

Influenza vaccination and healthcare workers: barriers and predisposing factors. A literature review

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Abstract. *Background and aim of the work.* Influenza is a disease that affects a large part of the world's population annually, with major health, social and economic impacts. Active immunisation practices have always been recommended to counter influenza, especially for people at risk. The recommendations of major health agencies strongly advise influenza vaccination for all healthcare workers, mostly for those in contact with at-risk or immunocompromised individuals. Yet, the influenza vaccination coverage among healthcare workers remains rather low worldwide. This review explore barriers and the facilitators of health care professional toward influenza's vaccination. *Methods.* Narrative review consulting the databases: PubMed, CINAHL by combining keywords health care worker, flu, influenza, vaccination, barrier, resistance, hesitancy, between November 2019 and February 2020. *Results.* From the 1031 records initially, twenty-two primary studies were included in this narrative review. Our results show that the identified facilitators are: desire for self-protection, protection for loved ones and community. Instead, the barriers to vaccination identified are: fear of contracting influenza from the vaccination itself; not considering themselves at risk; to believing believe that their immune system is capable of managing a trivial disease; disease considered trivial, laziness; false beliefs. *Discussion and conclusion.* Adherence rate on influenza vaccination among health professionals is quite low. The interventions that make it "complex and traceable" flu vaccination refusal increase adherence to this type of vaccination. The results show that current vaccination campaigns do not increase the rate of adherence by healthcare workers. Identifying the predisposing factors and barriers to such vaccination can help to create, develop and test targeted educational programmes.

Keywords: influenza; vaccination; healthcare workers; adherence; barriers; review

Background

The risk of infection associated with social care and healthcare is a significant issue, given the complexity of the determinants and the rising epidemiological trend for healthcare-associated infections (1). More specifically, in line with the results of studies on hospital-acquired infection, the Centers for Disease Control and Prevention and the Advisory Committee

on Immunization Practices strongly recommend active immunisation amongst healthcare professionals for several preventable illnesses, including seasonal influenza (2).

Influenza is a disease that involves health, social and economic burdens worldwide (3). Annual influenza epidemics can affect 5% to 15% of the world's population, causing up to 4-5 million serious cases and 250,000 to 500,000 deaths (4).

Influenza viruses can cause disease among people in all age groups (5). Influenza complications requiring urgent medical treatment, including hospitalization or death, may result from direct effects of influenza virus infection, with age or pregnancy complications, or cardiac complications existing at moment of contagion or other chronic illnesses (6, 7). Influenza-associated hospitalization rates are considerably higher in children and adults than the period when influenza viruses are not in circulation (7-11). Children have higher rates of infection, but the risks for complications, hospitalizations and death are higher among 65 or older (12) and among children below 2 years of life (5, 13). Other physical conditions, i.e. immune-compromised patients, favor influenza complications in people of any age (14). Influenza viruses are classically divided into type A and type B. Both influenza viruses circulate globally (15). These influenza viruses are distinguished from each other based on antigenic similarities. The type A virus is divided into subtypes based on surface antigens (16). Influenza viruses B viruses are not subdivided into subtypes, two genetically and antigenically distinct lineages can be discriminated on the basis of the HA surface glycoprotein, namely the B/Yamagata lineage and the B/Victoria lineage (17) The new variants of influenza viruses are the result of antigenic mutations that occur during viral replication. Recent studies investigate the molecular evolution of influenza virus A (18) that have a major rapid antigenic drift than B. Influenza vaccination aims to prevent the complications of high-risk groups as well as not becoming the infectious source of influenza infection to high-risk groups. Another goal of influenza vaccination is to prevent the outbreak of influenza infection.

Serious respiratory complications can develop, including pneumonia and bronchitis, to which older people and those with certain chronic medical conditions are particularly susceptible. During the influenza peak, the circulation of other pathogenic bacteria is common in the community, such as respiratory pathogens that can create and exacerbate pneumonia acquired in or outside a hospital (19). Influenza vaccination has been shown to reduce the risk of pneumonia acquired outside hospitals in elderly people (20). Influenza vaccine is also recommended for healthcare workers to protect themselves and to reduce transmission of influenza; but, despite these recommendations, the rate of vaccination

against influenza of doctors, nurses and other staff in hospital and outpatient clinics has never undergone substantial increases (21). Efforts to increase the rate of vaccination among nurses, doctors, and healthcare workers (HCWs) are important to reduce the transmission of influenza by different healthcare professionals to patients, especially for high-risk patients with complications for influenza (21).

The Centers for Disease Control and Prevention (22, 23) recommends that all healthcare professionals be vaccinated against influenza for three main reasons: 1) to reduce the risk of patients catching influenza from healthcare professionals, 2) to protect healthcare professionals and their families against influenza, and 3) to reduce healthcare professional absenteeism during the influenza period, and consequently to decrease costs for the national health service. A vaccination strategy based on these grounds has favourable cost-benefit and cost-effectiveness profiles (24).

Despite the proven efficacy of vaccinations and despite national and international guidelines, including European Directive 2000/54/EC on the '*Protection of workers from risks related to exposure to biological agents at work*' (25), vaccination coverage amongst healthcare professionals remains low worldwide, although it varies from one country to another (from 90% in the United States to 24% in Portugal) (26-28). European Member State reached the target of 75% coverage (range: 5-54.9%; median rate: 25.7%).

HCWs are a priority target group for flu's vaccination (29). They may spread flu to patients, colleagues, relatives, and reduce productivity and increase absenteeism (30, 31).

Understanding barriers and predisposing factors to flu vaccination by HCWs will help design and promote specific educational programs that can have positive outcomes not only in this specific population. This study was designed to explore in literature the barriers and the facilitators of HCPs toward vaccination for influenza.

Methods

Search strategy: the review process was developed out following 5 phases: identification of the research problem; bibliographical research; data evaluation; data

analysis; presentation of the results. The literature search was conducted by consulting the databases: PubMed, CINAHL. The keywords used were the result of a preliminary free search followed by a comparison with MeSH terms such as: health care workers, healthcare workers, flu, influenza, vaccination, vaccine, immunization, adherence, facilitators, attitude, behaviors, compliance, barriers, resistance, hesitancy. To decrease the bias and include as many useful articles without excluding any valuable information, two search strings have been formulated:

String 1- (health care worker* OR healthcare worker*) AND (flu OR influenza OR influence) AND (vaccination OR immuni*) AND (adherence OR facilit* OR attitude); string 2- (health care worker* OR healthcare worker*) AND (flu OR influenza OR influence) AND (vaccination OR immuni*) AND (barrier* OR resistance OR hesitancy).

