

Original Article

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Uptake of and attitudes towards influenza vaccination among Danish hospital healthcare workers

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ABSTRACT

INTRODUCTION Until now, influenza vaccination has not been officially recommended to healthcare workers (HCWs) in Denmark. Even so, many hospitals have been offering vaccination for their HCWs for some years. Nonetheless, uptake has remained low. We conducted a survey to determine predictors for vaccine uptake and to clarify the attitude of Danish HCWs towards employer-sponsored influenza vaccination.

METHODS An online questionnaire covering demographics, uptake of and thoughts about the influenza vaccine was distributed by e-mail to hospital staff. Analyses identifying factors associated with vaccine uptake were conducted.

RESULTS The response rate was 28% with 3,130 HCWs participating. Overall, 51% had received influenza vaccination. Formerly vaccinated participants were more likely to be vaccinated again. Perception of own gain, patient gain and a workplace recommendation were key incentives for vaccine uptake. The main reported reasons for rejecting vaccination were perceiving immunisation as a private matter, not feeling vulnerable to influenza and fear of vaccine side effects. Women, participants ≤ 49 years and participants with children living at home were less likely to be vaccinated.

CONCLUSIONS To improve influenza vaccine uptake among HCWs, campaigns targeting newly employed staff should be conducted thereby establishing the basis for future vaccination behaviour. Efforts should be made to increase vaccine acceptance among women, younger employees and nursing staff.

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Influenza is a respiratory infection associated with increased morbidity and mortality among patients with comorbidity [1]. Transmission of influenza from persons with clinical influenza symptoms is appreciable but may also occur from persons with no or few symptoms [2]. Vaccination of healthcare workers (HCWs) can prevent influenza-related illness, hospitalisation and death among high-risk patients [3, 4]. HCWs have a greater risk of contracting influenza than people working in non-healthcare settings [5], making them a potential source of hospital-acquired influenza [6, 7]. Therefore, vaccination of HCWs may potentially protect patients. Until the autumn of 2020, there was no official HCW influenza vaccine recommendation from the Danish Health Authority, unlike many other European countries [8]. However, several Danish hospitals have offered vaccination to their employees for years. This also applies to Odense University Hospital, Svendborg Hospital

(OUH). However, vaccine uptake remains low at approx. 30%.

Studies on employer-sponsored vaccination have found HCWs to be in favour of vaccination [9], but mandatory vaccination programmes are controversial [10]. No prior Danish studies have investigated this topic. We therefore performed the present study to evaluate Danish HCW's attitudes towards employer-sponsored influenza vaccination and to determine predictors for vaccine uptake.

METHODS

Design and participants

This was a cross-sectional cohort questionnaire study conducted among all staff at OUH; a hospital with departments in four different cities and a total of 11,281 employees. The hospital conducts vaccination in dedicated vaccination clinics for HCWs in all four cities throughout the month of October. A total of 3,340 employees received an influenza vaccination in the clinics in October 2018.

Data collection

Anonymised electronic questionnaires (https://ugeskriftet.dk/files/a10200729_supplementary.pdf) were sent to the employees' work email on 25 January 2019. Bulletins were on the intranet of the hospital, and one e-mail reminder was sent. The questionnaire was available until 1 March. Incentives to heighten the response rate were not given because we considered that the project dealt with a topic that was considered sensitive by several colleagues. Study data were entered directly by the participants and managed using REDCap electronic data capture tools hosted by the Region of Southern Denmark. The survey questions were based on a review of the literature.

Variables

The questionnaire consisted of three parts:

Baseline characteristics for all participants: Sex (male/female), age (in categories from ≤ 29 to ≥ 70 years), place of employment (Department of Internal Medicine and Paediatrics /Surgery/Department of Anaesthesiology/Laboratory Department/Service Departments (*Radiology, Facilities Management, Logistics, Pharmacy, Kitchen, Cleaning and Rehabilitation*)/Hospital Administration), profession (physician/nursing staff/administrative or technical staff/service or additional health staff), regular patient contact (yes/no), children < 18 years (yes/no) and influenza vaccine uptake 2018/2019 (yes/no).

Participants vaccinated in 2018/2019: vaccinated at work (yes/no), previous influenza vaccine (yes/no), reasons for accepting the vaccine (Vaccination was recommended by my workplace/I belong to a risk group/It benefits myself/It benefits the patients/It benefits my family/It benefits my colleagues/ I think flu is a serious illness/ I've had the flu before/ I just follow vaccination routine) with optional commenting facility for respondents, side effects (*no/yes/systemic/local/other*), absent from work due to side effects (*yes/no*) and had influenza despite vaccination (*yes/no*).

