Overcoming healthcare workers' vaccine refusal – competition between egoism and altruism

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Vaccination reduces the risk of becoming infected with and transmitting pathogens. The role of healthcare workers (HCWs) in controlling and limiting nosocomial infections has been stressed repeatedly. This has also been recognised at a political level, leading the European Council of Ministers in 2009 to encourage coverage of 75% seasonal influenza vaccine in HCWs. Although there are policies, recommendations and well-tolerated vaccines, still many HCWs refuse to get vaccinated. This article uses literature from psychology and behavioural economics to understand vaccination decisions and the specific situation of HCWs. HCWs are expected to be highly motivated to protect others. However, their individual vaccination decisions follow the same principles (of weighting individual risks) as everyone else's vaccination decisions. This will lead to decisional conflict in a typical social dilemma situation, in which individual interests are at odds with collective interests. Failure to get vaccinated may be the result. If we understand the motivations and mechanisms of HCWs' vaccine refusal, interventions and campaigns may be designed more effectively. Strategies to increase HCWs' vaccine uptake should be directed towards correcting skewed risk perceptions and activating pro-social motivation in HCWs.

Vaccination reduces the risk of a person becoming infected with pathogens as well as transmitting them to another person. The benefit of vaccination in healthcare settings has been shown in numerous studies [1,2], especially those regarding vaccination against influenza [3]. As a result, vaccination is an important measure to control and reduce outbreaks or transmission of infectious diseases such as influenza in hospital settings [4]. In most countries, there are policies, recommendations and well-tolerated vaccines available [5]. According to the 2009 Council of the European Union recommendation, uptake of 75% of seasonal influenza vaccination is desirable [6]. However, vaccination rates among healthcare workers (HCWs), particularly against influenza, are too low [4]. In Europe, uptake rates for seasonal influenza vaccine are below 32% [2]. The corresponding rates in the United States have risen from 40% to 50% and then to 60–70% due to intense promotion efforts and, in part, mandatory vaccination in some healthcare units [3]. Why do many HCWs refuse to get vaccinated? In this perspective article, I provide a psychological view of vaccination decisions and the specific situation of HCWs, and discuss strategies to increase vaccine uptake among HCWs.

Skewed risk perceptions as reasons against vaccination

In 2009, a study summarised the most important reasons why some HCWs do not get vaccinated against influenza [7]. Across a large number of studies, HCWs most frequent reason against vaccination was a fear of side effects [2]. Studies have repeatedly shown that today's vaccines are well-tolerated [8]. Severe side effects are extremely rare and the frequency of their occurrence is usually overestimated [8]. However, perceptions of risk are subjective judgments and do not necessarily mirror objective numbers [9,10]. Still, they may very well impact behaviour. When the *perceived* risk of vaccination is high, vaccination is less likely; when the *perceived* risk of infection is high, vaccination is more likely [11,12].

The perceived risk of becoming infected indeed affects HCWs' vaccination decisions: low perceived risk of infection is among the top five reasons against vaccination [2,7]. Most evidence, however, indicates that the incidence of nosocomially acquired influenza among HCW is significantly higher when vaccination rates are low [1,2]. Moreover, some HCWs exhibited a lack of concern, potentially because they believed that the risk of transmitting influenza virus to their patients was low [3]. Again, most studies show that this perception differs from reality, as influenza transmission in healthcare settings, as well as patient morbidity, is significantly higher when vaccination rates are low (for an overview, see [1] and [2], but also [13]). Overall, skewed risk perceptions are among the most important reasons why HCWs do not get vaccinated. As discussed,