The limits used were the reference to the human population, publications of the past 5 years in English language. This study has been conducted between November 2019 and February 2020.

Inclusion criteria: original study. Those articles that dealt with data regarding barriers, facilitators and therefore the attitudes, ideas and behaviours that health professionals have towards flu vaccination were selected.

Exclusion criteria: secondary studies, guidelines, academic thesis dissertations, oral presentations. Besides, the articles that focused only on the behaviour of the general population, or some sub-groups of this, such as pregnant women, the elderly, children, students and risk groups, were excluded. Other research excluded were those that dealt with the behaviours and ideas of the general population or its sub-categories and of the health professionals concerning non-influenza vaccines.

Study selection: originally, through the review of the literature, 1031 articles were identified; in particular the first search string produced 216 results on PubMed and 570 results on CINAHL. The second search string produced 58 results on PubMed and 187 results on CINAHL. Three researchers independently conducted the entire review process and selection process. There were no inconsistencies in the selection of articles. During the first phase, after having eliminated the articles duplicates, the identified articles were 829. Subsequent reading of the title and the abstracts lead to discard 790 articles, since they did not meet the inclusion criteria. Of the remaining 40 articles, the full text was read in its entirety. A total of 22 articles were finally included in the review (Figure 1).

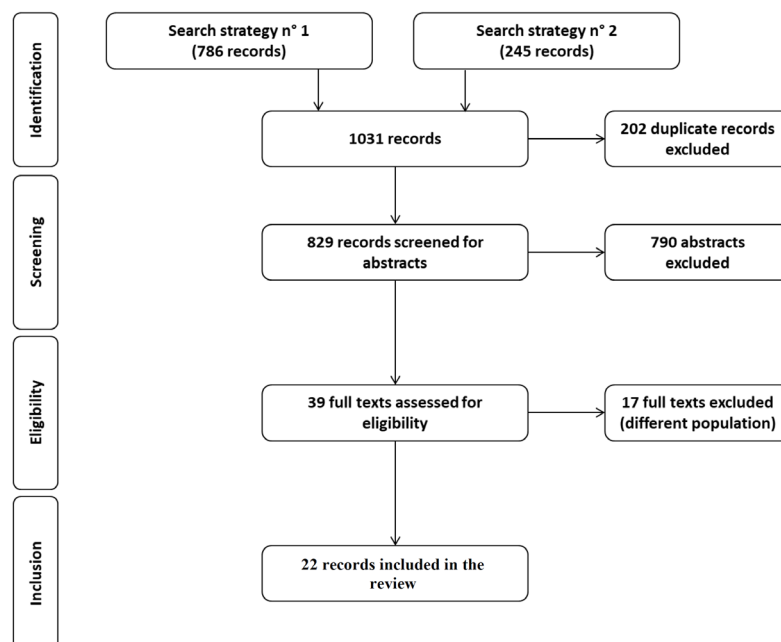


Figure 1. Flow chart diagram

Quality appraisal: all included studies were published in peer-reviewed scientific journals. The quality appraisal checklist by Dixon-Woods et al. (32) was used for all studies and each quality domain was categorized as by 'yes', 'no' or 'not reported' (Table 1). The quality of the original papers was judged by two researchers and approved by all the authors.

Results

Twenty-two primary studies were included in the review (Table 2). Those met the inclusion criteria and, in particular, investigated the opinions and behaviours of healthcare professionals regarding flu vaccination. It was decided to divide the selected studies according to the countries of origin to allow a greater contextualization of the results.

Table 1. Quality appraisal of the studies

TITLE MANUSCRIPT	Are the research objectives clear?	Is the research design clearly specified and appropriate for the purposes and objectives of the research?	Is the process that led to the results well specified?	Have the researchers exposed enough data to support their interpretations and conclusions?	The method of analysis is appropriate and adequately explained?
Knowledge and attitudes towards influenza vaccination of health care workers in emergency services	YES	YES	YES	YES	YES
Overcoming healthcare workers vaccine refusal-competition between egoism and altruism	YES	YES	NO	YES	NO
Understanding motivators and barriers of hospital-based obstetric and paediatric healthcare worker influenza vaccination programs in Australia	YES	YES	YES	YES	YES
Motivators and barriers to vaccination of health professionals against seasonal influenza in primary healthcare	YES	YES	YES	YES	YES
Prevalence of influenza vaccine hesitancy at tertiary care hospital in Riyadh, Saudi Arabia	YES	YES	YES	YES	YES
Promotion of influenza vaccination among health care workers: findings from a tertiary care children's hospital in Italy.	YES	YES	YES	YES	YES
Factors associated with influenza vaccination among healthcare workers in acute care hospitals in Canada.	YES	YES	YES	YES	YES
"I wouldn't really believe statistics" - Challenges with influenza vaccine acceptance among healthcare workers in Singapore.	YES	YES	YES	YES	YES
Reasons why nurses decline influenza vaccination: a qualitative study	YES	YES	YES	YES	YES
Qualitative motivators and barriers to pandemic vs. seasonal influenza vaccination among healthcare workers: a content analysis.	YES	YES	YES	YES	YES

(continued)

Healthcare worker's attitude to seasonal influenza vaccination in the South Tyrolean province of Italy: barriers and facilitators	YES	YES	YES	YES	YES
Determinants of adherence to seasonal influenza vaccination among healthcare workers from an Italian region: results from a cross-sectional study.	YES	YES	YES	YES	YES
Influenza vaccine uptake, determinants, motivators, and barriers of the vaccine receipt among healthcare workers in at tertiary care hospital in Saudi Arabia	YES	YES	YES	YES	YES
Knowledge, attitudes and behaviour of hospital health-care workers regarding influenza A/H1N1: a cross sectional survey	YES	YES	YES	YES	YES
Factors associated with acceptance of pandemic flu vaccine by healthcare professionals in Spain, 2009-2010.	YES	YES	YES	YES	YES
Knowledge, attitudes, beliefs and practices of Occupational Physicians towards seasonal influenza vaccination: a cross-sectional study from North-Eastern Italy	YES	YES	YES	YES	YES
Knowledge, attitudes, experience and behaviour of frontline health care workers during the early phase of 2009 influenza A(H1N1) pandemic, Birmingham, UK.	YES	YES	YES	NO	YES
Attitudes, beliefs, determinants and organisational barriers behind the low seasonal influenza vaccination uptake in healthcare workers – A cross-sectional survey.	YES	YES	YES	YES	YES
Health workers' attitudes, perceptions and knowledge of influenza immunization in Lima, Peru: A mixed-methods study	YES	YES	YES	YES	YES
Vaccine hesitancy among healthcare workers in Europe: A qualitative study.	YES	YES	YES	YES	YES
Occupational vaccination of health care workers: uptake, attitudes and potential solutions.	YES	YES	YES	YES	YES
Factors influencing influenza vaccination among nurses in teaching hospitals of Yazd University of Medical Sciences in 2011	YES	YES	YES	YES	YES

