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# Healthcare worker influenza immunization vaccinate or mask policy: Strategies for cost effective implementation and subsequent reductions in staff absenteeism due to illness

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ABSTRACT

*Background:* A new policy requiring staff in clinical areas to vaccinate or wear a mask was implemented in British Columbia (BC) in the 2012/13 winter. This review assessed the impact of the policy on absenteeism in health care workers.

*Methods:* A retrospective cohort study of full-time HCW that worked prior to and during the 2012/13 influenza season in a health authority in BC. The rate of absenteeism due to all cause illness was compared between vaccinated and unvaccinated staff controlling for behaviors outside influenza season.

*Results:* Of the 10079 HCW, 77% were vaccinated. By comparison to absenteeism rates in the pre-influenza season, unvaccinated staff in winter had twice the increase in absenteeism due to all-cause illness than vaccinated staff.

*Conclusion:* After controlling for baseline differences between those vaccinated and unvaccinated, influenza vaccination was associated with reduced absenteeism, saving the Health Authority substantial money. Having regular staff in attendance increases the quality of care.



## 1. Background

In recent years various forms of mandatory or semi-mandatory enforcement policies have been implemented in health jurisdictions to increase influenza immunization of healthcare workers (HCW) from generally poor levels. While it is accepted that influenza vaccination benefits both the worker and patient, debate has ensued over the extent of the translated benefit from HCW to patients. Influenza immunization is approximately 60% effective in preventing infection in healthy adults, and also reduces the duration and severity of symptoms when infection occurs [1].

Vaccination of HCW is associated with a reduced mortality in chronic care/long term care homes, as shown in randomized control trials [2–5], and with reduced hospital-acquired infections in acute care although these studies are of lower quality [6].

The findings of these randomized trials, have been disputed by review groups [7–9] although the methodology of the Cochrane reviews has been criticized for its selective acceptance of outcomes in coming to its conclusions [10].

In the Fraser Health Authority (FHA) in the Lower Mainland of British Columbia influenza vaccination coverage of acute care staff fell to 31% in 2010. This poor vaccination coverage led in 2012 to a province wide policy of requiring all staff to be vaccinated or wear a mask in patient settings throughout the designated winter period from the end of November through to April.

During the first year the influenza vaccination coverage in FHA in regular health care staff increased to 77%, rising in the second year of implementation to 86% of regular FHA staff.

The estimated cost of the additional clinic and training time over previous campaigns was around $40,000.

The patient safety aspect of a protected workforce was the impetus for the policy introduction but it was postulated that influenza immunization, could reduce employee absenteeism and improve quality of care by having regular staff in attendance.

Two randomized control have previously assessed the effects of vaccination on absenteeism in acute settings, with one noting a 28% reduction in respiratory related absenteeism [11], while no statistically significant differences were found in the other [12]. An observational study comparing staff before and after implementation of a mandatory policy in Denver found a reduction of 30% in employee absences from 9.14 to 6.15 absences per 100 employees per month.

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Our review assessed the impacts of the new policy on absenteeism due to illness among vaccinated and unvaccinated HCW in FHA.

## 2. Methods

### 2.1. Study design and setting

This is a retrospective study of HCWs who worked primarily out of the Fraser Health Authority prior to and during the 2012/13 influenza season. Although covered by the policy, volunteers and contracted staff were not included in analysis as records of absenteeism do not exist for these groups.

Employees vaccinated by occupational health had their immunizations entered directly into the employee database; those vaccinated elsewhere were required to report the vaccination to occupational health for subsequent database entry.

The time period prior to the influenza season was January 1 to September 30, 2012. The flu season was defined as October 1, 2012 to February 28, 2013. Only HCW that worked in both time periods were included in this analysis.

Data prior to the influenza season was examined to allow for the inclusion of potential baseline differences in sickness between these two groups.

