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Changing the default to promote influenza vaccination among health care workers

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ABSTRACT

Background: The prevention of health care acquired infections is an important objective for patient safety and infection control in all health care settings. Influenza vaccination uptake among health care workers (HCWs) is the most effective method to prevent transmission to patients, but vaccination coverage rates are low among HCWs. Several educational campaigns have been developed to increase the influenza vaccination coverage rates of HCWs, but showed only small effects. The aim of this study was to test an opt-out strategy in promoting uptake among HCWs in a tertiary care center for patients with complex chronic organ failure.
Methods: HCWs were randomly assigned to one of two conditions. In the opt-out condition ($N = 61$), participants received an e-mail with a pre-scheduled appointment for influenza vaccination, which could be changed or canceled. In the opt-in condition ($N = 61$), participants received an e-mail explaining that they had to schedule an appointment if they wanted to get vaccinated.
Results: The findings show no statistically detectable effect of condition on being vaccinated against influenza. However, HCWs in the opt-out condition were more likely to have an appointment for influenza vaccination, which in turn increased the probability of getting vaccinated.
Conclusion: To change the default to promote influenza vaccination among HCWs might be an easy and cost-effective alternative to the complex vaccination campaigns that have been proposed in recent years.

1. Introduction

The prevention of health care acquired or nosocomial infections is an important objective for patient safety and infection control in all healthcare settings [1]. Several studies reported on the incidence of influenza infections leading to nosocomial outbreaks with negative consequences for patients and the healthcare organization [2–6]. A review including 12 nosocomial outbreaks in healthcare settings reported an infection prevalence of up to 50% among patients on the epidemic ward [3]. Sartor and colleagues [6] found that 41% of patients and 23% of healthcare workers (HCWs) contracted influenza on an internal medicine ward during an outbreak, which resulted in additional morbidity, as well as considerable interferences with and delay of healthcare services.

Nosocomial outbreaks are especially problematic for immunosuppressed patients, including those with underlying chronic diseases leading to increased morbidity, mortality and associated costs [7–9]. In particular, patients with chronic obstructive pulmonary disease (COPD) have been shown to suffer from a 15% to 50% acute exacerbation following a respiratory infection [9]. Patients get infected with influenza through relatives, other patients, or HCWs. It is estimated that 20% of HCWs get infected with influenza annually [10]. Many of them continue working and thereby promote the spread of influenza [11]. Vaccination against influenza is the most effective method to prevent nosocomial transmission [12,13], and studies showed that vaccination helps to reduce influenza-related diseases and mortality among

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patients with chronic lung diseases [14]. A Dutch study executed in University hospitals showed that an increase of 10.8% in the vaccination uptake of HCWs through means of a multi-faceted program resulted in approximately 6% fewer patients with nosocomial influenza and/or pneumonia compared with control hospitals [15]. In addition, studies clearly indicated that vaccinating HCWs is cost-effective [6,16,17].

Despite all evidence for the effectiveness of vaccination in the prevention of nosocomial infections, vaccination coverage rates among European HCWs are low. A study by Blank, Schwenkglenks, and Szucs [18] in 11 European countries reported vaccination rates of between 6.4% and 26.3% among HCWs. Attitude is an important determinant predicting HCWs' intention to get vaccinated against influenza [19,20]. The common sense strategy to change attitudes is to give people factual information and good arguments for the desired health behavior (i.e., getting vaccinated against influenza). In accordance, proposed theoretical methods to change attitudes and underlying beliefs are oftentimes educational in nature [21]. However, an increasing number of studies conclude that information alone cannot achieve behavior change [22]. Nevertheless, several educational campaigns have been developed to increase the influenza vaccination coverage rates of HCWs [15,23–25], but showed only small effects. Consequently, there seems to be a need for a radically different approach to change vaccination behavior.