Participants not vaccinated in 2018/2019: Previous influenza vaccine (yes/no), reasons for not accepting the vaccine (allergy/ I've heard of side effects and someone who got sick from the vaccine/I've had side effects/I was sick at the time of vaccination/I don't think flu is a serious illness/I've never had the flu before and I'm not at risk/I got the flu anyway/It hurts to get vaccinated/ It doesn't benefit myself/It does not benefit my family/The patients do not benefit/It does not benefit my colleagues/oversight/I couldn't leave my workplace to get vaccinated/The workplace should not interfere with vaccinations), with comment opportunity, consider vaccination in the future (yes/no), with optional commenting facility for respondents.

Most questions could also be answered “Do not want to answer” or “Do not know”. More than one type of side effect or motivational factors could be reported. Outcomes of interest were vaccine uptake in 2018/2019 and reasons for accepting or rejecting vaccination. Baseline characteristics were evaluated as predictors for vaccine uptake.

Data sharing statement

The datasets used and/or analysed during the present study are available from the corresponding author on reasonable request.

Statistical analysis

Descriptive statistics were calculated for baseline characteristics and questions with numbers and percentages. Age, place of employment and profession are categorical variables. The remaining variables are dichotomous. Information about missing data is provided in **Table 1**, **Table 2**, and **Table 3**. Factors associated with 2018/2019 influenza vaccinations were identified by univariable logistic regression. Variables with $p < 0.05$ were included in the multivariable model. However, the variable *place of employment* was left out to have sufficient power. Due to interaction between age and profession, and age and former influenza vaccination, the multivariable analysis was stratified for two age groups and assessed using Pearson’s goodness-of-fit test. Odds ratios were determined. $p < 0.05$ was considered statistically significant.

Trial registration: not relevant.

TABLE 1 Demographics of all participants and stratified by vaccination status in the 2018/2019 influenza season. The values are n (%).

	Vaccinated (n = 1,581)	Not vaccinated (n = 1,544)	All participants (N = 3,125)
<i>Sex</i>			
Female	1,244 (78.7)	1,360 (88.1)	2,604 (83.3)
Male	335 (21.2)	179 (11.6)	514 (16.5)
Do not want to answer	2 (0.1)	4 (0.23)	6 (0.2)
Missing data	0	1 (0.1)	1 (0.03)
<i>Age group</i>			
< 50 yrs	855 (54.1)	938 (60.7)	1,793 (57.4)
≥ 50 yrs	721 (45.6)	605 (39.2)	1,326 (42.4)
Missing data	5 (0.3)	1 (0.1)	6 (0.2)
<i>Place of employment</i>			
Internal medicine departments and paediatrics	560 (35.4)	468 (30.3)	1,028 (32.9)
Surgery departments	319 (20.2)	412 (26.7)	731 (23.4)
Departments of anaesthesiology	151 (9.6)	179 (11.6)	330 (10.6)
Service departments ^a	205 (13.0)	215 (13.9)	420 (13.4)
Laboratory departments	192 (12.1)	91 (5.9)	283 (9.1)
Hospital administration	120 (7.6)	118 (7.67)	238 (7.6)
Do not know	20 (1.3)	24 (1.6)	44 (1.4)
Do not want to answer	13 (0.8)	34 (2.2)	47 (1.5)
Missing data	1 (0.1)	3 (0.2)	4 (0.1)
<i>Profession</i>			
Physician	334 (21.1)	129 (8.4)	463 (14.8)
Nursing staff	598 (37.8)	773 (50.1)	1,371 (43.9)
Administrative or technical staff	340 (21.5)	372 (24.0)	712 (22.8)
Service and additional health staff ^b	300 (18.9)	255 (16.5)	555 (17.8)
Do not know	5 (0.32)	5 (0.3)	10 (0.3)
Do not want to answer	4 (0.25)	8 (0.5)	12 (0.4)
Missing data	0	2 (0.13)	2 (0.06)
<i>Regular contact with patients</i>			
No	468 (29.6)	424 (27.6)	892 (28.5)
Yes	1,101 (69.6)	1,106 (71.6)	2,207 (70.6)
Do not know	9 (0.6)	5 (0.3)	14 (0.5)
Do not want to answer	1 (0.06)	2 (0.1)	3 (0.1)
Missing data	2 (0.1)	7 (0.5)	9 (0.3)
<i>Children in your household < 18 yrs</i>			
No	772 (48.8)	668 (43.3)	1,440 (46.1)
Yes	802 (50.7)	867 (56.2)	1,669 (53.4)
Missing data	6 (0.4)	7 (0.5)	13 (0.4)
Do not want to answer	1 (0.1)	2 (0.1)	3 (0.1)

a) Radiology, facilities management, logistics, pharmacy, kitchen, cleaning, rehabilitation.

b) Pharmacists, audiologists, physio- or occupational therapists, psychologists, service staff.