Studies carried out in Italy

In the Italian study by Cozza, V. *et al.* (33), conducted in a pediatric hospital, the response rate of participants was 90.8% (109/120) for nurses and 83.7% (41/49) for doctors. 35% of the sample stated that they had been vaccinated against influenza at least once

during their lifetime, in particular between 2008 and 2011. This figure could be a consequence of the AH1N1 influenza epidemic that occurred in those years, and that received extensive media coverage. Participants reported that their primary motivation for influenza immunisation was the protection of patients (34.3%). However, the same results showed that only 6.8% of

Table 2. Results' summary

Authors	Hulo S, Nuvoli A, Sobaszek A, Salembier-Trichard A.
Title	Knowledge and attitudes towards influenza vaccination of health care workers in emergency services
Year	2017
Aim	Identify knowledge and attitudes of HCW among flu vaccination in emergency services
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	This study collected 344 questionnaires. Doctors were vaccinated more often (55%) than nurses (16%). Fear of passing on flu to their families, patient protection and self-protection are the most frequently cited reasons to be vaccinated, (69%, 59% and 58% respectively). The obstacles to vaccination reported were: lack of time (33%), lack of vaccine safety (31%), fear of getting flu due to vaccination (29%), lack of efficacy (23%), doubts about the usefulness of the vaccine in healthy subjects (21%). As for the incentive measures to vaccination the most important measure is linked to the need to inform healthcare professionals about the effectiveness of the vaccine (30%), its security (18%) and real risks to the patient (11%). One of the most disturbing results is that 30% of health workers believe that no incentive action could encourage them to get vaccinated.
Authors	Tuckerman JL, Shrestha L, Collins JE, Marshall HS.
Title	Understanding motivators and barriers of hospital-based obstetric and paediatric healthcare workers influenza vaccination programs in Australia
Year	2016
Aim	Explore the decision-making process that leads HCWs to get vaccinated or not against flu and other recommended vaccines
Tools	Interviews
Design	Cross-sectional study
Results	The study was attended by: 14 nurses, 5 midwives, 2 doctors and 1 administrative officer. The same interview lasting an average of 18 minutes was made to all the aforementioned members. The answers were grouped into 6 categories: 1. Knowledge of vaccines and their access; 2. Opinions on mandatory vaccinations for HCW; 3. Knowledge of pediatric seasonal flu vaccination programs; 4. Barriers to the hospital's seasonal flu program; 5. Motivators to vaccination for HCW; 6. Suggestions for improvement.
Authors	Petek D, Kamnik-Jug K.
Title	Motivators and barriers to vaccination of health professionals against seasonal influenza in primary healthcare
Year	2018
Aim	Assess seasonal flu vaccination rates among healthcare professionals in the Koroška region (Slovenia) and find incentives and barriers to vaccination
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	Out of 1113 health workers, 192 (17.3%) were vaccinated between 2013-2014. The two reasons that pushed the operators to get vaccinated were: belonging to a group of people at risk (83.3%) and self-protection (70.0%). In the 2014/15 season, health professionals decided not to get vaccinated for two reasons: they didn't feel they were exposed to the disease (37.3%) and doubted the effectiveness of the vaccine (37.3%).
Authors	Alabbad AA, Alsaad AK, Al Shaalan MA, Alola S, Albanyan EA
Title	Prevalence of influenza vaccine hesitancy at tertiary care hospital in Riyadh, Saudi Arabia
Year	2018
Aim	Determine the prevalence of reticence against the flu vaccine and the effect of awareness campaigns on vaccine acceptance in three groups: parents, adult patients and healthcare professionals.
Tools	ad hoc questionnaire
Type	Cross-sectional study

Results	There were 100 participants in each group (3 groups). The HCW group included nurses (58%), physiotherapists (20%), doctors (11%), technicians (7%) and pharmacists (4%). The parent group included similar proportions of mothers (54%) and fathers (46%); 65% of the children were boys and 34% were girls. Overall, 17% of participants completely rejected the flu shot, while 83% had been vaccinated in previous seasons or were planning to be vaccinated in the future. Among the 17% participants who refused vaccination completely, the most common reasons for refusal were: "It has no positive effect or benefit" (n = 11 [21.5%]), "I don't need it because I'm healthy" (N = 9 [17.6%]) and "I think it causes serious side effects" (n = 7 [13.7%]). Most of the information came from medical staff, outreach campaigns and the media; these represented 25%, 24% and 20%. However, 137/300 (45.6%) of the sample did not know the correct duration of vaccine protection or the need for annual vaccination. There was no significant relationship between the level of education and the intake of the flu vaccination. 183/300 (61%) of the study population had a university degree or higher; however, there was no significant relationship between the level of education and the hesitation of the flu vaccine. The confidence of the participants in the three groups towards the Ministry of Health and doctors was very high, with 97% of adults, 95% of parents and 93% of health workers.
Authors	Cozza V, Alfonsi V, Rota MC, Paolini V, Ciofi
Title	Promotion of influenza vaccination among health care workers: findings from a tertiary care children's hospital in Italy.
Year	2015
Aim	Assess the attitudes of health care workers against influenza vaccination and their opinion about it. Estimate coverage rates in the Bambino Gesù hospital
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	A total of 191 health workers participated in the survey; the response rate was 90.8% (109/120) for nurses and 83.7% (41/49) for doctors. About 75% (144/191) of the participants had seen at least one promotional tool; 65.5% of the respondents who had seen the tools (93/142) found they gave useful information. The main message perceived to promote vaccination was the risk of flu transmission by healthcare professionals to patients (46% of respondents). Patient protection was the primary reason for vaccination. (34.3%); considering influenza as a mild disease was the main reason for non-vaccination (36.9%); considering the vaccine as ineffective was the main reason for not having an annual revaccination (28.8%)
Authors	Hussain H, McGeer A, McNeil S, Katz K, Loeb M, Simor A, Powis J, Langley J,
Title	Factors associated with influenza vaccination among healthcare workers in acute care hospitals in Canada.
Year	2018
Aim	Determine which factors are helpful in increasing the flu vaccination rate in Canada among HCWs
Tools	International Physical Activity Questionnaire (IPAQ);ad hoc questionnaire
Design	Secondary analysis of cohort study
Results	They participated in the study in 2436 HCW per season, observed in the three seasons studied. The average age was 43.5 years, 85.5% were women and 38.5% were nurses. the overall vaccination rate was 75.3% and 63.3% of the participants were vaccinated in all three seasons before participating in the study. factors associated with vaccination in HCW were linked to a previous vaccination history, employment and belonging to a specific ethnic group. Unvaccinated staff were more likely to get vaccinated during the study.
Authors	Sundaram N, Duckett K, Yung CF, Thoon KC, Sidharta S, Venkatachalam I, Chow A, Yoong J.
Title	"I wouldn't really believe statistics" - Challenges with influenza vaccine acceptance among healthcare workers in Singapore.
Year	2018
Aim	Identify the factors limiting the acceptance of the flu vaccine in Singapore among HCWs
Tools	Focus group discussion and meeting
Design	Cross-sectional study