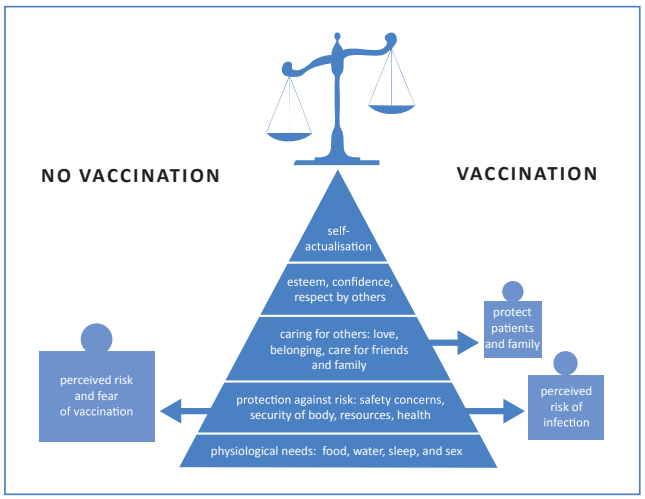
frequently the perceived risks deviate from objective, or at least empirically substantiated, levels of risk.

Protecting oneself against risks and threats is a fundamental motivator behind human behaviour. This follows directly after the instincts to fulfil physical needs for food, water, sleep and sex, as illustrated in Maslow's pyramid of needs [14] (Figure). In the eighteenth century, for example, infectious diseases used to represent a great risk against which individuals sought protection, e.g. by means of vaccination [15,16]. People saw first-hand others affected by and dying from severe diseases. With increased vaccine uptake, two diseases, poliomyelitis and smallpox, are in the process of being or have been completely eradicated, and, with that, the vivid pictures of affected neighbours have disappeared. Simultaneously, however, reports of vaccine adverse events have increased in number. This is due primarily to the growing number of vaccinations taking place [17]. However, more or less organised anti-vaccination communications that announce alleged side effects also play a key role [18-21]. The most prominent example may be the false claim that vaccination against measles, mumps and rubella may cause autism [21,22]. This damaged people's confidence in vaccination over the years and is still in people's minds today, even though there is no scientific evidence for the claim and the paper had to be retracted [8,22]. Similarly, increased incidence of narcolepsy seen in some European countries after administration of the influenza A(H1N1)pdm09 vaccine [23] may falsely create the idea that seasonal influenza vaccines may also lead to the same consequences. However, narcolepsy following the A(H1N1)pdm09 vaccination has been observed in a limited area and has not been observed following any other vaccination [23].

Thus, given the low incidence of vaccine-preventable diseases and alleged and real adverse events, modern vaccines can represent a risk that individuals want to protect themselves from because they fear side effects. Such fear is a very powerful force in reducing vaccination intentions. In a study during the 2009 influenza pandemic, fear of side effects was shown to significantly reduce vaccination intentions, even when fear of infection was also high [24]. If fear of side effects had been lower, vaccination rates may have been substantially higher. In another study, pregnant women's perceived risk of vaccine-related adverse events was much higher than their perceived risk of influenza infections [25]. Given these risk perceptions and assuming that future mothers want to protect themselves and their unborn children from risks, the logical decision would seem to be for them to omit vaccination. Thus vaccination decisions appear to be the result of weighing risks of infection and risks of side effects (Figure). Perceptions of risk do not necessarily need to be rooted in reality; they depend on stories a person hears, their education and experiences, and reports in the media. If fear of side effects increases, vaccination becomes even more unlikely.

Figure

How basic human forces compete and may pull healthcare workers' vaccination intentions in different directions



When making vaccination decisions, human motivational forces of protecting against risk and caring for others may sometimes compete and pull in different directions. This is mainly due to skewed risk perceptions and fear of vaccination. The major goal of educational interventions and campaigns should be to have both forces pull in the same direction by correcting false risk perceptions and stressing the importance of caring for others.

The relative size of the weights illustrates the relative importance of the predictors [7,11,24]. The pyramid represents Maslow's pyramid of needs [14].

Protecting others as a reason for vaccination

In addition to protection against risks, a second powerful force motivates human behaviour: care for family and friends – doing good for others (Figure)) [14]. Vaccination provides a person with the chance to do good for others because it reduces transmission of pathogens [26]. The more people become immunised in a population, the more difficult it becomes for a disease to spread. People who are too young or ill to get vaccinated will be protected through herd immunity [26]. With a sufficient number of people immunised, some diseases can be eliminated – as is currently the goal of the World Health Organization European Region measles and rubella initiative [27].