An approach that has shown to be effective in influencing behavior is nudging [26]. Nudges are small and simple changes in the environment that push decision makers in the right direction without restricting their choice autonomy. One such nudge that has shown to be able to promote health behavior is the default effect [26,27]. Decision makers show the tendency of sticking with a default option, the option that comes into effect if the decision maker does not actively decide against it. A study by Chapman, Li, Colby, and Yoon [28] manipulated the default by sending e-mail appointments for annual influenza vaccination to University staff. Employees in the opt-out condition had an appointment by default and had to actively cancel it if they did not want to have an appointment (or they could ignore the appointment, which most did). Employees in the opt-in condition did not have an appointment and had to actively make an appointment if they wanted to have an appointment for vaccination (or they could be vaccinated as walk-ins). A 12% absolute increase in vaccination rate was found in favor of the opt-out condition. In addition, it was found that appointment status mediated the relationship between condition and getting vaccinated.

Because HCWs are an important source of nosocomial infections in vulnerable patient groups, and previous educational interventions have failed or only reached small effects, this replication study tested the use of the default strategy to increase the influenza vaccination uptake of HCWs in a Dutch expert center for patients with chronic organ failure using a randomized experimental design. It was hypothesized that appointment status mediates the relationship between condition and getting vaccinated, like it did in the study of Chapman and colleagues [28].

2. Methods

2.1. Setting, participants, design and procedure

CIRO+ is a center of expertise for the diagnosis and treatment of patients with complex chronic organ failure, in particular obstructive pulmonary diseases (i.e., COPD and asthma) and chronic heart failure. It is located in the south of the Netherlands. The center employs 122 people, including (chest) physicians (approximately 6%), nursing staff (33%), psychotherapists and social workers (5%), ergo-therapists (3%), physiotherapists (14%), laboratory workers (18%), biomechanical engineers (4%), dieticians (11%), and researchers (6%). Most employees have patient contact. The annual procedure for influenza vaccination of HCWs in the center is as follows: The chest physician sends an e-mail to all employees that free vaccination is available at one day mid-October and if they want to get vaccinated they have to respond to the e-mail. Depending on the number of employees who respond, the center buys vaccines and the employees are vaccinated as walk-ins by a nurse at the day specified in the e-mail.

In the beginning of October 2014, CIRO+ employees were invited to attend a presentation, outlining the available evidence regarding the effectiveness of influenza vaccination in protecting patients, during one of their regular educational seminars. In mid-October, all 122 employees at CIRO+ were randomly assigned to one of two conditions in a one-factorial between-subjects design (email invitation: opt-in vs. opt-out). Randomization was done by the first author, who listed employees alphabetically by their last name and split the sample in half. Employees were blind to group assignment, as were the nurses administering the vaccination. Those in the opt-out condition received an e-mail from the responsible chest physician (FMEF) explaining that they had been scheduled for the annual influenza vaccination, with the day, time, and location provided. Vaccinations free of charge were given on two different days of the week. Hyperlinks in the e-mail allowed participants to change or cancel the appointment day and/or time. For those in the opt-in condition, the e-mail explained that there were two days on which free influenza vaccinations were available and they had to schedule an appointment by responding to the chest physician via e-mail if they wanted to get vaccinated, which resembled the annual procedure at this center. In the week of the vaccinations, all opt-out participants that had changed or did not cancel their appointment were sent a reminder. Opt-in participants were not sent a reminder.

2.2. Data analysis

Pearson Chi-Square analysis was conducted with SPSS 21.0 to test for a difference in influenza vaccination uptake between the opt-in and the opt-out condition. Mplus 7 was used to test for mediation of appointment status. The bias corrected and accelerated (BCa) confidence intervals were set at .95 with 5000 resamples.

3. Results

The study sample consisted of 122 CIRO+ employees, of which 97 (79.5%) were female. Of the 61 participants that were randomly assigned to the opt-in condition, 12 scheduled an appointment, of which 8 got vaccinated, while 49 participants did not make an appointment, of which 2 got vaccinated. In the opt-out condition, 37 of the 61 participants cancelled their appointment. Of the 24 participants that did not cancel their appointment, 19 retained their original appointment of whom 12 got vaccinated and 7 did not. The appointment was changed to a different time and/or day by 5 participants; all 5 received the vaccination (see Table 1).

