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Major article

Predicting influenza vaccination uptake among health care workers: What are the key motivators?

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Background: Health care worker (HCW) vaccination was critical to protecting HCW during the H1N1 pandemic. However, vaccine uptake rates fell below recommended targets. This study examined motivators and barriers influencing HCW pH1N1 vaccination to identify modifiable factors that can improve influenza vaccine uptake.

Methods: A cross-sectional survey was conducted at a large Canadian tertiary care hospital. HCW (N = 3,275) completed measures of demographics, vaccination history, influenza risk factors, and attitudes toward pH1N1 vaccination. Self-reported vaccination was verified with staff vaccination records. Of the total sample, 2,862 (87.4%) HCW received the pH1N1 vaccine. Multiple logistic regression analyses were used to predict HCW vaccination.

Results: HCW attitudes toward vaccination significantly predicted vaccination, even after adjusting for demographics, vaccine history, and influenza risk factors. This model correctly predicted 95% (confidence interval [CI]: 0.93-0.96) of HCW vaccination. Key modifiable factors driving HCW vaccination include (1) desire to protect family members and patients, (2) belief that vaccination is important even if one is healthy, (3) confidence in vaccine safety, and (4) supervisor and physician encouragement.

Conclusion: This research identified fundamental reasons why HCW get vaccinated and provides direction for future influenza vaccination programs. To enhance vaccine uptake, it is important to target HCW attitudes in influenza vaccine campaigns and create a culture of vaccine promotion in the workplace, including strong messaging from supervisors and physicians.

Maintaining the health and availability of health care workers (HCW) is an essential component of pandemic preparedness.[1,2] A key to protecting HCW during the H1N1 influenza pandemic was vaccination.[1-3] Vaccination of HCW against pandemic H1N1 (pH1N1) was prioritized as essential for outbreak management and health care pandemic response.[3,4] However, despite the vaccine's proven effectiveness and the highly visible nature of the pH1N1 vaccine campaign, HCW vaccine uptake rates fell well below recommended targets.[5]

Some researchers have reported on factors influencing HCW pH1N1 vaccine uptake; however, the majority of this research focused on intent to be vaccinated (as opposed to actual vaccination status) and did not investigate the impact of HCW attitudes and beliefs on their vaccine uptake.[6] Thus, existing literature is limited in its capacity to enhance the current understanding of HCW influenza vaccination behavior. This study seeks to address this gap in the literature through the examination of a broad array of factors (including HCW attitudes and beliefs) that predict *actual* pH1N1 vaccine uptake among a large multiprofessional sample of Canadian HCW. Furthermore, by applying the Health Belief Model framework,[7] a well-established theory of health behavior change, we sought to identify *modifiable* factors that predict vaccine uptake in our sample. Such modifiable factors could be influenced in future vaccine campaigns.

The overall goal of this study was to identify the motivators and barriers to pH1N1 vaccine uptake among HCW to inform the future

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Table 1
Sociodemographic, influenza risk factors, and vaccine history predictors of health care worker pH1N1 vaccine uptake

Characteristics	Did not receive pH1N1 vaccine (n = 413)	Received pH1N1 vaccine (n = 2,862)	*P* value
Sociodemographics			
Mean age, yr	40.24 ± 11.67	43.32 ± 11.14	.023
Sex: Female	83.7%	81.0%	.196
Ethnic background: white	87.7%	89.6%	.02
Formal religious belief	64.9%	75.8%	<.001
In a relationship	70.8%	76.6%	.013
Dependent children <21 years of age	41.6%	49.8%	.002
Children living at home	43.6%	52.3%	.001
Type of work: full-time	61.4%	73.2%	<.001
Occupation classification, %			
Nursing	30.5	35.9	<.001
Physician	1.2	5.8	<.001
Allied HCW	7.3	11.6	<.001
Administrative/clerical	31.0	20.7	<.001
Health care technicians	5.3	7.7	<.001
Research and laboratory	9.4	8.3	<.001
Facilities and logistics	7.7	6.4	<.001
Other nonclinical	7.5	3.6	<.001
Influenza vaccine risk factors, %			
Regular contact with children	50.1	62.8	<.001
Regular contact with elderly patients	46.2	59.6	<.001
Living with someone with a chronic illness	9.2	14.1	.004
Family member has a chronic illness	18.17	27.6	<.001
Personally has a chronic illness	10.5	14.1	.029
Influenza history, %			
Past adverse effects to influenza vaccination	26.1	23.8	<.001
Egg allergy	3.2	0.6	<.001
Allergy to vaccine components	10.9	0.8	<.001
Previous influenza infection	41.5	41.0	.84
Perceived self-health, %			
Poor	0.7	0.2	.078
Fair	3.7	2.6	.078
Good	23.5	23.0	.078
Very good	43.3	41.8	.078
Excellent	28.9	32.4	.078
Vaccine uptake			
2008/2009 Seasonal influenza vaccination	24.1	81.7	<.001
2009/2010 Seasonal influenza vaccination	9.8	60.2	<.001