TABLE 2 Previous influenza vaccination, reasons for getting vaccinated and prior influenza illness despite vaccination reported by 1,581 participants, who were vaccinated. Ranked by frequency.

	n (%)
<i>Vaccinated at work or elsewhere?</i>	
At work	1,474 (93.2)
Elsewhere	107 (6.8)
<i>Have you previously received influenza vaccination?</i>	
Yes	1,343 (85.0)
No	235 (14.9)
Do not know	3 (0.2)
<i>Reasons for accepting influenza vaccination?</i>	
It benefits me	1,130 (71.5)
It benefits the patients	975 (61.7)
It benefits my co-workers	846 (53.5)
It benefits my family	839 (53.1)
It is workplace recommended	762 (48.2)
I previously had influenza	433 (27.4)
Influenza is a serious disease	275 (17.4)
I belong to a risk group	275 (17.4)
I routinely get my influenza vaccine	243 (15.4)
Other reason, left a comment ^a	70 (4.4)
Do not know	3 (0.2)
Do not want to answer	3 (0.2)
<i>Have you previously had influenza despite vaccination?</i>	
No	1,076 (68.1)
Yes	388 (24.5)
Do not know	116 (7.3)
Do not want to answer	1 (0.1)

a) See Results section.

TABLE 3 Previous influenza vaccination, reasons for rejecting vaccination and thoughts on possible future vaccination reported by 1,544 participants who were not vaccinated. Ranked by frequency.

	n (%)
<i>Have you previously received influenza vaccination?</i>	
No	1,100 (71.4)
Yes	439 (28.5)
Do not want to answer	3 (0.1)
Do not know	2 (0.1)
<i>Reasons for rejecting influenza vaccination?</i>	
Vaccination is a personal matter/I do not want the vaccine or to feel pressured	516 (33.4)
I have never had influenza before and do not think I am at risk	494 (32.0)
Heard about unwanted side effects	308 (19.9)
Influenza is not a serious disease	215 (13.9)
I or others were previously vaccinated and had influenza anyway	156 (10.1)
The vaccine provides poor coverage	
I have been ill from vaccine side effects before	126 (8.1)
I forgot about it or did not prioritise it	116 (7.5)
I do not know	62 (4.0)
It does not benefit me	52 (3.3)
Could not leave work to get vaccinated	42 (2.7)
I was sick/absent at the time of vaccination	41 (2.7)
Do not want to answer	36 (2.3)
It does not benefit my patients, or I only see healthy patients	35 (2.2)
It hurts to get vaccinated	24 (1.5)
It does not benefit my family	22 (1.4)
I have an allergy against a vaccine ingredient	16 (1.0)
It does not benefit my co-workers	10 (0.6)
I was pregnant	3 (0.1)
I do not mind being absent from work due to illness	1 (0.06)
Lack of knowledge	1 (0.06)
<i>Could anything make you consider vaccination?</i>	
No	520 (33.8)
Do not know	516 (33.5)
Yes ^a :	
If I or my children got a chronic illness/old age	181 (11.7)
I just forgot/something got in the way. Otherwise, I would have	91 (5.9)
If I get influenza/I have just had influenza	85 (5.5)
I need more knowledge about the evidence for vaccination	55 (3.6)
If I had patient contact	48 (3.1)
If no side effects or a better vaccine	34 (2.2)
If vaccination in own department or different opening hours in the vaccination clinic	25 (1.6)
Subtotal	484
Do not want to answer	20 (1.3)
Missing data	4 (< 0.01)

a) > 1 answer possible.

RESULTS

Questionnaires were sent to 11,281 employees and 3,130 participated. Thus, the response rate was 28%. We excluded five participants as they failed to provide information about their vaccination in the latest season, leaving 3,125 respondents. Among those, 1,581 (50.6%) were vaccinated. Their demographic characteristics overall and stratified by vaccine uptake are shown in Table 1.

