Healthcare Worker Perceptions and Practices Regarding Influenza Vaccination
A Thesis submitted to the University of Arizona College of Medicine -- Phoenix in partial fulfillment of the requirements for the Degree of Doctor of Medicine

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Abstract

Background

Rates of influenza vaccination among healthcare workers (HCWs) are low despite the significant morbidity and mortality benefit to the HCWs, their patients and their families.

Objective

To examine whether attitudes, perceptions and beliefs of HCWs about influenza and influenza vaccination affect their uptake of the seasonal influenza vaccine.

Methods

Telephone interviews were conducted of HCWs during March 2011 to assess seasonal influenza vaccine uptake, attitudes regarding influenza vaccination, and perceptions of risk of influenza infection.

Results

Telephone surveys were completed by 1,171 HCWs and of these 903 responded to all questions relevant to this analysis. Logistic regression models of rates for current, 2010-2011, influenza vaccination season and preceding influenza vaccination seasons were performed. Statistically significant (P<0.05) positive odds ratios for vaccination were found among providers, HCWs with more experience, those who favor mandatory workplace vaccination, believing that the vaccine protects family members, believing the average person is somewhat or very likely to be infected with influenza in a given year, not believing that the influenza vaccine will cause illness, and claiming a higher likelihood of vaccination if the vaccine were less costly or free. Of these, the strongest modifiable predictors of seasonal influenza vaccination uptake were a belief that the vaccine provides protection to the HCWs’ family members and a belief that the average person is somewhat or very likely to be infected with influenza in a given year.
Conclusion

Beliefs about influenza vaccination have significant effects on HCW seasonal influenza vaccine uptake. We recommend targeting these beliefs when designing educational programs for HCW regarding influenza vaccination.
Introduction

Influenza vaccination has shown to reduce infection as well as severity and duration of illness, including death.\textsuperscript{1,2} Evidence suggests that vaccinating HCW against seasonal influenza decreases influenza morbidity and mortality in patients. Based on the strong evidence supporting HCW vaccination in reducing seasonal influenza and healthcare costs, many healthcare facilities have initiated mandatory vaccination programs for employees.\textsuperscript{3} Nonetheless, uptake rates among HCWs vary widely and are dismal in some settings, as low as 38% in one study at an academic teaching hospital in the United States\textsuperscript{4}, and lower in some studies abroad.\textsuperscript{2,5-8} Some studies have examined HCWs’ prior vaccination habits. Correlations have been sought between these habits and the HCWs’ present or intended future vaccination status,\textsuperscript{9-14} level of knowledge about influenza and influenza vaccination,\textsuperscript{10,12,15,16} or uptake of 2009 pandemic H1N1 influenza vaccination.\textsuperscript{17,18} While these correlations are detected with some consistency across studies, less is known about which specific attitudes and beliefs are associated with lower rates of influenza vaccination amongst HCWs.

To better understand HCWs perceptions and practices regarding Influenza vaccination in Maricopa County, Maricopa County Department of Public Health (MCDPH) surveyed HCWs currently employed in their profession and working within Maricopa County.
Methods

Maricopa County Department of Public Health, Office of Epidemiology designed a telephone and online survey targeting a representative number of ~95,000 HCWs who provide care in Maricopa County. To determine a representative sample of each type of provider in Maricopa County power calculations, given a margin error of 5%, 95% confidence interval, and response distribution of 50%, was performed. Using databases from professional HCW associations/boards records of all active licenses in Maricopa County for each HCW category were reviewed. Surveys were conducted by WestGroup Research (Phoenix, Arizona) during May 11 – June 24, 2011. HCWs were divided into three groups, providers (doctors, physician assistant, nurse practitioners, etc.), nurses (certified nursing assistants, licensed practical nurses, registered nurses), and technicians (respiratory therapists, physical therapists, pharmacy technicians, etc.). To ensure a proportional sample size and prevent skewing of the sample due to variable response rates, quotas within each subgroup were set proportional to their representativeness in the workforce within the county. Respondents were screened for age over 18 years, currently employed in relevant job role and currently working in Maricopa County. The survey consisted of 33 questions, some of which contained follow-up questions or sub questions, and were a mix of multiple-choice and open-ended responses. The survey was divided into six sections focused on working while sick, vaccine recommendations, self-vaccination practices, workplace and demographics.

