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Healthcare worker compliance with seasonal and pandemic influenza vaccination

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Healthcare workers (HCWs) can be an important source of transmission of influenza to patients and family members, and their well-being is fundamental to the maintenance of healthcare services during influenza outbreaks and pandemics. Unfortunately, studies have shown consistently low levels of compliance with influenza vaccination among HCWs, a finding that became particularly pronounced during recent pandemic vaccination campaigns. Among the variables associated with vaccine acceptance in this group are demographic factors, fears and concerns over vaccine safety and efficacy, perceptions of risk and personal vulnerability, past vaccination behaviours and experience with influenza illness, as well as certain situational and organisational constructs. We report the findings of a review of the literature on these factors and highlight some important challenges in interpreting the data. In particular, we point out the need for longitudinal study designs, as well as focused research and interventions that are adapted to the most resistant HCW groups. Multi-pronged strategies are an important step forward in ensuring that future influenza vaccination campaigns, whether directed at seasonal or pandemic strains, will be successful in ensuring broad coverage among HCWs.

Keywords Compliance, healthcare worker, influenza, pandemic, vaccination, vaccine.

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Introduction

Healthcare workers (HCWs) are at increased risk of exposure to influenza and may transmit the disease to patients in their care.[1–3] Recognising the role that HCWs may play in the transmission of influenza, both the World Health Organization (WHO) and the Strategic Advisory Group of Experts on Immunization recommend seasonal and pandemic influenza vaccination (PIV) for HCWs.[4,5] In the United States, seasonal vaccination of HCWs has been recommended for more than two decades and is currently endorsed by 29 European countries.[6,7] Despite these recommendations, vaccination coverage of HCWs has remained disappointingly low and showed little improvement as pandemic influenza A (H1N1) swept across the globe in 2009. The 2010/2011 influenza season was the first time the percentage of HCWs receiving the seasonal vaccine exceeded 60% in the US.[6] Unfortunately, vaccination rates in this group have been consistently lower in most of Europe, and as will be discussed, recent provision of pandemic vaccine may have actually served to magnify the challenges with influenza vaccination among HCWs.[8–15] This article reviews and summarises the social sciences literature on factors associated with HCWs' decision to be vaccinated against influenza.

Methods

The articles used for this review are a subset of a larger group of publications identified during the formulation of a report on the quantitative and qualitative trends in the social sciences literature on Influenza published between 1990 and 2010. The literature search was performed using Web of Science, and articles in all languages were included. Two different search criteria and time-lines were used, one for a search of literature on decision-making and another on literature exploring risk perceptions and behaviours in relation to influenza. For the latter, the key words included 'risk perception', 'health behaviours', 'misconceptions', 'knowledge', 'attitudes', 'practices', 'acceptability', 'non-pharmaceutical measures', 'social-distancing', 'quarantine', 'influenza', 'seasonal influenza', 'pandemic', 'avian influenza' and 'flu'.

The list of articles were compiled using this timeline, and these keywords were evaluated for relevance through an analysis of the abstracts. Articles that concerned topics outside the social sciences domain (e.g. virology, pathophysiology, immunology), meeting abstracts and publications that solely addressed non-influenza respiratory illnesses (including SARS) were excluded. When there was doubt about the relevance of the content of the abstract, the full

texts of the publications were referred to. The next step was to conduct an in-depth analysis of the main topics covered in the retained collection of articles and create categories of the main themes.

Using this method, the main topics covered in the literature on risk perception and behaviours related to influenza included articles that dealt with compliance with influenza vaccination and perceptions of the illness itself. In the light of the fact that the perception of influenza vaccination, particularly among the HCW population, was one of the main themes addressed in the literature, a decision was made to focus on some key articles in this extensive collection of over 250 publications to highlight the main findings for this particular group. Recognising the impact of introducing pandemic vaccine during the 2009–2010 H1N1 pandemic and the challenges with ensuring HCW compliance in this particular context, we decided to add to our collection a systematic review on the topic published in 2011 found through a simple search using google scholar and using the terms 'healthcare workers', 'pandemic vaccination' and 'systematic review'. A further four articles, also published in 2011, were identified through a forward search of citations listed in the systematic review.