(continued)

Table 2. Results' summary (continued)

Results	73 health workers: 19 doctors, 22 nurses, 20 social health workers and 12 auxiliary employees - participated in eleven discussions conducted between June 2014 and March 2015. The flu vaccine was generally considered to be a low priority and was classified below other vaccines such as hepatitis B or pox. The barriers encountered are due to: perception that vaccination causes flu as a side effect, concerns about the effectiveness of the vaccine, anecdotal experience, personal and otherwise, negative with the vaccine, annual vaccination, considered uncomfortable and painful, influenza not considered a serious illness, reluctance to introduce unnatural substances into the body, not being considered vulnerable to influenza, limited flu vaccination and patient transmission capacity, insufficient institutional support.
Authors	Pless A, McLennan SR, Nicca D, Shaw DM, Elger BS
Title	Reasons why nurses decline influenza vaccination: a qualitative study
Year	2017
Aim	Investigate the reasons why nurses decline influenza vaccination
Tools	Interviews
Design	Descriptive study
Results	18 nurses, 14 women and 4 men were interviewed. The work experience of the participants ranged from 1 to 37 years (average 14.4). Nurses worked in six different units with high-risk patients (hematology, cardiology, nephrology, geriatrics, intensive care, oncology) and held various hierarchical positions. 17 nurses had direct contact with patients. The interviews were conducted in 2012 with informed consent. Some respondents did not perceive the flu as a threat to their health and well-being and therefore did not found a vaccination necessary, others believed that the vaccine would not promote their health, due to the lack of efficacy, or that it could even damage it due to negative side effects on immune system. Almost all nurses have expressed the belief that flu does not pose a threat to their health, since they are healthy and not belonging to a category at risk
Authors	Prematunge C, Corace K, McCarthy A, Nair RC, Roth V, Suh KN, Garber G
Title	Qualitative motivators and barriers to pandemic vs. seasonal influenza vaccination among healthcare workers: a content analysis.
Year	2014
Aim	To study the motivators and barriers that push HCW to be vaccinated against seasonal influenza and / or pandemic
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	10,464 survey packages were sent to all active HCW staff at the hospital and 3301 (31.5%) were returned; 3275 completed and included in the analysis. Overall, 2862 (87.4%) HCW were vaccinated against panINFLU and 2433 (74.3%) against sINFLU. The most frequently cited reasons for taking both pan-INFLU (29.9%) and sINFLU (33.9%) were related to personal factors. The secondary reasons most frequently cited for both pan-INFLU (23.2%) and sINFLU (21.4%) vaccinations are related to the safety and protection of loved ones and prevention of the transmission of infections. Patient concerns also motivated healthcare professionals to become vaccinated against panINFLU (12.4%) and sINFLU (13.0%). Vaccinated healthcare professionals cited the possible increase in workload due to flu-related absenteeism. The vaccine-related barriers both panINFLU (46.2%) and sINFLU (37.3%) were linked in particular to the safety of the vaccine, the ingredients of the vaccine, the possible side effects and allergies.
Authors	Rabensteiner A, Buja A, Regele D, Fischer M, Baldo V
Title	Healthcare worker's attitude to seasonal influenza vaccination in the South Tyrolean province of Italy: barriers and facilitators
Year	2018
Aim	Obtain socio-demographic information, knowledge and attitudes of HCW against the flu vaccine. Also study the differences in behavior internal to various healthcare professionals.

Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	4091 of the 9633 employees contacted attended. The survey had an overall response rate of 42.4%. The percentage of people who accepted vaccination in 2015/16 was low: only 10.4% of all respondents said they had been vaccinated against seasonal flu. The reasons why vaccination was accepted were the same for all professional groups: "To avoid disease", followed by "To avoid the spread of flu between the family and the general population" and "To avoid spreading the flu among patients. "The reason" the flu vaccination was highly recommended by my health service "met the lowest level of agreement in all professional groups. The most frequently cited reason for refusing to be vaccinated was the same for all professional groups, namely: "I do not consider myself at high risk of developing the flu and its possible complications." The level of agreement differed statistically between the various groups, however, was lower for doctors. The same trend was seen for the next two most frequently chosen reasons for refusing vaccination: "I personally prefer to take as few medicine as possible" and "I don't consider it itself a disease with a high risk of spreading among patients". Of the 2,288 respondents in our sample who reported having received requests from patients for advice on vaccination against influenza in the winter of 2015/16, almost 60% had recommended vaccination, 35.8% had suggested to patients to decide for themselves and 4.4% had advised against vaccination. Nearly 90% of doctors have recommended vaccination to their patients, while just under 50% of other non-medical health professionals have done the same.
Authors	Durando P, Alicino C, Dini G, Barberis I, Bagnasco AM, Iudici R, Zanini M, Martini M, Toletone A, Paganino C, Massa E, Orsi A, Sasso L
Title	Determinants of adherence to seasonal influenza vaccination among healthcare workers from an Italian region: results from a cross-sectional study.
Year	2016
Aim	Identify the reasons for the low adherence to flu vaccination in Liguria (a North-West Italian region) among HCWs
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	A total of 830 health workers (10.1%) out of 8248 completed the survey. The average age of the study population was 46.8 years. Most of the respondents were nurses (79.3%), professionals working in the medical area and graduates (72.5%). About 30% of participants reported having at least one chronic disease (28.2%). The subjects who had received a flu vaccination in the 2013/2014 season were 26.4%. A total of 104 subjects (12.5%) were vaccinated throughout the course of all six seasons. In contrast, 402 subjects (48.4%) were never vaccinated during the study period. The three main reasons for being vaccinated were: "Family protection" (53.9%), "to avoid the flu" (53.4%); "To protect patients" (35.2%). The most commonly indicated reasons for non-immunization were: "disagreement with vaccination" (34.5%), "efficacy depends on circulating effort" (30.8%) and "suboptimal protective efficacy" (22.7 %).
Authors	Haridi HK, Salman KA, Basaif EA, Al-Skaibi DK
Title	Influenza vaccine uptake, determinants, motivators, and barriers of the vaccine receipt among healthcare workers in a tertiary care hospital in Saudi Arabia
Year	2017
Aim	Evaluate the percentages and the factors that influence the intake of influenza vaccine among HCW
Tools	ad hoc questionnaire
Design	Cross-sectional study

(continued)

Table 2. Results' summary (continued)

Results	Overall, 447 of the 500 questionnaires distributed were returned (response rate 89.4%). 394/447 (88.3%) of the respondents reported having received the vaccination in the 2014/15 season. Absorption was significantly higher in the last season (2014/15) among nurses (93.3%) than doctors (86.9%) and other healthcare professionals (83.1%). Almost three quarters of the participants (73.6%) believe that the flu vaccine is valuable in preventing the disease. Nurses are more convinced (81.5%) of the vaccine's effectiveness than doctors (64.6%) or other healthcare professionals (71.0%). The majority of participants said they recommended the vaccine to target groups (81.0%) and their family (82.3%). Over half (55.0%) expressed concern about the vaccine. 38.9% were concerned about the effectiveness of the vaccine and 16.1% of the side effects. Most of the participants (83.7%) expressed the belief that all healthcare professionals should receive the vaccine, 11.6% were uncertain and only 4.7% disagreed. In all, 83.7% of respondents replied that they strongly agreed or agreed with the mandatory vaccination policy; 7.4% were uncertain and only 9.0% disagree / strongly disagree.
Authors	Fernández-Villa T, Molina AJ, Torner N, Castilla J, Astray J, García-Gutiérrez S, Mayoral JM, Tamames S, Domínguez Á, Martín V
Title	Factors associated with acceptance of pandemic flu vaccine by healthcare professionals in Spain, 2009-2010.
Year	2017
Aim	Understand the reasons for the low adherence to flu vaccination in Spain among HCWs
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	A total of 5,433 health workers (2,711 general practitioners, 668 pediatricians and 2,054 nurses) were invited to participate and 1,965 people received responses. After eliminating 216 respondents who cited contraindications for receiving the flu vaccine (allergy to eggs or other components of the vaccine, or other health problems that make flu vaccination unsuitable) and 88 who lacked some crucial variables, the sample final was 1,661 professionals. The overall response rate was 36.2%. Of the 1,661 surveys analyzed, 48.3% (802) came from general practitioners, 10% (166) from pediatricians and 41.7% (692) from nursing staff. Of the total, 73.3% (1218) were women and the majority were between 35-54 years old (68.1%). In the 2009-2010 season, 635 respondents (38.2%) had received both seasonal and pandemic vaccines, 367 (22.1%) had only the seasonal one, 78 (4.7%) had only the pandemic and 581 (35.0%) neither. Those who had not received the pandemic vaccine were mainly women of relatively young age who had denied contact with risk groups. Those who had not received the pandemic vaccine were inclined to have negative beliefs about the effectiveness of the flu vaccine and stated that they did not worry about taking influenza on the job or passing it on to patients. Compared to the vaccinated participants, almost double the unvaccinated participants felt that the recommendations and actions put in place during the pandemic were inadequate. the strongest predictor of non-acceptance of vaccination was a non-administration during previous campaigns
Authors	Riccò M, Cattani S, Casagrande F, Gualerzi G, Signorelli C.
Title	Knowledge, attitudes, beliefs and practices of Occupational Physicians towards seasonal influenza vaccination: a cross-sectional study from North-Eastern Italy
Year	2017
Aim	Investigate the attitudes and knowledge of Italian doctors about the flu vaccine.
Tools	ad hoc questionnaire
Design	Cross-sectional study