Data were analyzed using SAS/STAT Enterprise Guide 5.1 software. Responses that were missing, refused or unknown were excluded from analysis and Likert-scaled responses were dichotomized as described below. Two separate logistic regression models were performed: (1) vaccination status for the 2010-2011 influenza season, (2) regular seasonal vaccination wherein possible responses were either, ‘Every year’, ‘Most years’, or ‘Some years’ dichotomized as ‘Every, Some or Most years’, or ‘Never or almost never.’ Both models used the same explanatory variables and were adjusted for the same potential confounding factors including work experience, sex, age, and HCW group. Explanatory variables included whether the respondent favors mandatory workplace seasonal influenza vaccination, respondent’s perception of his or her own risk of acquiring influenza if unvaccinated as well as the same risk to an average person and responses to nine sub-questions regarding the respondent’s beliefs about the seasonal influenza vaccine. The nine sub-questions regarding beliefs were read in random order and responses recorded on a Likert-scale from strongly agree to strongly disagree, (a) Getting the flu vaccine protects my patients, (b) Getting the flu vaccine protects my coworkers, (c) Getting the flu vaccine protects my family members, (d) Getting the flu vaccine protects myself, (e) I’d be more likely to get the flu vaccine if it were convenient, for example could get at work, (f) I’d be more likely to get the flu vaccine if it were cheap or free, (g) I’d be more likely to get the flu vaccine if others were sick around me, (h) I’d be more likely
to get the flu vaccine if it was recommended to me by a healthcare provider, (i) I’m concerned that the flu vaccine will make me sick. Responses to statements (a) through (h) were dichotomized into categories ‘Agree’ and ‘Does not agree.’ Responses to statement (i) were dichotomized into response categories ‘Disagree’ and ‘Does not disagree’ in order to maintain consistency with the other statements wherein the neutral response was grouped with responses ostensibly associated with a lower likelihood of obtaining the seasonal influenza vaccination.
Results

Responses were collected from 1171 respondents, who answered yes to all three screening questions, comprised of 405 Providers, 402 Nurses, and 364 Technicians. Of these, 265 responses were deleted due to missing, refused or unknown values for one or more variable. Table 1 depicts the responses according to demographic category and responses to several survey questions, along with p-values for responses to question 11, having received the seasonal influenza vaccine during the survey season and question 12, being vaccinated every, most or some years. Logistic Regression Results are presented through Odds Ratios (OR) with 95% Wald Confidence Limits, where a ratio greater than 1 indicates greater correlation with either having received the seasonal influenza vaccine during the survey season (model 1) or a greater correlation with being vaccinated every, most or some years (model 2).

Model 1 (square markers, figure 1): Eight variables had statistically significant odds ratios, as defined by \( P < 0.05 \). Being a Provider (OR 2.92, \( p < 0.01 \)), having more than 15 years of experience (OR 2.07, \( p < 0.01 \)), agreeing with statement (c) “Getting the flu vaccine protects my family members” (OR 3.24, \( p = 0.01 \)), agreeing with statement (f) “I’d be more likely to get the flu vaccine if it were cheap or free” (OR 2.52, \( p < 0.01 \)), disagreeing with statement (i) “I’m concerned that the flu vaccine will make me sick” (OR 2.32, \( p < 0.01 \)), favoring a workplace vaccination mandate (OR 2.87, \( p < 0.01 \)) and believing the average person to be very or somewhat likely to be infected with influenza if not vaccinated (OR 5.03, \( p < 0.01 \)) each correlated with increased odds of influenza vaccination during the survey year. One variable had statistically significant decreased odds: agreeing with statement (a) “Getting the flu vaccine protects my patients” (OR 0.42, \( p = 0.05 \)).