All-cause sick hours and productive hours were extracted from an electronic database, Meditech; employee details, such as age, gender, worksite and influenza vaccination status for both the current year and the previous year were extracted from WHITE (Workplace Health Indicator, Tracking and Evaluation database). Vaccination status was determined as of February 28, 2013. Both paid and unpaid sick hours were included in the analysis.

The WHITE data is pulled directly from the employee payroll system and hence is robust. Absence and illness are coded differently to vacation in the payroll system. The SQL database in WHITE is a transcription of the original payroll coding.

Distinctions are made between productive hours and non-productive hours. The latter includes separate categories of sick leave (paid and unpaid), other absence types (occupational injury) and vacation/education and other leave types.

The primary outcome was the difference in the rate of sick hours per 100 scheduled hours between the pre-influenza and influenza periods (defined as the total number of sick hours divided by the total number of paid productive work hours, which includes sick hours and productive hours, multiplied by 100).

### 2.2. Statistical analysis

Demographics and clinical characteristics of HCWs among those vaccinated and unvaccinated were compared using descriptive statistics. Chi squared, or Fischer exact test when appropriate, were used for analysing categorical variables and *t*-test for continuous variables.

To account for the repeated measurements, it was intended to use the paired *t*-test for analysis. However, the outcome (sick rate) was not normally distributed and attempts to normalize the data were unsuccessful. Non-parametric (i.e. distribution free) paired *t*-test equivalent, the Wilcoxon signed ranked test, was thus used to test if the sick rate differed between the two periods.

Baseline differences existed in illness absenteeism in the pre-influenza season. A linear regression, using the difference in illness absenteeism between the two seasons, was used to determine if this differed significantly for those vaccinated and unvaccinated, when controlling for baseline differences. The potential confounders of age gender and employment category were incorporated in the model constructs, with age included in the final model. This linear regression construct enabled us to thus correct for differences in the previous absenteeism rates in vaccinated and unvaccinated staff prior to the policy.

In a sensitivity analysis, those vaccinated following the start of the influenza season were recoded as unvaccinated. Exclusion of residential care workers was also examined.

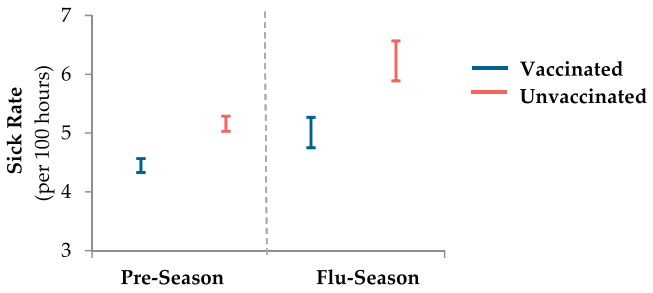


**Fig. 1.** Mean sick hours for staff employed prior to and during the flu season.

## 3. Results

Of the 10290 full time HCW that worked during the influenza season in 2012/13, 10079 also worked during the period prior to the influenza season forming the population studied. Of these, 23% (2360) were unvaccinated and 77% (7719) vaccinated. The mean age of HCW was 44.9 years of age, and did not differ significantly between those vaccinated or unvaccinated. The majority of HCW were females and the gender proportions again were similar between the vaccinated and unvaccinated groups. Eight percent of workers were employed in a residential care facility. A higher proportion of those employed in residential care were vaccinated (81%) compared to those not employed in residential care (76%), see Table 1.

### 3.1. Rate of illness absenteeism

During the flu season, there were over 6 million scheduled hours. Fourteen percent of HCW had zero illness absenteeism during this time period. Table 2 summarizes the average hours for both those vaccinated and unvaccinated in the two periods.