For HCWs, caring for others is their job. Patients will expect that HCWs' motivation to protect them will be at a maximum. But does the motivation to protect others impact vaccination behaviour? The answer: it depends. Scientists in the United States assessed whether individuals are generally motivated to protect others by being vaccinated themselves [28]. They found that individuals indeed decide to get vaccinated if others can benefit from their vaccination. However, this was only the case if their personal risk of vaccination was low. If their personal risk was high, they refused to get vaccinated to help others. In a German study, individuals intended to get vaccinated when they were informed that their vaccination had a social benefit,

but only if the costs – such as time or money – were low [29]. These two studies point to the same conclusion. Vaccination for the benefit of others? Yes, if the costs and personal risks are low.

In order to explore HCWs' pro-social motivation, we can compare two interestingly different vaccinations: against hepatitis B and against influenza. For example, in the United States Centers for Disease Control and Prevention recommendations for HCWs [30], hepatitis B is described as the greatest infectious hazard for HCWs. The description includes the incidence of chronic liver disease due to hepatitis B as well as numbers of deceased HCWs in the previous year. Reasons for recommending influenza vaccination, in contrast, include the disruption of healthcare, transmission to patients, and morbidity and mortality in nursing homes. Thus, while the reasons for hepatitis B vaccination are directly related to protecting HCWs' health, the reasons for getting vaccinated against influenza are more or less exclusively related to the environment of the HCW and aim at saving resources and protecting others (e.g. patients). This difference in reasons for the recommendations may lead to different vaccination rates. Indeed, a recent German study with medical students showed that vaccination rates were much higher for hepatitis B than for influenza (87% vs 35% [31]), even though both vaccinations are not mandatory for HCWs in Germany. Similarly, data from 2003 showed that an estimated 75% of HCWs in the United States had been vaccinated against hepatitis B, while only 40% were vaccinated against influenza [30]. Thus, when their own health is at stake, as communicated in the hepatitis B recommendation, HCWs appear more inclined to get vaccinated than when the major reasoning of the recommendation is to protect patients. Hollmeyer et al. arrived at a similar conclusion: 'If HCW get immunized against influenza, they do so primarily for their own benefit and not for the benefit to their patients' [7, p. 3935].

Competing human forces: protecting the self versus caring for others

It is HCWs' professional duty to ensure maximum patient safety, care and professional effectiveness during infectious disease outbreaks [3]. Moreover, some of them must take care of immunocompromised patients, for whom infection with influenza would lead to severe illness. This view may lead to the assumption that HCWs who do not get vaccinated are neglecting their professional obligations and doing a poorer job than their vaccinated colleagues. However, there is an alternative interpretation: competing motivational forces.

The human motivational forces, protection against risk and caring for others, may sometimes compete with each other and pull in different directions (Figure). An individual's desire to help others may be in conflict with the costs and risks that they must face and that reduce the person's benefit as a result of the action. Consider, as an example, the process of eradicating polio. High vaccine uptake is necessary to reach the collective benefit of eradication. Fortunately, in most countries today, the probability of contracting polio is nearly zero. The subjective risk of suffering from adverse events after vaccination against polio, however, may be larger than zero [8].

This structure of the decision problem renders the vaccination decision a social dilemma [29,32]. In a social dilemma, individual interests are in conflict with collective interests: as long as a large number of individuals in the population are vaccinated, the individually rational strategy is to 'free-ride', i.e. omit vaccination and thus avoid the costs associated with vaccination while enjoying the benefits of herd immunity. This choice is in opposition to the collective benefit, because herd immunity cannot be reached when too much free-riding takes place [26].

Once a disease is nearly eradicated or eliminated, the perceived risk of infection is very likely to be lower than the perceived risk of vaccine-related adverse events [17]. Further, the situation is also structurally equivalent in each case in which the risk of infection is perceived to be low and risk of vaccination is perceived to be high (as described above, HCWs perceive their risk of contracting influenza as low and they fear side effects). The collective benefit of HCWs' influenza vaccination may therefore be higher than the HCWs' individual benefit.