A total of 1,581 participants received influenza vaccination in 2018/2019

Reasons for vaccine acceptance were provided by 1,575 (99.6%) participants. The three most frequently reported reasons were own personal gain (1,130; 71.5%), it is a benefit for patients (975; 61.7%) and my co-workers (846; 53.5%). Seventy participants left a free text answer. Only a few were not covered by the pre-established answer options. They were “I want to show good leadership”, “peer pressure” and “pregnancy in progress”. A total of 170 (10.7%) participants reported side effects (localised and systemic combined), and 20 had to call in sick. Another ten would have called in sick but refrained from doing so. Among those vaccinated, 85.0% reported a previous vaccination. Additional data are presented in Table 2.

A total of 1,544 participants did not receive influenza vaccination in 2018/2019

Reasons for rejecting vaccination were provided by 1,446 (93.7%) participants. Answers could be given as prefixed and free-text answers. A total of 361 participants (23.4%) provided free-text answers all of which were assessed by study staff. Many were covered by a prefixed answer and they were then combined. The three most frequently provided reasons for rejecting vaccination were, I perceive immunisation as a private matter and do not want to feel pressured (516; 33.4%), I do not feel vulnerable to influenza (494; 32.0%) and I have heard of vaccine side effects (308; 19.91%).

Considerations regarding future vaccination were provided by 484 (31.4%) participants in free text. The majority responded, “If I get old or contract a chronic illness (181; 11.7%). Additional data are presented in Table 3.

Factors associated with influenza vaccination in 2018/2019

Prior influenza vaccination, age ≥ 50 years, male sex, employment in Laboratory departments, serving as a physician, and no children living at home were all significantly associated with vaccine uptake in univariable analysis. Regular patient contact was not. Multivariable analyses (**Table 4**) were performed for two age groups (≤ 49 and ≥ 50 years). Prior influenza vaccination was a predictor in both age groups; for ≤ 49 years (odds ratio (OR) = 10.33; 95% confidence interval (CI): 8.18-13.05) ($p < 0.001$) and ≥ 50 years (OR = 24.61; 95% CI: 18.02-33.61) ($p < 0.001$) compared with no prior vaccine. So was male sex for ≤ 49 years (OR = 1.42; 95% CI: 1.02-1.97) ($p = 0.037$) and ≥ 50 years (OR = 2.07; 95% CI: 1.33-3.23) ($p = 0.001$) compared with female sex and no children living at home; for ≤ 49 years (OR = 1.49; 95% CI: 1.16-1.92) ($p = 0.002$) and ≥ 50 years (OR = 1.45; 95% CI: 1.15-2.61) ($p = 0.022$) compared with having children at home. For participants ≤ 49 years, serving as a physician (OR = 3.06; 95% CI: 2.13-4.48) ($p < 0.001$) was a predictor compared with all other professions, whereas serving as service or additional health staff was a predictor (OR = 1.73; 95% CI: 1.15-2.61, ($p = 0.009$) for participants ≥ 50 years compared with all other professions. Nursing staff had the lowest odds for vaccination in both age groups.

TABLE 4 Factors associated with influenza vaccine uptake in 2018/2019 among healthcare workers by multivariable analysis.

	Age group					
	< 50 yrs			≥ 50 yrs		
	vaccinated cases, n (%) (N = 855)	factors associated with influenza vaccination, multivariable logistic regression, OR (95% CI) ^a	p-value	vaccinated cases, n (%) (N = 721)	factors associated with influenza vaccination, multivariable logistic regression, OR (95% CI) ^b	p-value
<i>Influenza vaccination any prior season</i>						
No	157 (19.4)	1 (ref.)		81 (15.3)	1 (ref.)	
Yes	698 (71.1)	10.33 (8.18-13.05)	< 0.001	640 (80.5)	24.61 (18.02-33.61)	< 0.001
<i>Sex</i>						
Female	679 (45.1)	1 (ref.)		561 (51.2)	1 (ref.)	
Male	175 (61.4)	1.42 (1.02-1.97)	0.037	159 (70.0)	2.07 (1.33-3.23)	0.001
<i>Profession</i>						
Nursing staff	312 (38.9)	1 (ref.)		283 (50.0)	1 (ref.)	
Physician	197 (72.2)	3.06 (2.13-4.48)	< 0.001	135 (72.2)	1.04 (0.63-1.71)	0.883
Administrative or technical staff	176 (45.2)	1.33 (1.00-1.77)	0.054	164 (50.8)	1.04 (0.73-1.50)	0.820
Service and additional health staff ^c	166 (52.4)	1.90 (1.40-2.59)	< 0.001	134 (56.3)	1.73 (1.15-2.61)	0.009
<i>Children^d living at home</i>						
Yes	612 (47.0)	1 (ref.)		189 (51.8)	1 (ref.)	
No	239 (49.5)	1.49 (1.16-1.92)	0.002	529 (55.5)	1.45 (1.15-2.61)	0.022

CI = confidence interval; OR = odds ratio; ref. = reference.

a) 1,770 cases were included in the analysis for the age group < 50 yrs.

b) 1,305 cases were included in the analysis for the age group ≥ 50 yrs.

c) Pharmacists, audiologists, physio- or occupational therapists, psychologists, service staff.

d) < 18 yrs.