The mean rates of illness absenteeism were 5.16 and 6.26 for those unvaccinated and 4.45 and 5.01 for those vaccinated pre influenza season and during influenza season, respectively. The Wilcoxon signed-rank test showed that the rate of sick hours changed significantly between the pre-influenza and influenza periods for both the vaccinated and unvaccinated groups ($p < 0.000$). Similarly, the Man-Whitney test showed that the rate of sick hours were significantly different between those vaccinated and unvaccinated during both time periods ($p < 0.000$), see Fig. 1.

The difference in the rate of illness absenteeism from pre influenza season to influenza season was calculated for each HCW. The mean was 0.69 overall, indicating an absenteeism increase of 0.69 h/per 100 scheduled hours from the pre influenza to the influenza season. The mean difference was 1.10 absenteeism hours/per 100 scheduled hours among those unvaccinated, and 0.56 h/per 100 scheduled hours for those vaccinated.

A linear regression showed that unvaccinated HCWs had an increased rate of absenteeism of 0.5 (95% CI: 0.2–0.9) h/per 100 scheduled hours, compared to those vaccinated. This difference was statistically significant ($p = 0.004$). Age was included in the final model, however this did not alter the estimates.

While plausibly not all excess absenteeism hours relate to influenza associated illness among those unvaccinated, this difference translated to an excess of 3.3 (1.3–6.0) sick hours for each unvaccinated employee, or 7854 (3142–14,137) sick hours total.

**Table 1**
Characteristics of staff employed prior to and during the influenza season.

| | Unvaccinated | | Vaccinated | | All |
|---|---|---|---|---|---|
| | *n* | *r*% | *n* | *r*% | *n* |
| | 2360 | 23.4 | 7719 | 76.6 | 10,079 |
| Mean age (SD) | 44.69 | 10.7 | 44.99 | 11 | 44.92 |
| Median age | 45 | | 46 | | 46 |
| Gender | | | | | |
| Male | 381 | 16.1 | 1345 | 17.4 | 1726 |
| Female | 1979 | 83.9 | 6374 | 82.6 | 8353 |
| Vaccinated last year | | | | | |
| Yes | 244 | 10.3 | 3663 | 47.5 | 3907 |
| No | 2116 | 89.7 | 4056 | 52.5 | 6172 |
| Residential care | | | | | |
| Yes | 159 | 6.7 | 667 | 8.6 | 826 |
| No | 2199 | 93.2 | 7054 | 91.4 | 9253 |

**Table 2**
Average hours for staff employed prior to and during the flu season.

| | Vaccinated | | | Non-vaccinated | | |
|---|---|---|---|---|---|---|
| | Sick hours | Productive | Total hours | Sick hours | Productive | Total |
| Pre Flu | 52 | 1122 | 1174 | 56 | 1106 | 1162 |
| Flu | 34 | 654 | 688 | 40 | 626 | 666 |
| Total | 86 | 1776 | 1776 | 96 | 1732 | 1828 |

Viewed alternatively those vaccinated had 23,473 (10,035–46,314) less illness absenteeism hours saving over $1.25 M in staff costs.

The variation in absenteeism was seen in a year of moderate correlation between vaccine strain and circulating virus. The estimate of vaccine effectiveness in Canada against laboratory confirmed influenza based on the sentinel surveillance system was 45% although this effectiveness is likely to have been higher in the healthy worker group we studied [13].

### 3.2. Sensitivity analysis

A small number of HCW were vaccinated after December 31, 2012 ($n = 72$), which was the time influenza activity increased in FHA. The analysis was repeated with these HCW recoded as unvaccinated and similar results were found. Also, due to potential differences in risk level for HCW working in residential care facilities, the analysis was repeated with this group excluded and again the results were unchanged.

## 4. Discussion

Our observational population based study of HCW in FHA found that, after controlling for differences in the pre-influenza season, unvaccinated staff had a larger increase in absenteeism due to all-cause illness during the influenza season than vaccinated staff. The fiscal benefit of this absenteeism saving was over $1 M and the cost of introduction of the new policy minimal by comparison.

