21% to 71.8% (2014/2015 season), while the median VCRs for this season was 49.8% [14]. The highest VCRs for people with chronic medical conditions were reported by the United Kingdom – Northern Ireland. The Northern Ireland reached the EU target of 75% in the 2013/2014 season, but it missed the target in 2014/2015 by a low margin [14].

Table 2. Influenza vaccine coverage rates among the elderly in selected European countries [45]

Country	Seasons included	Median vaccination coverage (%) (min-max)
Denmark	2002/2003-2013/2014	49 (30-55)
England	1996/1997-2012/2013	72 (49-75)
France	2001/2002-2013/2014	64 (52-67)
Germany	2000/2001-2012/2013	49 (31-59)
Ireland	2003/2004-2013/2014	61 (41-68)
Italy	1999/2000-2013/2014	63 (41-68)
Latvia	2006/2007-2013/2014	2 (2-3)
the Netherlands	1991/1992-2013/2014	81 (28-84)
Portugal	1998/1999-2013/2014	45 (31-55)
Romania	2004/2005-2012/2013	19 (15-36)
Slovakia	2006/2007-2013/2014	25 (15-36)
Spain	1997/1998-2013/2014	64 (56-70)

Influenza VCRs for residents of long-term care facilities for the 2012/2013 influenza season were provided by the following three Member States: Ireland, Portugal and Slovakia, and they were 73%, 89% and 71.1%, respectively [13].

In Canada, a decreasing trend was reported for patients aged 12-64 with > 1 chronic condition (39% in the 2006/2007 season and 36% in 2013/2014) [4].

Xu et al. reported influenza VCRs among children aged 2-7 years at the level of 12.2% in the 2014/2015 season and 12.8% in the 2015/2016 season in China [53].

INFLUENZA VACCINE COVERAGE RATES – HEALTH CARE WORKERS (HCWS)

Influenza among health care personnel (HCP) can result in lost workdays for HCP and it can spread both to other members of the HCP and to patients who are at a higher risk of serious influenza complications [32]. The Advisory Committee on Immunization Practices (ACIP) recommends that all HCP should receive an annual influenza vaccination [38]. HCWs are also a priority group for influenza vaccination according to WHO recommendations [52].

In the US, CDC analyzed data from an Internet panel survey conducted among HCWs, which indicated that in the early 2016/2017 influenza season the influenza VCRs 68.5% and it was similar to or even slightly higher than the early-season coverage during the 2015/2016 season (66.7%) [6]. This means that the influenza VCRs among HCP has improved over the past six influenza seasons, but it still remains below the national Healthy People 2020 target of 90%. The highest coverage was reported among physicians (83.0%), nurse assistants (82.8%), pharmacists (81.4%), nurses (80.7%), and other clinical professionals (72.3%), while the lowest one was among administrative and nonclinical support staff (65.3%), assistants and aides (56.8%). With regard to the work setting, the highest VCRs was among HCP working in hospitals (80.8%), and the lowest among staff working in long-term care (LTC) settings (55.1%) [6].

Influenza VCRs for the 2013/2014 and 2014/2015 seasons were provided by 13 Member States of the EU. The median VCRs in 2014/2015 amounted to 24%. The highest VCRs were reported by the United Kingdom (except Northern Ireland), Hungary and Romania. In the 2014/2015 influenza season, Cyprus, for the first time, reported VCRs data on HCWs. In addition, two Member States (Ireland and Portugal) reported VCRs among HCWs working in long-term healthcare settings (25.7% and 22%, respectively) [14]. It is estimated that influenza VCRs in Poland may vary from 6% to 24%, depending on the data source and season [31]. In Canada, pool data from a cross-sectional study covering the period 2007-2014 indicated 50% of HCWs (occupation type range 4%-72%) [5]. Compared with the general working population, family physicians and practitioners were most likely to be immunized against influenza [5].

INFLUENZA VACCINATION ATTITUDES AND BELIEFS

It is estimated that 60-80% of the population of the developed countries support vaccinations, whereas 1-2% oppose them (opponents) and 10-20% are hesitant [10]. With regard to influenza vaccinations, it can be assumed that these proportions are different, and it can be claimed that the proportions between the hesitants and the supporters are reversed. Generally, vaccine hesitancy describes the acceptance of vaccines and it is referred to the delay in the acceptance or refusal of vaccinations despite the vaccination availability. Vaccine hesitancy is complex and context specific, depending on the access time, place and vaccines [25, 43]. Influenza vaccines have some special characteristics that should be taken under consideration when discussing the vaccine hesitancy: vaccine effectiveness may vary annually, vaccination is needed every season, and there are influenza-specific myths (e.g. a flu shot may cause influenza) [43].