DISCUSSION

To our knowledge, this is the first Danish study on this topic. Prior influenza vaccination was a predictor for vaccine uptake, as also presented in other studies [11-13]. This indicates that past experiences lay the grounds for future vaccination patterns. Hence, staff attending educational stays at the hospital and the newly employed should be targeted in this respect. Women, participants ≤ 49 years and participants with children living at home were all less likely to be vaccinated. This also applied to all non-physicians in the group ≤ 49 years. These findings concur with those reported by similar studies [14-16]. Being young or having small children may be indicators of good health and no co-morbidity and, accordingly, of not considering influenza immunisation. In past studies, nursing staff has also scored low on vaccine acceptance [17, 18], which is undesirable since nurses come into close contact with and provide close care for vulnerable patient groups.

Participants from surgery or anaesthesiology departments were least likely to be vaccinated. They might have only sporadic contact with influenza patients as these patients are treated in internal medicine departments; hence, they might share the perception that they constitute a low infection risk. Employment in laboratory departments was significantly associated with vaccination. These employees might have contact with many different patients during their workday and might therefore feel more exposed to transmission.

The main reasons for opting out of vaccination were perceiving immunisation a private matter, not feeling vulnerable to influenza and fear of vaccine side effects. Perception of a lack of risk, a low disease prevalence and behaviour are core concepts here, as also discussed in other studies [19, 20]. Changes in these factors were also main reasons for considering vaccination.

Reasons provided for vaccine acceptance were primarily assessment of own gain and patient gain. Thus, it may be expedient to highlight the advantages for the HCW in efforts aiming to increase vaccine uptake. Perhaps efforts should focus on vaccination, not only for those at risk of severe disease, but also for those with the

greatest risk of infection independently of their general health as a way to avoid the spread of influenza and protect patients. To many participants, the workplace recommendation was important, so perhaps vaccine uptake can be improved by making immunisation education mandatory as part of new employees' introduction to the workplace.

The foundation for offering influenza vaccination to HCWs has been underlined by the COVID-19 pandemic. We see HCWs bringing the infection from the community to their workplace where they infect elderly and vulnerable citizens or patients and vice versa. The young and mobile preserve the infection in the community. COVID-19 may alter influenza vaccination acceptance in the future, but how do we address the concerns raised in this study when planning vaccine propositions for HCWs? One question may be if immunisation may be considered a private matter when you are a HCW, or if HCWs carry a special obligation to lower influenza transmission. Our results may indicate that special emphasis should be given to targeting women, nursing staff and the young through immunisation campaigns. Furthermore, validated information on vaccine side effects should be made easily accessible, so that efforts become knowledge based. Vaccine uptake might increase with time if all new HCW employees receive education on the reasons to vaccinate. A widespread recommendation for the use of the influenza vaccine in the background population would probably also increase vaccine uptake among all healthcare professions.

This study has several strengths as it covered all staff and professions employed at a large somatic hospital. Several limitations also deserve mention. Firstly, this study was conducted at a single hospital, and the result may therefore not be representative for all hospital-based HCWs in Denmark. Secondly, the response rate was low at 28% with a vaccine uptake of 51%. In comparison, 30% of all staff were vaccinated at the OUH clinic in October 2018. Thus, the study is subject to sampling bias. Many of the non-responders had probably opted out of vaccination. This may influence the generalisability of the results to the rest of the OUH population, and predictors for vaccination may have been overestimated. Thirdly, the questionnaire was set up as a quantitative questionnaire. The participant received pre-defined reasons for and against vaccination acceptance or hesitance, and were, to some point, forced to choose a reason, even though their choice might not truly reflect their reasons or opinions.

CONCLUSIONS

Despite some limitations in design and a rather low response rate, we believe that our study may generate ideas on issues that should be addressed to improve vaccination uptake in a healthcare setting. Efforts should be made to increase vaccine acceptance among women, younger employees and nursing staff. Employers should conduct campaigns targeting recently employed staff, thus establishing the basis for future vaccination behaviour. This study paves the way for further studies about vaccine hesitancy among HCWs in Denmark, which may change in the light of the COVID-19 situation.

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