design and implementation of a more effective vaccination campaign, thereby increasing HCW vaccine uptake. Understanding the fundamental reasons why a core group of HCW failed to receive the pH1N1 vaccination despite an aggressive campaign, perceived vaccine shortage, and national media coverage may help us develop a successful vaccination campaign to enhance uptake among the most recalcitrant HCW.

METHODS

Study participants and design

This cross-sectional observational study was conducted at a large bilingual teaching hospital in Ontario, Canada. Following the conclusion of the hospital's pH1N1 vaccination campaign in June 2010, all hospital HCW (N = 10,464) were invited to complete a bilingual study questionnaire through a mass mailing. The study package included an informed consent form, a questionnaire package, and a stamped, self-addressed return envelope. Participants returned their completed questionnaires to Occupational Health and Safety (OCHS). OCHS de-identified the questionnaires, and only de-identified responses were analyzed by the research team.

OCHS housed a list of employees who received the pH1N1 vaccine and those who did not. These records were used to verify the self-reported vaccination status of HCW responding to the survey, thus allowing the prediction of *actual* vaccine uptake. All aspects of the study were approved by the Institution's Research Ethics Board.

Measures

HCW completed measures of (1) sociodemographics, (2) influenza infection risk factors, (3) influenza vaccine history, and (4) pH1N1 vaccine attitudes. The pH1N1 Vaccine Attitude Scale, a 34-item measure, was adapted from questionnaires developed to measure behavioral determinants associated with influenza vaccine uptake among HCW.[8,9,10] This scale surveys the 5 constructs of the Health Belief Model (HBM),[7] including perceived (1) susceptibility to influenza, (2) severity of influenza, (3) benefits of accepting vaccination, (4) barriers to accepting vaccination, and (5) cues to action (ie, internal and external stimuli that motivate vaccine uptake). The scale also assesses general attitudes of HCW toward pH1N1 vaccination. Participants indicated on a 5-point Likert scale the extent to which they agree or disagree with scale items. The HBM provides a valuable theoretical framework for understanding attitudes and beliefs driving various health behaviors, including seasonal influenza vaccination,[7-13] suggesting these constructs may also explain pH1N1 vaccine uptake.

Statistical analysis

All analyses were conducted using SPSS/PASW v.17 statistical package (SPSS Inc, Chicago, IL). Data were initially screened, and statistical assumptions were evaluated. Descriptive and frequency statistics were used to evaluate the responses to individual scale items of the questionnaires. The distribution of key sociodemographic variables and pH1N1 vaccine uptake of the study sample was compared with the overall HCW population (ie, staff at the institution) to assess external study validity. HCW reported level of agreement with the pH1N1 Vaccine Attitudes Scale items was dichotomized into agree and disagree statements.

The χ^2 analyses and independent samples *t* tests were used to examine differences between vaccinated and nonvaccinated HCW in terms of sociodemographics, vaccine history, and influenza risk factors. Univariate analysis was used to examine differences between vaccinated and nonvaccinated HCW in their responses to pH1N1 Vaccine Attitudes Scale items, and odds ratios (OR) (with 95% confidence intervals [95% CI]) were calculated to examine the items' association with vaccination and nonvaccination. Multivariate logistic regression analysis, using forward stepwise selection of variables, was used to model factors predictive of HCW pH1N1 vaccination. Inclusion of factors in the multivariate regression analysis was based on a systematic review of HCW pH1N1 vaccine uptake literature,[6] as well as univariate predictors of pH1N1 vaccination ($P < .1$).

In an attempt to quantify the ability of pH1N1 Vaccine Attitudes Scale items to predict pH1N1 influenza vaccination behavior, 2 independent regression models were generated. All factors found to be statistically significant predictors of HCW pH1N1 vaccination ($P < .05$) were included in the final models: (1) Base model: includes key sociodemographics, occupation, influenza infection risk factor, and vaccination history related variables but excludes pH1N1 Vaccine Attitudes Scale items; and (2) Base model plus pH1N1 Vaccine Attitudes Scale items: includes all variables in