Influenza vaccine hesitancy may be analyzed at several levels: micro-level (characterized by psychological profiles that refer to psychological models of health decision making and behavior), mezo-level (proposed by the SAGE working group: individual, social and contextual issues play a role in the vaccine decision making); macro-level (complacency, convenience, confidence and calculation are important influencing factors (so-called 4C model)) [22, 43].

The number of articles on influenza vaccine hesitancy is increasing over time. After a full-text analysis of 470 articles, 258 (!) independent barriers for influenza vaccination were found that were divided into four groups: psychological (including the perception of the utility of the vaccine as a function of the benefits and risks associated with the vaccination, e.g. issues referring to vaccine safety, risk perception of the disease, social benefits of the vaccination, past behavior and experience related to the vaccination), sociodemographic (e.g. age, gender, financial status), contextual (e.g. access to vaccines and vaccinations, interactions with health care system) and physical barriers (unhealthy lifestyle) [43]. It has been proven that barriers for seasonal and pandemic influenza uptake are very similar; however, differences occurred with regard to the '4C' profiles (Table 3) [43]. For both seasonal and pandemic vaccines, the most frequently reported barrier for the vaccine uptake was previous behavior (missed influenza vaccine in the previous seasons was the most often reported barrier). Likewise, the influence of age, gender and additional risk factors (including chronic diseases) was similar. From the perspective of a macro-level, lack of confidence (e.g. a negative attitude, misconceptions about the disease or the vaccine) was the most common reason for the lack of seasonal influenza vaccines, while complacency (e.g. low

worry and perceived risk of the disease) was a major barrier for pandemic influenza vaccine uptake [43].

PSYCHOLOGICAL ASPECTS FOR INFLUENZA VACCINATION

One of the most common reasons for abstaining from vaccinations is disregard of the disease, and a belief that the disease is either rare or benign [43]. In the case of diphtheria or poliomyelitis vaccination, patients underestimate the diseases that have not been present in their place of residence for many decades. They forget that the disease continues to occur in other countries, and that a significant improvement in the epidemiological situation is the result of mass vaccination carried out for many years. However, in the case of influenza, patients underestimate the disease for other reasons. Some doctors and patients mistake influenza with a cold and, therefore, consider it to be a benign, self-limiting disease without the risk of complications. In this context, it is necessary to provide good virological and epidemiological surveillance of influenza at the national and regional level, as well as prompt reliable publication of the data used, and provide professionals, patients and the media with full and easy access to this data. In order to obtain the fullest possible data on the incidence of influenza, complications of influenza, ambulatory consultations, hospitalizations and deaths, it is necessary to correctly identify influenza-associated illnesses (the spread of quick diagnostic tests for influenza together with the ability to interpret them and knowledge their weaknesses and strengths; providing access to and financing of molecular biology methods is also necessary). When appropriately publicized and used, reliable and representative data on the influenza incidence and the number of influenza and respiratory complications can change the perception of influenza as a rare ('overrated') and benign disease.

Perceiving the disease as having a low risk was identified as a barrier for influenza vaccination in most risk patient groups (pregnant women [3, 49], HCWs [29] and the general public [39, 44]).

Another reason for not being vaccinated against influenza is the belief that 'this disease affects other people, not me', i.e. not perceiving oneself as a person who may be affected by the disease and its complications ('I am not at risk') [43]. In this aspect it is necessary to intensify various educational activities aimed at improving knowledge about the disease (source of infection, transmission routes, risk factors for complications, and complications). The recipients of educational activities should be both patients (e.g. women of childbearing age, pregnant women, persons in contact with children up to 5 years of age and immunosuppressed patients, senior citizens, patients with chronic diseases) and medical personnel. In the case of medical workers, it is important to establish the belief that influenza can be a hospital-acquired infection, and that the medical staff can be infected by patients and they can infect patients [32].