Results	95/105 participants (90.5%) gave their consent to participate in the study and 92/105 completed the questionnaire. 39 (42.4%) were male and 53 (57.6%) female, with an average age of 47.3 ± 10.4 years. 55.4% of the participants (51/92) were > 50 years old. Among the sampled subjects, 50 (54.3%) were specialists in occupational medicine, while 42 (45.7%) were specialists in hygiene and public health. 47/92 (51.1%) identified vaccine additives as dangerous, the majority. Most of the participants knew that infectious diseases cannot be treated with antibiotics (88.0%, 81/92), including flu, however 23.9% of the sample (22/92) questioned the efficiency of the vaccine and 40.2% (37/92) believed that too many vaccinations were administered, while 29.3% (27/92) claimed that the immune system could be overwhelmed by a high number of vaccines. About a quarter of the sample said that children would be more resistant to infections if they were not vaccinated against so many diseases (23/92, 25.0%) and that vaccines may be related to allergic disorders (28.3%, 26/92) and autoimmune diseases (26.1%, 24/92). More specifically diabetes mellitus (15/92, 16.3%) and multiple sclerosis (13/92, 14.1%), but also to neurological diseases such as subacute sclerosing pan-encephalitis (28/92, 30.4%), encephalitis lethargic (18/92, 19.6%) and even autism (17/92, 18.5%). 63/92 (68.5%) were in favor of the flu shot. Overall, 46.7% of the participants (43/92) said they had been vaccinated against seasonal flu in the previous year. The most frequent reason for declining the vaccination was the lack of time (23/49, 46.9%), followed by the belief that they are already immune due to previous vaccinations (13/49, 26.5%), while 9/49 (18.4%) reported that they preferred the use of alternative countermeasures and 8 / 49 (16.3%) were not convinced that the flu shot was useful and 4/49 (8.2%) reported that they fear side effects.
Authors	Boey L, Bral C, Roelants M, De Schryver A, Godderis L, Hoppenbrouwers K, Vandermeulen C
Title	Attitudes, beliefs, determinants and organizational barriers behind the low seasonal influenza vaccination uptake in healthcare workers – A cross-sectional survey.
Year	2018
Aim	To determine the factors that limit the intake rate of flu vaccine among HCW
Tools	Interviews
Design	Cross-sectional study
Results	In total, 28,790 health workers participated in the study, of which 26,524 were hospital staff and 2266 nursing home staff. They received a link to complete the survey. The overall response rate among healthcare professionals was 17.9%: 17.0% in hospitals and 27.9% in nursing homes. The respondents were mainly women (79% in hospitals and 88.5% in nursing homes) and the average age was 42.6 years in hospitals and 43.5 years in nursing homes. The vaccination coverage recorded by the participating HCWs was 40.4% in hospitals and 45.3% in nursing homes during the last flu season (2015-2016). Being male, having an advanced age, chronic diseases, higher education and working on irregular or night shifts were factors significantly associated with taking a flu shot. In hospitals, doctors were more likely to be vaccinated than nurses, while midwives, healthcare workers were more likely to take flu shots if encouraged by their supervisor or close contacts. The reasons that promoted the intake of the vaccine were linked to the desire not to infect patients and consider vaccination as a deontological duty. In addition, 70–90% of healthcare professionals stressed the importance of freely choosing whether to get vaccinated or not. 37.6% of unvaccinated hospital staff and 29.1% of unvaccinated staff working in nursing homes believed that the flu was not dangerous. Similarly, unvaccinated healthcare professionals believed that vaccination weakened the immune system (29.7% in hospitals and 42.5% in nursing home nurses) and that it itself caused the flu (36.7% in hospitals and 42.9% in nursing homes).
Authors	Bazán M, Villacorta E, Barbagelatta G, Jimenez MM, Goya C, Bartolini RM, Penny ME
Title	Health workers' attitudes, perceptions and knowledge of influenza immunization in Lima, Peru: A mixed Instruments study
Year	2017
Aim	Explore barriers, facilitators to accepting flu vaccination in healthcare professionals and the most appropriate strategies to increase the vaccination coverage rate
Tools	Closed and open-ended interviews
Design	Cross-sectional study

Table 2. Results' summary (continued)

Results	<p>According to the interviews carried out, for the vaccinated participants, the main driver was self-protection. Others were related to the perception of the disease as a serious disease, given its possible complications and implications associated with the contraction (absenteeism and transmission to family members). The protection of the family and patients was highlighted in particular as another factor among doctors, nurses and technical staff, while the recognition of the effectiveness of the vaccine was a reason shared by all professional groups except doctors. In addition to these main drivers, another was given by the emulation of vaccinated colleagues taken as an example. The reason for the declination of the vaccination was the fear of possible adverse reactions. In all cases, the reactions had not been directly experienced but were based on media reports or anecdotes. The other main reasons were the perception of a low risk of acquiring the infection and the flu-like syndromes of vaccinated colleagues. In addition, some respondents characterized the flu as mild and rapidly resolving, giving little importance to vaccination. Other causes of rejection due to the pain caused by the needle and the lack of availability of the vaccine have been counted as a reason for non-vaccination.</p>
Authors	Karafilakis E, Dinca I, Apfel F, Cecconi S, Würz A, Takacs J, Suk J, Celentano LP, Kramarz P, Larson HJ
Title	Vaccine hesitancy among healthcare workers in Europe: A qualitative study.
Year	2016
Aim	Discover barriers to flu vaccination among HCWs in Croatia, France, Greece and Romania
Tools	Interviews
Design	Cross-sectional study
Results	<p>65 semi-structured interviews were conducted in Croatia (17/65), France (16/65), Greece (15/65) and Romania (17/65). Most of the participants were women (66%) between 25 and 44 years of age (58%). Most were general practitioners (72%), gynecologists (9%), epidemiologists (6%), pediatricians (6%) and internal medicine specialists (6%). Healthcare professionals in all four countries have identified the following vaccination benefits: the benefits outweigh vaccination risks (Croatia (C) = 17; France (F) = 12; Greece (G) = 8; Romania (R) = 13), vaccines allow to prevent dangerous diseases and current outbreaks are the best example of danger related to non-vaccination (C = 16; F = 10; G = 8; R = 10). Many health workers, particularly in France, Romania and Croatia, have stressed the benefit of herd immunity (C = 15; F = 11; G = 2; R = 10) and the responsibility of health professionals to protect society. A large number of health workers in Romania and Croatia have supported the vaccination as supported by important scientific evidence. Concerns about the safety of vaccination have been the most common topic in Romania and Greece, and has also been raised by a small number of health professionals in France and Croatia. The most common concern reported, particularly in 2006 in Greece and Romania, related to side effects (C = 5; F = 3; G = 9; R = 14), including feelings of guilt if patients had suffered from of adverse events related to vaccination. Other reports concerned the low efficacy of the vaccine or the belief that flu shots did not always work. This thought was particularly common in Greece. Many health workers in both Romania and Greece have claimed that there may be too many vaccines. All countries believed that pharmaceutical companies had financial interests and that they put pressure on health workers to increase their revenues. They were also accused of providing insufficient information on side effects. There was a general mistrust of the French Romanian and Greek health authorities (C = 0; F = 3; G = 9; R = 4). Few doctors in Greece and Romania (C = 0, F = 0, G = 4, R = 3) were also completely against vaccination and two of these also expressed a preference for homeopathy or natural remedies.</p>
Authors	Little KE, Goodridge S, Lewis H, Lingard SW, Din S, Tidley M, Roberts RJ, Williams NS, Hayes S
Title	Occupational vaccination of health care workers: uptake, attitudes and potential solutions.
Year	2015
Aim	Estimating vaccination coverage levels among HCW of influenza and MMR. Explore the reasons behind the low rates of coverage to identify potential practical solutions
Tools	Interviews
Design	Cross-sectional study