As outlined above, the decision to get vaccinated against influenza is difficult for HCWs, as weighing individual risks – based on skewed risk perceptions – may suggest that the vaccination should be avoided. The following section discusses strategies to overcome HCW's vaccine refusal by considering the competing motivations and the incentive structure of the decision situation.

Potential strategies to increase vaccine uptake in healthcare workers

Mandatory vaccination

In the United States, seasonal influenza vaccination rates have risen due to extensive efforts to promote vaccination by combining free-of-charge vaccination with educational campaigns [2] as well as mandatory vaccination in some healthcare facilities [3]. In Europe, mandatory vaccination is discussed critically, with a preference for voluntary policies [3]. Still, it may be possible to increase HCW's vaccination by making the alternative to vaccination unattractive – e.g. requiring non-vaccinated HCWs to wear a mask while working, which is uncomfortable and stigmatises unvaccinated HCWs. There is evidence that such an intervention can significantly increase vaccination rates [33]. From a game theory point of view [32], wearing masks can be viewed as a punishment for failing to contribute to the public good. In economic public goods games, a public

good (which benefits everyone) can only be reached or maintained when most individuals contribute some portion of their resources [34]. Punishing those who do not contribute increases their subsequent contributions in public goods games [34]. Thus, the requirement to wear masks when unvaccinated may be a concrete way to 'punish' those who refuse vaccination and simultaneously increase patient protection from the illness.

Where voluntary policies are preferred, however, it is important to identify effective voluntary advocacy approaches to increase HCW's vaccine uptake.

Advocacy

A framework for vaccine advocacy was formulated as 'Vaccination Adoption = Access + Acceptance' [35, p. 1]. In the remainder of this paper, this framework serves as guidance for summarising promising strategies to increase HCWs' vaccine uptake.

Access

Generally, access to healthcare should not be a problem for HCWs when compared with global access issues of insufficient vaccine supply and inadequate healthcare systems. Rather, in this context, access means facilitated access, e.g. lowering or eliminating costs or using mobile units to save HCWs' time. These measures are not new and usually of low effectiveness [3], especially when applied as isolated strategies [2]. However, low-cost vaccination (both regarding time and money) should be combined with focused communication and education strategies [2], as detailed below.

Acceptance: education and interventions

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, curricula early in the course 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 [36,37], as misperceptions are also common in future HCWs, i.e. medical students [12]. 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 behaviour [29].

Education could also be used to anchor and strengthen HCWs' pro-social values in the course of their education. Research has shown that social value orientation influences behaviour in economic games that are structurally similar to the vaccination decision [38]. Pro-social orientations increased cooperation, indicating that strong pro-social motivation may increase vaccination rates.

Pro-social motivation can also be activated by interventions. Communication strategies should be used that activate positive, other-regarding preferences ('protection of others') (for an overview, see [34]). If such preferences are activated, they are likely to affect behaviour accordingly [38,39]. In the context of vaccination, it has been shown that these effects occur only if the costs of vaccination are low [29,40]. Thus, the activation of social motives will be likely ineffective as an isolated strategy; rather, it must be combined with easy access, as discussed above.

In addition, incentivising HCWs contingent on the vaccine uptake reached in their healthcare unit represents an additional possible strategy that is based on the social dilemma structure. Economic experiments have shown that hypothetical vaccination rates increased in an experimental game when individuals were paid according to the group rather than individual outcome [28]. The practical feasibility of this intervention, however, remains to be tested.

Conclusion

According to the analyses discussed above, strategies to increase HCWs' vaccination uptake should have two goals: (i) correct skewed risk perceptions; and (ii) activate pro-social motivations in HCWs while simultaneously reducing the costs of getting vaccinated. Strategies may be more effective if they take driving human forces into consideration, i.e. protection against risk and caring for others. Without appropriate education and the correction of skewed risk perceptions, these forces may pull in different directions, as illustrated in the Figure. Education and interventions should thus aim to make the two forces pull in the same direction, in order to increase vaccination uptake.

Conflict of interest

None declared.

Authors' contributions

The author is solely responsible for the full text.

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