Model 2 (diamond markers, figure 1): Nine variables had statistically significant odds ratios. Being a Provider (OR 1.98, \( p = 0.02 \)), having more than 15 years of experience (OR 1.98, \( p = 0.02 \)), agreeing with statement (c) “Getting the flu vaccine protects my family members” (OR 3.24, \( p = 0.01 \)), agreeing with statement (d) “Getting the flu vaccine protects myself” (OR 2.42, \( p = 0.02 \)) agreeing with statement (f) “I’d be more likely to get the flu vaccine if it were cheap or free” (OR 2.29, \( p = 0.01 \)), disagreeing with statement (i) “I’m concerned that the flu vaccine will make me sick” (OR 2.75, \( p < 0.01 \)), favoring a workplace vaccination mandate (OR 4.95, \( p < 0.01 \)) and believing the average person to be very or somewhat likely to be infected with influenza if not vaccinated (OR 5.56, \( p < 0.01 \)) each correlated with statistically significant increases in regular seasonal influenza vaccination. One variable had a statistically significant decreased odds ratio: agreeing with statement (a) “Getting the flu vaccine protects my patients” (OR 0.32, \( p = 0.01 \)).
Table 1
Demographics of respondents and responses to belief questions by self-reported vaccination status

Table depicts responses to questions about vaccination status for the influenza season ending in 2010 and self-reported usual vaccination status by demographics and by responses to statements regarding influenza and vaccination beliefs. Column labeled N is the number of respondents from corresponding demographic category or number who gave listed response to belief questions. The denominator for the percentage is the number of respondents without missing or refused responses to the corresponding belief question or vaccination status questions. P-values are from Chi-square analysis.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Yes (p-value)</th>
<th>N (%), Yes (p-value)</th>
<th>Every year or most years (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;40 years</td>
<td>798 (72%)</td>
<td>508 (20%)</td>
<td>228 (0.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certification type</td>
<td></td>
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</tr>
<tr>
<td>Providers</td>
<td>404 (55%)</td>
<td>292 (0.02)</td>
<td>88 (0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses</td>
<td>399 (34%)</td>
<td>251 (0.92)</td>
<td>116 (0.95)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>&gt;15 years</td>
<td>671 (54%)</td>
<td>448 (0.06)</td>
<td>173 (0.05)</td>
<td></td>
</tr>
<tr>
<td>Getting the flu vaccine protects my patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>933 (82%)</td>
<td>617 (10)</td>
<td>226 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting the flu vaccine protects my coworkers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>943 (82%)</td>
<td>628 (0.06)</td>
<td>221 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting the flu vaccine protects my family members</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>919 (80%)</td>
<td>630 (&lt;0.01)</td>
<td>196 (&lt;0.01)</td>
<td></td>
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</tr>
<tr>
<td>Getting the flu vaccine protects myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>689 (78%)</td>
<td>628 (&lt;0.01)</td>
<td>177 (&lt;0.01)</td>
<td></td>
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</tr>
<tr>
<td>I’d be more likely to get the flu vaccine if it were convenient, for example could get at work</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>819 (74%)</td>
<td>589 (&lt;0.01)</td>
<td>151 (&lt;0.01)</td>
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</tr>
<tr>
<td>I’d be more likely to get the flu vaccine if it were cheap or free</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Agrees</td>
<td>724 (65%)</td>
<td>536 (&lt;0.01)</td>
<td>121 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I’d be more likely to get the flu vaccine if others were sick around me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>731 (65%)</td>
<td>501 (&lt;0.01)</td>
<td>156 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I’d be more likely to get the flu vaccine if it were recommended to me by a healthcare provider</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrees</td>
<td>782 (68%)</td>
<td>537 (&lt;0.01)</td>
<td>154 (&lt;0.01)</td>
<td></td>
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</tr>
<tr>
<td>I’m concerned that the flu vaccine will make me sick.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagrees</td>
<td>744 (65%)</td>
<td>555 (&lt;0.01)</td>
<td>120 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you (or would you be) in favor of your workplace requiring employees to get a seasonal flu vaccine?</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Favors</td>
<td>393 (35%)</td>
<td>325 (&lt;0.01)</td>
<td>35 (0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In any given year, if you didn’t get an influenza (or flu) vaccination, how likely do you think you are to get the flu?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td>923 (83%)</td>
<td>621 (0.05)</td>
<td>212 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In any given year, if the average person doesn’t get a flu vaccination, how likely are they to get the flu?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td>616 (55%)</td>
<td>497 (&lt;0.01)</td>
<td>70 (&lt;0.01)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1
Self-reported influenza vaccination status modeled by demographics and responses to belief statements