Results	A total of 133 surveys were returned, of which 75 (60.5%) had been completed in higher risk wards (Intensive care, delivery room, palliative care and Pediatrics) and 49 (39.5%) came from wards at low risk (Mental health, rheumatology, general surgery and cardiology). 9 (6.8%) went blank. The response rate was overall 68.4% (65/95) for the higher risk departments and 72.5% for the lower risk departments. The survey was extended to all staff, however, nurses (41.1%), doctors (13.7%) and administrative staff (11.3%) participated more actively. 78% were women. The reasons for the low adherence to the flu vaccination were due to 26.4% of fears of side effects / health problems, 13.9% lack of knowledge 12.5%, lack of efficacy.
Authors	Nouri SM, Khadijeh N, Hamide D
Title	Factors influencing influenza vaccination among nurses in teaching hospitals of Yazd University of Medical Sciences in2011
Year	2015
Aim	Determine incentives and barriers to taking flu vaccination among nurses
Tools	ad hoc questionnaire
Design	Cross-sectional study
Results	Of the 215 units that received the questionnaires, 200 (93%) returned it completed. According to the results of descriptive statistics, 18.5% of the study participants were men and 81.5% were women, 59% were in the age group of 23-33 years, 35.5% in 34-44 years and 5.5% in the age group over 45 years. The coordinators were 7.5%, 88.5% nurses and 4% medical social workers. Only 32.5% of the subjects reported having received a flu vaccination. The factors encouraging influenza vaccination were: personal protection (95%), advertising (1%) and prevent absenteeism (1%). The factors inhibiting the intake of the flu vaccine were the high cost (57.5%) and not having chronic diseases (4.5%). The nurses who participated in the study expressed as a strategy to promote flu vaccination, administration in the workplace (95%) and the establishment of information systems (7.5%)
Authors	Edeghere O, Fowler T, Wilson F, Caspa R, Raichand S, Kara E, Rampling SJ and Olowokure B
Title	Knowledge, attitudes, experience and behavior of frontline health care workers during the early phase of 2009 influenza A (H1N1) pandemic, Birmingham, UK
Year	2015
Aim	To describe the knowledge, attitudes, experience and behavior of frontline HCWs in Birmingham
Tools	semi-structured questionnaire
Design	Cross-sectional study
Results	Frontline HCWs providing clinical care during the early stages of the pandemic appear to be willing to work even in conditions of scientific uncertainty. Attitudes and experience towards a range of preventive and curative interventions were generally good, but more needs to be done to change HCWs' negative attitudes towards taking antivirals and receiving an influenza vaccination.
Authors	Albano L, Matuozzo A, Marinelli P and Di Giuseppe G
Title	Knowledge, attitudes and behavior of hospital health-care workers regarding influenza A/H1N1:a cross sectional survey
Year	2014
Aim	To assess the knowledge, the attitudes, and the behavior towards influenza A/H1N1 and the vaccination among health-care workers.
Tools	Ad hoc questionnaire
Design	Cross sectional study
Results	Only 36.1% correctly knew the main modes of transmission, and that HCWs are a risk category and this level of knowledge was significantly higher in HCWs having received information through scientific journals. A higher perceived risk of contracting influenza A/H1N1 has been observed in the HCWs more knowledgeable, in those considering influenza A/H1N1 a serious disease, and in those working in surgical wards. Only 16.7% have received the influenza A/H1N1 vaccination and HCWs with more fear of contracting influenza A/H1N1, those considering vaccine more useful and less dangerous were more likely to receive vaccine. Education and communication strategies for improving the level of knowledge and for the immunization uptake regarding influenza A/H1N1 HCWs are strongly needed.

(continued)

Table 2. Results' summary (continued)

Authors	Betsch C
Title	Overcoming healthcare workers' vaccine refusal –competition between egoism and altruism
Year	2014
Aim	To understand the motivations and mechanisms of HCWs' vaccine refusal, and do interventions and campaigns more effectively. Strategies to increase HCWs' vaccine uptake should be directed towards correcting skewed risk perceptions and activating pro-social motivation in HCWs.
Tools	Investigation
Design	Descriptive study
Results	HCWs' acceptance of vaccination may be reached through education about risks and correcting myths as well as interventions highlighting the importance of vaccination. In order to correct skewed risk perceptions, of the educational process should inform HCWs about their risk of becoming infected and infecting their patients and families as well as the fact that vaccination may reduce this risk. Importantly, fear of side effects must also be corrected. Systematic ways of debunking vaccination myths should be used to reduce fear. This may help to move the vaccination decision out of the social dilemma structure: as long as the perceived risk of infection is larger than the perceived risk of vaccine related adverse events, the benefit to the individual from being vaccinated is larger than that from not being vaccinated, which should encourage vaccination behaviors.

participant attended the annual revaccination. Considering influenza a mild disease was the main reason for non-vaccination (36.9%); poor vaccine effectiveness was the main reason for missed annual revaccination (28.8%). Also in the study conducted in the autonomous province of Trentino by Riccò, M. et al. (34) and Albano, L. et al. (35), among the main barriers were reported doubts about the effectiveness of the vaccine, the perception of influenza disease as not dangerous, as well as the belief that they had an adequate level of protection against the disease as a result of previous immunisation. In particular, 46.7% of the participants said they had been vaccinated against seasonal influenza the previous year. In the study by Durando, P. et al. (36), conducted in the province of Genoa, out of a total of 830 subjects, the main reasons for vaccination were: protection of family (53.9%), personal protection against influenza (53.4%) and protection of patients (35.2%). The barriers to immunisation were: disagreement with vaccination (34.5%), lack of efficacy due to poor herd immunity (30.8%) and poor efficacy of the drug (22.7%).

From the results that emerged in the cross-sectional study conducted by Rabensteiner, A. et al. (3) and carried out at a South Tyrolean health company

on 4091 healthcare workers and administrative staff, the main reasons for influenza vaccination were avoiding to contract the disease and to transmit it to family members, the general population and patients. Barriers to vaccination included a low perception of the risk of contracting influenza, or of being subject to its possible complications.