Rationale for vaccinating HCWs against influenza

There are two broad reasons why HCWs have been an important target for influenza vaccination: (i) to protect HCWs from illness and prevent absenteeism particularly during outbreaks or pandemics and (ii) to protect others, particularly those in their care, as HCWs can be an important source of nosocomial spread of this disease.[1–3,16,17] When a health professional is vaccinated, this also sets an example for patients to follow and increases the likelihood that the HCW will recommend the vaccine to others.[1,17–22] The latter is especially important being that members of the community and HCWs themselves often depend on the recommendation of a physician or a nurse when deciding to accept influenza vaccination.[8,12,23–28]

Demographics of HCW vaccination compliance

Although HCWs as a group have low vaccine coverage rates, there is considerable variability within the cohort along various demographic variables.

Age

In many studies, older age was found to be associated with higher intentions to be vaccinated and vaccine receipt among HCWs.[9,12,22,28–30] Fewer studies have associated younger age with vaccine acceptability, and others have found no significant association between age and influenza vaccination.[19,31–34]

Gender

In many studies, male HCWs are found to be more likely to accept vaccination.[11,22,30,33,35] However, following the implementation of a vaccination programme in the UK, female sex was found to be positively associated with vaccine uptake.[36]

Job title

Among HCWs, physicians are often found to have the highest intentions to receive influenza vaccination and the best rates of vaccine uptake.[9,11,12,15,19,33,37,38] Few studies have shown higher acceptance among non-physician HCWs (nurses, paramedics) compared with doctors.[32,39,40] In fact, being a nurse is often negatively associated with vaccine uptake.[10,41,42]

Factors influencing influenza vaccination of HCWs

Achieving compliance with Influenza vaccination among HCWs is a complex process and is affected by a wide variety of factors that are difficult to disentangle. Country- and culture-specific variables may further complicate the picture. Although an individual decision to vaccinate or not may involve unique considerations, some general trends appear to cut across many contexts as discussed below.

Past influenza vaccination status

A finding common to most studies is that previous receipt of the seasonal influenza vaccine is positively associated with intentions and receipt of seasonal and pandemic influenza vaccines.[9–12,14,15,19,29,30,38,41] In a study by Amodio *et al.*[42] not having been vaccinated against seasonal influenza was also found to be associated with a lower likelihood of accepting PIV.

Perceptions and misconceptions

Many HCWs base their decision to receive vaccine (or not) on perceptions of risk, which are often calculated with incorrect or incomplete information. In some studies, perceptions of seasonal and pandemic influenza as mild diseases were associated with reduced intentions and lower uptake of the vaccine.[10,35] Conversely, the perception of influenza as a severe disease was associated with higher acceptance of vaccination.[19,20,43] Regardless of severity, HCWs often stated that they declined influenza vaccination because they believed that their immune systems were 'strong', and they did not identify themselves as a risk group needing added protection against the disease.[8,21,44] Those who intended to get vaccinated or who got vaccinated, on the other hand, had a higher sense of personal susceptibility to influenza.[19,36,41] In an article not

related to influenza, sickness absence among general practitioners, hospital doctors and company fee earners were compared. The study revealed that doctors were less likely to take sick leave for minor illnesses and were more likely to 'work through' their ailment.[45] This reflects doctor's reluctance to adopt the patient role as well as potential organisational and cultural barriers that make it difficult for them to miss work. In another study conducted in Sweden, workers in the care and welfare sectors also showed some of the highest levels of sickness presenteeism.[46] While these findings support the argument that HCWs often find themselves at work even when sick, this is not to say that they do indeed benefit from a better health status than other professional groups. In fact, their self-perceived 'strength' and the fact that they do not generally miss work due to illness may actually represent other organisational and defensive mechanisms that act to dissuade them from taking sick leave when this would be necessary.