There were significant baseline differences in absenteeism before the influenza season, with those unvaccinated having an additional 0.7 illness absenteeism hours for every 100 h scheduled to work. This difference grew to 1.2 sick hours/100 scheduled hours during influenza season. The baseline difference suggests an element of healthy worker effect in the original vaccinated group however most of those vaccinated in the study year had not previously accepted vaccination and the difference between the groups increased during winter. Independent of baseline variations, the fiscal benefit and the reduction in absenteeism occurred and were a benefit to patients and the health authority.

Higher than normal influenza activity occurred in the 2012–2013 influenza season with peaks above those seen in the previous 10 years in FHA. This high activity likely optimized the ability to observe a difference between these two groups. While the high activity may have exaggerated differences in the two groups, the season saw predominantly H3N2 circulation and greatest impact was observed in the elderly not the healthy worker group. As with any influenza vaccination study conducted over a single year the quantified extent of the difference and the savings realized may not be representative of other influenza seasons.

Other studies have shown positive effects of influenza vaccination on absenteeism, however most have not measured or seen differences in total absenteeism due to illness. A study among HCWs in an emergency department found smaller, though non-significant, difference in cumulative sick days in the vaccine recipients. Sick leave due to influenza like illness (ILI) was 25% higher in the unvaccinated group [14]. An observational study in Taiwan found vaccinated non-HCWs had a reduction of 38% in acute respiratory illness, and while fewer absences due to all causes was also observed among those vaccinated, this was not statistically significant ($p = 0.08$) [15].

Most studies have tended to measure absenteeism due to respiratory illness. A randomized study found a 32% reduction in lost workdays attributed to clinical respiratory illness among vaccinated workers when compared to those unvaccinated. The vaccine and circulating strain were similar in that study [16]. In a health care setting, a randomized study found a 28% reduction in absenteeism related to respiratory infection. A difference in the total number of days the HCW felt themselves unable to work, regardless of having worked, was also noted to significantly decrease among those vaccinated [11]. While similar results were found in another randomized controlled trail, the differences were not statistically significant, although this could be due to an insufficient sample size [12].

This study has some limitations. Firstly, this is an observational study and thus has inherent limitations. Secondly, our study used absenteeism due to all cause illness as its outcome, which is nonspecific. Canadian estimates for absenteeism due to seasonal influenza have ranged from 5 to 20% for the general population

[17]. One study among non-HCWs aged 50–64, however, found that ILI accounted for 45% of all days of illness [18]. Thirdly, our study did not control for important confounders such as health status or health behaviors such as smoking. While these are limitations, our study used baseline data in the multivariate analysis to account for some of these potential differences. Moreover, roughly 50% of those vaccinated this year were not vaccinated in the previous year, which could represent a group that does not typically vaccinate and could thus have different health behaviors.

Staff accessing vaccination outside FHA through pharmacies or GPs self reported vaccine and in this year were not required to provide proof. Some inaccuracies may exist in the data about who was vaccinated if reports were falsely given to avoid mask wearing. However over 70% were given by the health authority so any false data is likely to be small in number.

In summary, previous studies have shown that influenza vaccination can reduce absenteeism due to influenza related illness, and our study shows that these benefits can be demonstrated for all cause illness. HCW vaccination reduces transmission of influenza to patients and this benefit is enhanced by having regular staff undertaking patient care.

Resistance was seen prior to the introduction of the policy in British Columbia, in part based on the likely cost of the implementation and the lack of quantifiable direct patient benefit in acute care settings. The devolved responsibility model used to implement the vaccination policy included ward based local peer nurse immunizers, and external providers, as part of the immunizing group. This devolution reduced the actual cost of the new program to a small amount of extra central nurse clinic time.

As other jurisdictions in Canada and elsewhere look to follow suit with similar policies this review demonstrates a substantial cost reduction associated with reduced illness absenteeism and provides further support for directed HCW influenza vaccination policies.

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