*Figure depicts logistic regression models 1 (square) and 2 (diamond) describing self-reported influenza vaccination status for the influenza season ending in 2010 and self-reported usual habits for influenza vaccination based on demographics and responses to questions regarding beliefs about influenza and vaccination. Error bars represent 95% confidence intervals.*
Discussion

The data analyzed are limited to one county, albeit one of the most populous in the United States. While results were collected to ensure proportions of providers to nurses to technicians were matched between the sample and the HCW population in the county, selection bias remains possible regarding other attributes. Additionally, the data were collected early in the implementation of mandatory employee influenza vaccination campaigns at area healthcare facilities, though it is unknown whether or how this may have affected perceptions of influenza risk or response rates to the survey.

The strongest correlations between increased seasonal influenza vaccine uptake were agreement with the statement, “Getting the flu vaccine protects my family members,” and answering very or somewhat likely to the question, “In any given year, if the average person doesn’t get a flu vaccination, how likely are they to get the flu?” This suggests that those who do not regularly receive the seasonal influenza vaccination do not believe there is a protective benefit from the seasonal influenza vaccine for one’s family members and do not perceive the risk of influenza in the general population to be high.

However, these beliefs are not consistent with current evidence, which suggests that vaccination of all close contacts results in significantly lower mortality and lower rates of serious illness.\textsuperscript{19,20} The Centers for Disease Control and Prevention emphasizes seasonal influenza vaccination for anyone living with a person at particular risk of severe influenza.\textsuperscript{21}

While it is possible that respondents’ characterizations of risk of influenza infection was confounded by the nonspecific term “likely”, the correlation with characterizing this risk as not very likely or not at all likely with declining seasonal influenza vaccination suggests that these respondents believe that the benefit of reducing this risk is insufficient to motivate them to be vaccinated. And while risk-benefit analysis is complex and varies with individual values, these survey results suggest that those who decline influenza vaccination have a potentially inappropriately low evaluation of the risk of influenza infection.
Future Directions

Educational programs for healthcare workers are the next logical step in this project, alongside studies to evaluate their efficacy. Furthermore, as additional medical facilities and organizations require vaccination as a condition of employment, the landscape of perceptions of the vaccination may change, and therefore additional studies similar to this one would be useful to identify new or changing educational targets and to discover whether the education is a useful tool in increasing seasonal influenza uptake.
Conclusion

The correlation between regular seasonal influenza vaccination and agreement with the statement “I’d be more likely to get the flu vaccine if it were cheap or free” suggests that those who already get vaccinated and likely believe the vaccine works would be more likely to get the vaccine if it were cheap or free. It does not, however, indicate that non-vaccinators would be more likely to get vaccinated if the vaccine were cheap or free. These data do not say, however, whether decrease in cost of the vaccine would encourage those who do not regularly vaccinate to change their behavior. It is not clear whether this is due to existing sources of cheap or free vaccination for healthcare workers or whether this is because those who decline seasonal influenza vaccination do so for reasons other than cost. This observation, combined with the lack of statistically significant correlation with statements regarding increased likelihood of vaccination if the vaccine were more convenient, was recommended by a healthcare provider or if others were sick suggests that these may not be effective targets when working to increase seasonal influenza vaccine uptake. While it may be that other contextual factors not studied in this survey have stronger effects, it is also possible that the strength of incorrect beliefs about vaccination risk and benefit overwhelm considerations such as cost, convenience, healthcare provider recommendation and influenza prevalence. Therefore, better education targeted toward these beliefs appears to be a better strategy.

These results provide further evidence that there is a dearth of knowledge of the protective benefits of influenza vaccination for HCW family members and the significant risk of contracting influenza. Therefore, we recommend using these as educational targets for HCW in order to improve seasonal influenza vaccination uptake.
References

1. Thomas Roger E, Jefferson T, Lasserson Toby J. Influenza vaccination for healthcare workers who work with the elderly. 2010(2).