Despite their training, HCWs appear to lack a proper understanding of their potential role in transmitting influenza while at work, which may be related to the unmet need for scientific information among this group.[44,47,48] As such, although patient protection was cited as a reason to get vaccinated, it was often secondary to self-protection, the main motivating factor behind intention and actual receipt of seasonal and PIV in many studies.[11,22,31,34,49,50] Similarly, protection of family members was also found to be an important motivator for vaccine acceptance in HCWs.[14,35,41]

Fears and concerns

Concerns that the vaccine itself may cause influenza and fears about potential side effects were often cited as reasons for declining vaccination or were found to be negatively associated with immunization.[10,11,14,21,22,29,35,51] Acceptance of vaccination was higher in those who perceived the vaccine to be safe.[19,38] Higher confidence in the efficacy of the vaccine was also associated with acceptance of the influenza vaccine.[15,19,22,30,41] A fear or dislike of needles has been cited in a few studies exploring low uptake of SIV and PIV among some HCWs[16,30,34,52], while others have shown that an opposition to vaccines in principle can be a strong barrier to receipt of SIV.[37]

Personal experience with illness

Some authors have found that HCWs were more likely to receive influenza vaccination if they had a colleague who had acquired infection with Influenza A (H1N1) or if they had experienced becoming ill with influenza in the past.[19,41] The evidence on the effect of working with patients infected with influenza on motivating compliance with vaccination is mixed. A study in Sao Paolo, Brazil, showed that having cared for patients with severe influenza was significantly associated with SIV.[53] However, the experience of caring for patients with Influenza A (H1N1) did not have the same effect for nurses in China.[54] Similarly, prior experience with SARS was not found to enhance the uptake of influenza vaccine by Hong Kong nurses.[31,55] It seems that despite the high case fatality ratio of this disease and the fact that many cases had been HCWs, there was little impact on the attitudes of this vulnerable group towards other related health protective measures.[55]

External factors

Many HCWs have cited inconvenience of receiving the vaccine as a barrier to uptake, and others highlighted the importance of having sufficient free time to accomplish the task.[22,41,49,50] A literature review covering material published until 2008 showed that inconvenient delivery of the vaccine has remained the third most common reason for vaccine non-receipt among HCWs in countries outside of the US.[49] The US Centres for Disease Control and Prevention (CDC) has recommended the use of strategies that enhance accessibility of influenza vaccination, including mobile vaccination carts.[56] Despite the consensus about the importance of bringing the vaccine to HCWs, a study conducted during the Influenza A (H1N1) pandemic in China showed that the lack of access to SIV in their hospital continued to be a potential barrier to vaccine receipt among HCWs.[15] Related to accessibility, the provision of free vaccine or reimbursement of costs were cited as facilitators of vaccination in many studies and have been recommended by American advisory committees.[56–59]

Other studies have shown that increased governmental and managerial support such as declarations made by ministries of health and health authorities, as well as non-punitive approaches to promote vaccination, can improve immunization rates in HCWs.[48,51] Conversely, inconsistencies between actions taken by authority figures and conflicting messages provided by health authorities can negatively impact the effectiveness of vaccination campaigns.[10,51,60] Peer influence and pressure from family members may also have a positive impact on vaccine uptake[19,38,61], particularly when recommendations come from well-respected colleagues such as infectious disease specialists, physicians and other opinion leaders.[12,19]

The media also plays an important role in HCW influenza vaccine coverage. While the media may negatively affect HCWs' attitudes towards vaccination when it is used as the main source of information and is focused on the potential negative impact of vaccination[9,38,44,51], news about deaths from influenza A (H1N1) in the media positively influenced vaccination behaviour in HCWs in at least one study.[51] Furthermore, a study on pre-pandemic vaccine acceptance in HCWs in the UK showed that willingness to accept stockpiled H5N1 vaccine was higher during a period of increased media attention to an outbreak of the disease in a poultry farm.[62]

Relationship between seasonal and pandemic influenza vaccination and the effect of a threatened pandemic

Current or past receipt of SIV is a consistent predictor of pandemic vaccine acceptance among HCWs[9,11,12,14,15,21,29,42]; however, several studies provide a less clear picture of the link between seasonal and pandemic vaccination behaviour. The relationship is further complicated by the emergence of a threat by a pandemic influenza strain, and recent experience has shown that such a threat can have a variable impact on vaccine coverage rates.