In the opt-in condition, 10 of 61 participants (16.4%) were vaccinated against influenza, compared with 17 of 61 participants (27.9%) in the opt-out condition, an 11.5% absolute difference [95%

Table 1
Overview of HCWs' behavior in the two conditions and vaccination uptake.

	Opt-in	Opt-out
Assigned	61	61
Appointment	12	24 (5 rescheduled)
Vaccinated	10 (2 without appointment)	17
%	16.4	27.9

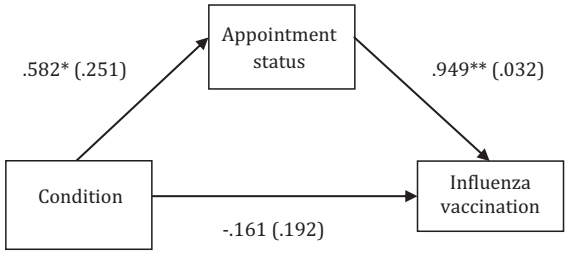

Fig. 1. Logistic regression coefficients (SE) for the relationship between condition (opt-out vs. opt-in) and influenza vaccination (yes vs. no) as mediated by appointment status (yes vs. no). $^{*}p < .05$; $^{**}p < .01$

CI, 3.3–25.8%]. Despite the non-significance of this difference ($\chi^2(1, N = 122) = 2.33$, $p = .13$), mediation analysis revealed that there is a meaningful indirect effect of appointment status (canceled vs. made/kept) on the relationship between condition (opt-in vs. opt-out) and flu shot (yes vs. no) ($b = .553$, BCa 95% CI [.107;1.043]; see Fig. 1). In the opt-in condition, 12 of the 61 staff members had an appointment, compared with 24 of the 61 staff members in the opt-out condition. Of the 36 staff members with an appointment, 25 got vaccinated, while only 2 of the 86 staff members without an appointment got vaccinated. The fact that zero falls outside the bootstrapped interval of the total effect indicates a significant mediation of the effect of opt-out vs. opt-in on vaccination rate through appointment status.

4. Discussion

This study tested whether a default manipulation increases the influenza vaccination uptake rate among HCWs. We did not find a significant increase of the likelihood of the opt-out condition on the probability to get vaccinated. Following the study of Chapman and colleagues [28], we hypothesized that there might be an indirect effect of appointment status on the relationship between condition and getting vaccinated. Contrary to what Baron and Kenny [29] originally proposed, MacKinnon and colleagues [30] acknowledged that there can be mediation in the absence of an effect of the independent variable on the dependent variable, as long as there is a significant relationship between the independent variable and the mediator, as well as a significant relationship between the mediator and the dependent variable. Thus, in comparison to the Baron and Kenny approach, the condition that the independent variable has to have a total effect on the dependent variable was removed. We hypothesized that HCWs with a neutral and with a positive attitude toward influenza vaccination will benefit most from the default effect. Since a large group of HCWs could be expected to have a negative attitude toward influenza vaccination, it was not surprising that condition did not show a total effect on getting vaccinated. However, similar to Chapman and colleagues, we found that the effect of the opt-out intervention was mediated by the appointment status of participants. Participants in the opt-out condition were more likely to have a vaccination appointment than participants in the opt-in condition, which increased the probability of getting vaccinated [28]. That is, being in the opt-out condition increased the likelihood of having an appointment for influenza vaccination, which in turn increased the probability of getting vaccinated. HCWs who retained their appointment for vaccination were most likely the ones who already held a neutral or a positive attitude toward influenza vaccination.