Studies carried out in Europe

In the study conducted in France by Hulo, S. et al. (4) at the Emergency and Intensive Care Departments, the results relating to facilitators reported by workers are similar to those reported in Italian studies, i.e. fear of transmitting influenza to their families, patient protection and self-protection. The analysis of the results shows that vaccination promotion by a treating physician induced the vaccination of 12% of the sample investigated compared to promotion by display/poster or awareness campaigns in the workplace (3%). Lack of time, lack of vaccine safety, fear of contracting influenza due to vaccination and doubts about the lack of effectiveness or usefulness of the vaccine have been reported as major obstacles to vaccination, as in

the European multicentre study by Karafillakis E. *et al.* (37) that have investigated influenza immunisation and the HCWs idea about other vaccination. In the English study by Little KE. *et al.* (38) conducted in 4 major hospitals in the UK, the main barriers to influenza immunisation included fears of side effects, doubts about the effectiveness of the vaccine and not perceiving passive influenza immunisation as a professional responsibility towards patients.

In line with the studies so far observed, the study by Boey, L. *et al.* (39), conducted in Belgium, demonstrates recurring motivations for influenza vaccination: protection for oneself, one's loved ones, patients and the community. In particular, it emerged that support for vaccination by supervisors was a predisposing factor in the choice of whether or not to be vaccinated, supporting the role of social norms on the choice of behaviour (40).

The obstacles to influenza vaccination that have emerged include limited confidence in the effectiveness of the vaccine, doubts about the usefulness of the vaccine and the actual need for vaccination.

In the cross-sectional study conducted in Slovenia by Petek, D. *et al.* (41), healthcare workers recognised themselves as an at-risk group, and the desire to protect themselves, their loved ones and their patients were the main reasons for immunisation. The barriers reported in this study included doubts about the effectiveness of immunisation and not perceiving oneself as being at risk of infectious disease. This perception is also reported by Pless, A. *et al.* (42), in their study conducted in Switzerland and by Fernández-Villa, T. *et al.* (43). in Spain.

Studies carried out in America

The cross-sectional study conducted by Prémantunge, C. *et al.* (44) in Canada, on 3301 healthcare workers, reported a rate of adherence to influenza immunisation of almost 90%. The main reasons included the desire to protect themselves, families and patients. Besides, the probability of getting sick and causing an increase in workload was another reason for vaccination. In Canada, immunisation against influenza is strongly encouraged by healthcare workers'

employers. Furthermore, as reported by Hussain, H. *et al.* (45), to have been previously vaccinated is a predictive factor for subsequent influenza immunisation. The "barriers" identified with respect to influenza immunisation were once again not considering themselves at risk of infection, not trusting the vaccine preparation and the belief of excessive media alarmism(44).

In the study conducted in Peru by Bazán, M. *et al.* (46) vaccinated subjects report self-protection, protection of family members and patients as motivation factors for vaccination. Similar results were reported in the study by Boey, L. *et al.* (39), in which the example of vaccinated colleagues represents an additionally motivator.

The perception of there being a low risk of contracting the infection, the belief of poor vaccine efficacy, and the fear of adverse reactions were the main barriers.

Studies carried out in the Australia

The Australian study by Tuckerman, JL. *et al.* (47) demonstrated that self-protection and protection of the most immune-compromised family members and patients were the main reasons for immunisation. The main barrier seemed to stem from the fact that healthcare workers did not consider influenza to be a serious condition or did not recognise themselves to be at risk of infection.

Studies carried out in Asia

In the study by Sundaram, N. *et al.* (48) conducted in Singapore self-protection and the protection for family members were identified as motivations for influenza vaccination by HCWs. The main barriers included not considering influenza to be a dangerous disease, to considerer the vaccine ta "non-natural" substance that could promote the onset of influenza itself.

Influenza immunisation was declared to be of low priority as it was not considered to be a serious disease, as reported in the studies by Alabbad, AA. *et al.* (49), and Haridi, HK. *et al.* (50) conducted in Riyadh and in Makkah, Saudi Arabia

The study conducted in Iran by Mahmood, NS. *et al.* (51), demonstrates the main facilitator of influenza immunisation as being the willingness to protect oneself (95%). Among the main barriers reported by the authors were the high cost (57.5%).

Discussion

The purpose of this literature review was identify the main facilitators and barriers to influenza vaccination in healthcare workers. In fact, the scientific evidence identifies healthcare workers as being at high risk requiring annual influenza vaccination. The annual frequency is due to the great capacity of the virus to mutate over time and the inability of the immune system to recognise it and respond effectively at all times.

The reasons that motivate workers to undergo influenza vaccination seems the same worldwide and concern the desire for self-protection, protection for loved ones and the community. Interestingly, healthcare workers share the same concerns, the same doubts that affect the general population(41). The reasons why the healthcare workers decline influenza vaccinations include: the fear of contracting influenza from the vaccination itself; not consider themselves at risk; to believe that their immune system is capable of managing trivial disease; laziness; false beliefs and other distorted information (52). These reasons are common to all the countries investigated in the study. Current interventions to increase the vaccination rate among healthcare workers focus on setting up awareness campaigns, educational interventions and improving information (39). It has been observed that the choice of whether to get vaccinated or not depends strongly on personal beliefs. The vaccination requirement enacted in Canada and North America has indeed increased vaccination rates, but healthcare workers have strongly criticised the restriction of their freedom of choice. As an alternative to compulsory vaccination, a number of European countries have adopted non-statutory policies which, however, made it “inconvenient” to decline influenza vaccination, such as forcing non-vaccinated healthcare workers to wear masks to protect patients from possible cross-infection (36).

The review has some limitations. The selected articles were published from 2014 to 2019. All studies had a small sampling size, which makes it difficult to compare the results with what exists in the literature. In addition, the incentives related to better immunisation are difficult to generalise to the whole population because healthcare workers come from very heterogeneous countries and backgrounds.

Conclusions

This review shows that, with the exception of countries that have made influenza vaccination mandatory for healthcare workers, the rate of adherence to influenza vaccination is often far below expectations. Although scientific evidence shows the importance of immunisation of this population, it would seem that current vaccination campaigns do not increase the adherence rate. Identifying the predisposing factors and barriers to such vaccination can help to create, develop and test targeted educational programmes. New empirical studies conducted in different cultural contexts, enriched by different methodological approaches capable of developing a greater understanding of the health choices of healthcare workers, are desirable.

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