The studies conducted in some settings have shown that transmission of a pandemic strain can serve to improve coverage with the seasonal influenza vaccine, even if the same success may not be seen for pandemic vaccination. In the US, the 2009/2010 vaccination season saw SIV coverage rates exceed 60% for the first time among HCWs. Despite this improvement, PIV remained just below 40%.[6] Similarly, coverage rates with the seasonal vaccine among HCWs in Spain during the 2009/2010 season was higher than that seen in previous seasons although uptake of pandemic vaccine remained low.[11]

The findings for SIV in the US and Spain are encouraging; however, in other countries, SIV coverage did not improve significantly despite the emergence of the 2009 H1N1 influenza pandemic. Two studies conducted in France demonstrated almost equivalent coverage with seasonal and pandemic vaccines of approximately 30% during the 2009/2010 vaccine season, which differed very little from coverage rates achieved in the previous year.[12,13] A study conducted among National Health System (NHS) and non-NHS workers in the United Kingdom showed that the former were no more likely than the latter to receive the pandemic vaccine, but they did express an increased willingness to take the seasonal vaccine.[14] In the end, there was no significant increase in the number of workers willing to receive SIV compared with the numbers who had received it in previous years. Uptake of seasonal vaccine among HCWs in China was also found to be little affected by the pandemic.[15] In this study, however, PIV coverage reached 25%, which is comparable with or exceeds the overall coverage rates for seasonal vaccination in this group, as well as coverage with the pandemic vaccine seen in other countries.[10,11,42,51]

Other studies have also showed different coverage rates for seasonal and pandemic vaccination in the 2009/2010 season: in Istanbul half of the respondents in the study sample who had received SIV in 2009 also received the pandemic vaccine[10] and in Greece, approximately 40% of HCWs who received SIV accepted PIV.[9]

The reasons why PIV remained below the levels achieved for SIV could be related to the novelty of the influenza strain causing the pandemic and heightened concerns over the safety of a vaccine that had undergone an accelerated authorisation procedure.[15,44] Fear over the safety of the vaccine, as well as mention of concerns over Guillain-Barré Syndrome surfaced as important barriers to PIV among HCWs in several studies.[9,12,15,44,54,63] In their article, Seale *et al.*[15] discussed the potential reasons for uptake rates for PIV remaining low with the introduction of influenza A (H1N1) into society. They argued that while intentions to be vaccinated may have been high at the start of the pandemic due to fear and perceptions of personal risk, the establishment of the virus in society resulted in a certain degree of emotional tolerance that dampened the initial motivation to be vaccinated. Similarly, a study conducted in China found that while perceived risk of contracting avian influenza was a predictor of SIV uptake among nurses in 2006, the threat from avian influenza was no longer an influence on vaccination behaviours in 2007. These authors pointed out that time elapsed because the appearance of the threat, its failure to progress, and notions of its controllability may have changed intended vaccination behaviours.[55]

Challenges in interpreting the data

Despite the interesting findings that can be extracted from the volume of literature available on influenza vaccination among HCWs, it is important to highlight some challenges that we encountered when interpreting this data. The focus is on two main issues; the lack of longitudinal studies that help identify the factors that govern the translation of stated intentions into actual vaccination behaviours and the challenges of drawing conclusions from studies that use various definitions of the HCW.