Given the low vaccination uptake of HCWs and small effects of voluntary vaccination programs, it can be argued that mandatory approaches are necessary to ensure patient safety. In the US vaccination coverage rates of 98% and higher are being achieved through mandatory vaccination programs [31]. However, while it becomes more common for US health care settings to employ such mandates, most European health care settings are more concerned with the violation of civil liberties and the individual right to refuse medical treatment [32,33]. Implementation of mandatory vaccination programs are highly unlikely in most European countries, which is probably why nudging approaches get more attention in recent years. Halpern, Ubel, and Asch [34] have suggested that default options might help in improving healthcare. Especially in the domain of organ donation, changing the default option has been shown to be effective. The number of registered organ donors is considerably larger in countries where people must opt-out from being registered if they do not wish to donate than in countries where people actively have to opt-in to be registered if they wish to donate [35]. Halpern and colleagues [34] suggested that the effect of the default procedure can be expected to be largest when people have a neutral attitude toward a health behavior and when it is not too easy to opt-out. Without strong preferences that guide a decision, people may be more likely to not act and to accept the default as the recommended behavior. Our previous studies suggest that on the continuum of preferences to get vaccinated, many HCWs have a clear preference, both in favor or against influenza vaccination [19,20], which is likely to interfere with the default effect in this health domain. HCWs who are in favor of vaccination and those that did not form a clear preference are the ones who should benefit most from the strategy. In addition, findings of previous studies had suggested that HCWs might build up more resistance against vaccination when their autonomy to choose is taken away [36]. This is why we chose to make it fairly easy for them to opt-out by simply following a link in the invitation email and choosing the option to cancel the appointment. Even though this seemed necessary, it might additionally explain why the effects were not significant in our study. A possible implication of this for future attempts at increasing the vaccination uptake with the default procedure may be to make it a bit more difficult for HCWs to opt-out, for example by working with declination statements. Declination statements are written explanations of why someone chose to not get vaccinated and have been successfully used in the context of influenza vaccination among HCWs in the US [37]. However, it has to be noted that this approach could in turn lead to more resistance by HCWs, because it might threaten their autonomy more than the default procedure alone.

Moreover, Li and Chapman [26] proposed that the default procedure must be easily enforceable, which is the case for having an appointment, but when HCWs choose to not opt-out, they still have to remember their appointment, make time for it, and go to the vaccination location, which is not enforceable. Nevertheless, it is surprising that this relatively effortless and low-priced nudging strategy can show a difference in uptake that is comparable with the difference in uptake achieved by complex, multi-faceted campaigns to increase influenza vaccination uptake among HCWs [15,25].

A major strength of this study is the randomized experimental design that allowed for comparison of the two conditions while keeping the environment the same. However, the intervention location had the disadvantage of a modest sample size ($N = 122$), which might have led to a too small power to detect an effect of condition on vaccination uptake. A post hoc power analysis with the program GPower [38] revealed a 0.28 power to detect a 12% absolute difference in vaccination uptake between the two groups, when $N = 61$ per condition. Based on past research it can be expected that HCWs might be less responsive to the default effect than University staff, because of their pre-existing preferences with regard to influenza vaccination. This might further explain why we did not find a significant effect, in contrast to Chapman and colleagues [28]. Moreover, due to anonymity and confidentiality reasons, we

did not collect data on the demographics of participants. Therefore, we cannot compare the baseline characteristics of the two groups, which could have biased the vaccination uptake rates. Finally, it has to be noted that because this study was executed in a tertiary care center of expertise for the diagnosis and treatment of patients with complex chronic organ failure, findings may not be generalizable to other healthcare settings.

In conclusion, even though we did not find an effect of the default option on influenza vaccination, being in the opt-out condition did increase the likelihood of HCWs to have an appointment for vaccination, which increased the likelihood of getting vaccinated. These findings suggest that using the default procedure may be a promising alternative to the complex vaccination campaigns that have been proposed in recent years. This is especially the case because it is relatively easy to implement and it is low in cost.

Contributions

GBC conceived the idea for the strategy described in this paper in an earlier study. BAL, GBC, and RACR contributed to the conception, design, and analysis of the study. FMEF facilitated the contact to the tertiary care center and the contact with employees who participated in the study. BAL generated the email messages that were sent to participants with an online tool. BAL and FMEF collected the data. BAL, GBC, RACR, and GK contributed to the interpretation of the data. All authors contributed to drafting the paper and read and approved the final manuscript.

Competing interests

All authors declare that they have no competing interests.

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