It has also been shown that HCWs are more likely to be vaccinated after 50 years of age, which may be due to the fact that older people are more likely to be diagnosed with long-term illnesses or due to the long professional experience [11]. It has been confirmed that medical personnel more frequently and more willingly perform influenza vaccinations to protect themselves against influenza and its complications, and less frequently they decide to do it from altruistic motives to protect their patients from getting sick and to implement the so-called cocoon strategy [18]. The desire to protect a child from influenza is also an important factor when pregnant women or women in the puerperium make a decision regarding vaccination; therefore, obstetricians, midwives, pediatricians and nurses looking after newborns should be aware of this factor [46].

Another common cause of non-vaccination against influenza is an exaggerated fear of adverse events following immunization (AEFI). The most frequently repeated myths about influenza vaccination are those suggesting the onset of flu-like symptoms shortly after the vaccination (the statement 'I got vaccinated and after a few days I became ill with the flu'). Doubts related to the safety of vaccination against influenza have been identified as an important determinant of non-vaccination in many patient groups [2]. Among pregnant women, the major reason for being unvaccinated was the lack of confidence in the vaccine (60.4%) [3]. Even among unvaccinated HCP, who did not intend to get influenza vaccination during the flu season, the most commonly reported reason for not being vaccinated was the fear of experiencing adverse effects or getting sick from the vaccine [8]. This suggests the need to increase knowledge among HCWs about the safety of influenza vaccination, the frequency and type of possible AEFI (with the emphasis that the most common AEFI are local symptoms (pain, redness and swelling on the injection site), and general symptoms (fever) that are of self-limiting character). Pregnant women and HCWs taking care of them should remember that vaccination with inactivated vaccines is safe for the fetus; it does not cause congenital abnormalities, does not increase the risk of miscarriage, preterm labor, cesarean delivery or fetal death, but it minimizes the risk of the mother and the child becoming ill and suffering from the disease complications [16, 34]. For patients with chronic (also cancerous) diseases, it is of crucial importance that there is no association between influenza vaccination and exacerbation of a chronic disease [42].

Another factor strongly influencing influenza vaccine uptake is the influenza effectiveness issue. The second most common reason for not being vaccinated against influenza among HCWs was that they did not think that the vaccine could be effective (misconceptions regarding influenza vaccine effectiveness) [8]. Likewise, 40% of unvaccinated pregnant women found influenza vaccine as 'not effective' [3].

Given the above-mentioned factors, which are the main causes for eschewing influenza vaccinations, both patients and HCWs need to be provided with educational activities that can deepen their knowledge about influenza vaccination, with particular regard to aspects related to the vaccine safety and efficiency. The lack of general knowledge about the influenza vaccine was identified to be an important barrier to be removed [46].

Another important factor influencing influenza vaccine uptake is one's past behavior and experience. Individuals who had already been vaccinated in previous seasons showed a higher vaccine uptake in all risk groups and HCWs [15, 17, 50].

PHYSICAL ASPECTS FOR INFLUENZA VACCINATION

Several authors stated that unhealthy lifestyle, such as alcohol consumption and smoking habits, may have a negative impact on vaccine uptake. Having given up smoking was reported to increase influenza vaccine uptake in HCWs [1], chronically ill [19] and the elderly [41]. The results concerning the level of the physical activity are mixed [46]. Generally, individuals who perceived health status as good were less likely to be vaccinated [12, 23]. Further possible barriers for influenza uptake were a lower body mass index and not having a preexisting medical condition [23, 46]. Among pregnant women, knowledge of the recommendation for regular hand-washing was negatively associated with the vaccine uptake among pregnant women [3, 46]. This observation indicates that there is a need to inform patients that adherence to hygiene rules, avoidance of crowds, and performance of non-specific immunity enhancement activities can reduce the risk of infection but they cannot replace a vaccination.

CONTEXTUAL ASPECTS FOR INFLUENZA VACCINATION

Factors, such as access issues, interactions with the health care system and system factors, may also play a role in the decision making process regarding influenza vaccine uptake [46].