The intention–behaviour relationship

Much of the social sciences literature exploring the factors associated with vaccine compliance in HCWs are cross-sectional studies that assess intention or receipt of seasonal or pandemic vaccination.[9,15,21,51] In a systematic review published in 2011, Bish *et al.* included a total of 37 articles examining factors associated with Influenza A (H1N1) vaccine compliance. Nineteen of these focused specifically on HCWs, and all reported the results of a cross-sectional study design.[64] Studies that looked at the intentions or willingness of HCWs to receive pandemic vaccine were an important contribution to the research on vaccination compliance during the initial stages of the 2009 pandemic and identified groups of HCWs that could have been targeted to ensure the effectiveness of vaccination efforts.[9,19,21,29,54] However, there was little effort to follow whether these stated intentions were translated into vaccination behaviours through longitudinal or serial cross-sectional methods.

Using our search criteria, we were only able to uncover one study that followed up stated intentions with data on

actual receipt of influenza vaccination among HCWs.[65] Godin *et al.* used an extended version of the theory of planned behaviour (TPB) to find determinants of SIV intentions and vaccine receipt in HCWs and also explored potential moderators of the intention–behaviour relationship. These authors found that moral norm, or one's feelings of obligation to adopt a certain behaviour, is a significant moderator of this relationship. Interestingly, however, they also found that HCWs who had low levels of moral norm were the ones who acted according to their stated intentions. This means that those who felt less of an obligation to do good for others often did not receive influenza vaccination. One of the main conclusions drawn from this study was that interventions need to focus on emphasising to HCWs the benefits of vaccination for patients and family members. Indeed, many studies have shown that HCWs generally fail to understand the importance of influenza vaccination as a means to protect their patients and families, with self-protection often quoted as the primary reason to accept vaccination.[11,22,34,38,59]

HCW classification

Understanding attitudes among HCWs towards influenza vaccination may have been further complicated by the changing definition of the HCW used by most authors and the issues associated with the generalisability of many of the study findings.[16,19,62] In many publications, the term 'healthcare worker' insinuates a group of workers employed in a healthcare institution that may or may not be responsible for patient care activities.[21,29,40] Wicker *et al.*[66] included physicians, nurses and laboratory technicians as HCWs. Canning *et al.*[34] restricted their definition of the healthcare worker to nurses and nursing assistants. Chor *et al.*[31] included allied healthcare professionals and administrators under this umbrella term. Besides a difference in the categorisation of HCWs, studies also differ according to the setting in which they are based, for example hospital vs. community settings (with fewer studies on community-based HCWs) and the country context.[9–11,31,67] While the main conclusions are consistent, an emphasis on the barriers specific to a particular group of HCWs allows for a better understanding of their concerns and the formulation of targeted vaccination campaigns. The use of findings on attitudes and perceptions towards vaccination in the formulation of tailored outreach programmes directed at a specific study population has only been undertaken by a few researchers.[68]

Improving HCW acceptance of influenza vaccination

Many vaccination programmes have used educational information as a means to improve HCW compliance with SIV.[16,69,70] Education is a necessary component of such strategies because health professionals often harbour misconceptions about the influenza vaccine that can be addressed with provision of appropriate information. Furthermore, improved knowledge about influenza and influenza vaccination can positively impact vaccine uptake.[52,71,72] These educational campaigns need to emphasise the rationale behind vaccination, that is, the protection of patients and preservation of the healthcare infrastructure, and simultaneously allay personal concerns over vaccine safety and efficacy.[12,52,61,70,71]

Although education is important, the literature has now shown that relying on a single component strategy may not be sufficient to enhance compliance with vaccination among HCWs.[73,74] Many have highlighted the importance of combining educational programmes with the provision of free and accessible vaccine.[67,75] A focus group study revealed that the creation of a 'safety culture' at work that emphasised the importance of influenza vaccination as part of a broader set of measures to ensure HCW and patient protection could be a better approach to ensure vaccine uptake by HCWs.[48] Others have argued for the use of an 'ecological model' when addressing HCW compliance to vaccination; a holistic approach that incorporates the community, organisations and policy-makers in making changes that can help influence vaccine uptake among the target group.[16] Such models are an important step forward in the formulation of multi-pronged strategies that will be better suited to address the target behaviours that need to be changed.