Generally, access to influenza vaccines may be limited due to political, geographical and economic issues. However, factors related to the production of vaccines and the reliability of supply were not identified as a barrier to vaccination (none of the 470 studies indicated a general lack of vaccines as a significant barrier to the vaccine uptake) [46]. Concrete financial expenses were reported as a barrier by HCWs. Kelly et al. found that the likelihood of having an influenza vaccine among Australian medical students who were offered government-funded vaccines was even 7 times higher than in the case of individuals who were ineligible for funding [21]. The annual free of charge influenza vaccinations should be offered to all HCWs in accordance with the recommendations. Other issues referring to 'limited access to vaccination' were raised by the elderly and chronic patients, but they were related to transportation to a clinic, physical disability, inconvenient office hours (indicated by HCWs, which is why it is recommended to offer this group the possibility to have influenza vaccinations while taking into account their shift work) [46].

Lower likelihood of getting vaccination was observed in individuals who interacted with the health care system less frequently and did not have a regular source of care (e.g. primary care physician) [48]. In this aspect the role of the occupational physician should be emphasized, who is the only representative of HCWs that might

Table 3. Seasonal and pandemic influenza vaccine hesitancy in different groups [46]

Group of patients	Seasonal influenza vaccine hesitancy reasons	Pandemic influenza vaccine hesitancy reasons
Children	sociodemographic variables (age, education) missing recommendation from HCW (for patients or caregivers)	complacency issues (decreased perceived severity of the disease, not believing in the importance of the issue)
The elderly	sociodemographic factors (gender, additional chronic conditions, education) physical variables (smoking status, perceived health status) past behavior (vaccination in previous seasons)	complacency issues (low perceived severity of the disease) lack of confidence (distrust in authorities)
Pregnant women	lack of confidence (high perceived risk of the vaccine, high worry about vaccine safety, low effectiveness perception, misconceptions about the disease and vaccine)	lack of recommendations from HCWs lack of confidence negative attitude to vaccination
HCWs	sociodemographic variables (age, gender, additional risk factors (chronic diseases) past behavior (vaccination in previous seasons)	complacency issues lack of confidence

encourage a patient, young and healthy adults in this respect, to vaccinat [40].

It should also be strongly underlined that the lack of recommendations from HCWs for influenza vaccination is an import barrier for the vaccine uptake. Individuals who did not receive a direct recommendation from the medical personnel were less likely to be vaccinated. Women who reported having received a recommendation for and offer of a vaccination were more than twice as likely to be vaccinated compared with women who received only a recommendation but no offer of vaccination (65.7% vs. 29.8%) and six times more likely to be vaccinated compared with women who received neither a recommendation nor an offer for vaccination (65.7% vs. 11.1%) [8]. Early-season flu vaccination coverage was higher among HCP whose employers required (89.3%) or recommended (69.4%) that they should be vaccinated compared with HCP whose employers did not provide a requirement or a recommendation regarding influenza vaccinations (26.0%). Blank et al. also reported that the principal driver for influenza vaccinations was receiving advice from the family doctor (51%) [8].

Other factors possibly influencing influenza vaccine coverage rates include system issues, such as the size of a health care facility (hospital, outpatient clinic, nursery home) [46]. Both for HCWs and for the patients an increased size of the health care facility is rather a barrier; however, there are also single reports suggesting that this may be a promoter of the vaccination. People who live or visit health care facilities in socioeconomically deprived areas are also less often vaccinated against influenza than people from wealthier areas [26].

SOCIODEMOGRAPHIC ASPECTS FOR INFLUENZA VACCINATION

Data indicating that an older age may be a barrier for influenza vaccine is inconclusive and presents different results [46]. A higher age may be a barrier for influenza vaccination due to the limited access to vaccination related to transport difficulties. However, the elderly are often offered free of charge influenza vaccinations, which is a strong incentive for vaccinations. Gender and ethnic factors were identified as barriers by some authors, while others deny such correlations [9, 24, 46]. The marital status (e.g. being unmarried or living alone) were negatively associated with the vaccine uptake [24].

CONCLUSIONS

The data presented above leads to the conclusion that influenza vaccinations are carried out too rarely. In most cases the rates recommended by experts were not achieved. Furthermore, a disturbing, decreasing trend for influenza vaccine coverage rates can be observed in many countries. This illustrates how complicated the issue of influenza vaccine hesitancy is and how difficult it is to find a solution to the problem of increasing the influenza vaccine coverage rates. Education about influenza and its prophylaxis, providing access to vaccinations (preferably refundable ones) as well as a change in the attitude to vaccinations and in the vaccination-related behaviors seem to be the key to the success in increasing the number of vaccinated patients and health care workers on the regional, national and global scale.

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