Interventions must take into consideration the differences of those within the HCW group as well as context-specific variables. For example, many studies identify nurses as a group that is particularly resistant to influenza immunisation,[34,55,62] and others have targeted HCWs working in specific settings, such as nursing homes, oncology centres or paediatric units.[76–78] The focus on specific subgroups of HCWs, especially those in closest contact with high-risk populations, has been noted in the literature as an important step to a better understanding of the concerns among HCW groups. The combination of strategies that encompass all HCWs with those that target HCWs showing the least susceptibility to vaccination campaigns can be instrumental in ensuring broad vaccine coverage in different settings.[33,49,52,79]

Conclusion

HCW compliance with influenza vaccine depends on a number of factors that come into play in the decision-making process. Utilitarian arguments have been used as a foundation for promoting vaccination policies in healthcare settings. However, these efforts have not improved coverage rates among HCWs, and the challenges of ensuring adherence to vaccine policies for novel influenza viruses have recently been highlighted with the emergence of the H1N1

pandemic strain in 2009. In the future, researchers should engage hospital and public authorities when planning and conducting studies to ensure that findings are translated to evidence-based policies that are in-line with the general thinking among HCWs.

Perceptions of vulnerability and severity, as well as concerns over one's health or the health of others, have been consistently proven to be associated with compliance with this measure. However, research has also shown that determinants of compliance extend to situational and organisational factors that need to be considered in the formulation and implementation of strategies to encourage uptake of influenza vaccination. One of the important situational criteria that need to be considered is the potential influence of an outbreak/pandemic with an emerging influenza virus in swaying vaccination-related choices. Studies have shown that the influenza A (H1N1) pandemic has had variable impact in shifting acceptance towards SIV among HCWs, and despite improvements seen in some settings, uptake of pandemic vaccine has generally failed to match seasonal vaccine coverage. There may be a number of reasons for this, including the perception of novel influenza as a mild disease, and fears over rapidly authorised pandemic vaccines. Further research such as longer-term follow-up of study populations is needed to better understand the translation of HCWs' willingness and intentions to be vaccinated into action. Such assessments could be a step towards a better understanding of the real-world barriers to vaccination compliance among HCWs and highlight the modulators of the intention–behaviour relationship.

There appears to be a need to tailor informational and educational campaigns so as to appeal to the main concerns and perceptions among HCWs, and allay fears these may have related to vaccination. Furthermore, an exploration of the barriers to this measure among some of the most resistant HCW groups and a targeted campaign to address their concerns could be an important step in ensuring broader vaccine coverage. Communication efforts need to be sensitive to the fact that HCWs respond to the implementation of influenza vaccination policies differently to the rest of the general population, and that even within this group, some healthcare professionals appear less susceptible to strategies to enhance compliance compared with others. Studies that specifically analyse the role of risk communication in changing vaccination behaviours among HCWs, and the role of social or peer influence should be an integral component of future initiatives to improve compliance rates.

Despite the need for the provision of information to HCWs as a means to enhance compliance, there is increasing recognition of the limited capacity for information alone to stimulate great improvements in vaccine coverage. Many researchers now advocate the use of multi-pronged strategies that combine personal- and organisational-level changes to promote vaccine uptake. This is part of a movement towards the use of more holistic and all-encompassing interventions to enhance compliance. The promotion of influenza vaccination among HCWs could be 'sold' to this audience more effectively if it is packaged as part of broader initiatives to ensure safe and conducive environments to influenza vaccination. This would require integrating vaccination campaigns within wider initiatives promoting health and safety at the workplace and a non-punitive and non-coercive approach to vaccination enforcement among HCWs. Evaluations of the comparative effectiveness of such initiatives should be conducted and tailored recommendations made to overcome any remaining challenges.

Conflict of interest

The authors have no potential conflicts to declare.

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