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A Statewide System for Improving Influenza Vaccination Rates in Hospital Employees

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Abstract

OBJECTIVE—To describe and report the progress of a provider-initiated approach to increase influenza immunization rates for healthcare workers.

DESIGN—Observational study.

SETTING—The State of Iowa.

SUBJECTS—Acute care hospitals in Iowa.

METHODS—Hospitals reported rates of employee influenza vaccination to a provider-based collaborative during 2 influenza seasons (2006–2007 and 2007–2008). Hospital characteristics related to higher vaccination rates were examined.

RESULTS—One hundred (87.0%) of 115 Iowa hospitals and/or health systems participated in season 1; individual hospital vaccination rates ranged from 43.5% to 99.2% (mean, 72.4%; median, 73.1%). In season 2, 115 (100%) of 115 Iowa hospitals and/or health systems participated. Individual hospital vaccination rates ranged from 53.6% to 100% (mean, 79.5%; median, 82.0%). In both seasons, urban and large hospitals had vaccination rates that were 6.3% to 7.6% lower than those of hospitals in other locations. Hospitals that used declination statements had influenza vaccination rates 12.6% higher than hospitals that did not use declination statements in season 2.

CONCLUSION—The initial vaccination rates were high for healthcare workers in Iowa, especially in smaller rural hospitals, and rates increased during season 2. The successful voluntary approach for reporting influenza vaccination rates that we describe provides an efficient platform for collecting and disseminating other statewide measures of healthcare quality.

Influenza vaccination of healthcare workers (HCWs) is the single most important measure for preventing hospital-acquired influenza,¹ and the Centers for Disease Control and Prevention currently recommends annual influenza vaccination for all HCWs.² Despite long-standing recommendations for HCW influenza vaccination, overall HCW rates remain at suboptimal levels: only 40% of US HCWs are vaccinated annually.²

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Several interventions have been implemented to increase vaccination rates, including offering free vaccination for HCWs at convenient times and locations, education campaigns, the use of immunization carts in hospitals, and pandemic influenza drills.³⁻⁶ Recently, declination policies that require HCWs to sign a form if they refuse vaccination have been recommended^{7,8} and used⁹⁻¹¹ in an attempt to increase vaccination rates. However, most of these approaches have been studied at a single center or within a single chain or group of hospitals. Although a number of successful interventions have been reported from single centers, to our knowledge, no voluntary and provider-based attempts to improve HCW influenza vaccination rates across a large geographic area have been reported. The purpose of this paper is to describe and report the progress of a voluntary, statewide initiative to increase influenza immunization rates for Iowa HCWs.

METHODS

The Iowa Healthcare Collaborative

The Iowa Healthcare Collaborative (IHC) is a provider-led organization dedicated to the promotion of “an Iowa healthcare culture of continuous improvement in quality, patient safety, and value.” It was formed through a partnership of the Iowa Hospital Association and the Iowa Medical Society in 2002–2003. Specific goals of the IHC include facilitating communication, collaboration, and the sharing of data and best practices between healthcare providers, purchasers, and the public. Through the activities of its committees and work-groups, the IHC promotes initiatives related to transparent public reporting of healthcare quality and safety metrics. Because of increasing public concern about healthcare-associated infections, special emphasis has been applied recently to this issue. The IHC also sponsors popular statewide conferences and distributes educational modules and toolkits on its Web site.¹²

The IHC Iowa Hospital Employees Influenza Immunization Project

In 2005, the IHC organized an advisory task force to develop a statewide system for reporting of hospital-specific healthcare infections and influenza vaccination rates of HCWs. The advisory committee consisted of members of the Iowa Hospital Association, the Iowa Medical Society, the Iowa Department of Public Health, the Iowa Foundation for Medical Care, and several independent infectious disease experts and infection control practitioners. The task force developed definitions, educational materials, and the data reporting system with input from the participating hospitals.

In 2006, the IHC initiated a voluntary hospital-based program to achieve an influenza HCW vaccination rate of 95% by 2010. To facilitate reporting of vaccination rates across participating institutions, an HCW was defined as anyone receiving a paycheck from an acute care hospital in Iowa.

Project surveys—Two Web-based surveys, one for 2006–2007 (season 1) and the other for 2007–2008 (season 2), were distributed to participating hospitals to determine rates of influenza immunization in HCWs. The reporting period for each vaccination season was October 1 through March 31, and the surveys were collected in May after the reporting period. A third Web-based survey was distributed at the end of season 2 (in June) to assess the implementation of the evidence-based recommendations, designed to increase vaccination rates among HCWs, that were endorsed by the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP).^{7,13}

Per previous agreement with the participating hospitals, individual hospital data were kept confidential. Each hospital, however, was informed of its own performance in relation to the

rest of the field. A data analysis group reviewed the data each year and prepared aggregated results for publication in the annual report of the IHC.

Statistical methods—To determine hospital characteristics related to higher vaccination rates, univariable and multivariable ordinary least square models were estimated. Two dependent variables were used: the hospital-specific vaccination rate in season 1 and the hospital-specific vaccination rate in season 2. Independent variables included the number of employees (less than 150, 151–300, 301–1,000, or greater than 1,000), the location (rural, rural referral, community access hospital, or urban), and the annual revenue (less than \$10 million, \$10–\$15 million, \$15–\$45 million, and greater than \$45 million).

To determine the relationship between the implementation of specific HICPAC and ACIP recommendations and actual vaccination rates, the data from the third questionnaire were examined. This survey, shown in Table 1, was only given during the second season. First, we estimated univariable models for each recommendation. The dependent variable in these models was the season 2 vaccination rate.

The answers to questions in the third survey were highly correlated, so we estimated a univariable model with an independent variable that was the sum of all the recommended items to which a hospital answered yes. All analyses were done using STATA, version 10 (StataCorp).

RESULTS

One hundred (87.0%) of 115 Iowa hospitals participated in season 1. (There are actually 116 hospitals in Iowa, but 2 hospitals are part of the same health system and reported aggregated rates). Individual hospital vaccination rates ranged from 43.5% to 99.2% (mean, 72.4%; median, 73.1%). Because hospitals vary in size, this represents a 67.9% vaccination rate for HCWs employed by acute care hospitals in Iowa. In season 2, 115 (100%) of 115 Iowa hospitals participated. Individual hospital vaccination rates ranged from 53.6% to 100% (mean 79.5%; median 82.0%). This represents a 76% vaccination rate for HCWs employed by acute care hospitals in Iowa.

On the basis of data from the 99 hospitals participating in both seasons, the overall vaccination rate increased a mean of 7.5 percentage points per hospital ($P < .001$; 1-sided test), ranging from a decrease of 9.9 percentage points to an increase of 33.5 percentage points from season 1 to season 2. Eighty-one hospitals (82%) had increased rates, and 18 (18%) had decreased rates, from season 1 to season 2.

Univariable regression results for both seasons are presented in Table 2. All variables with coefficients that were significantly different than zero with 90% confidence intervals are included in the table. The only variables to meet this criterion were urban location, more than 1,000 full-time-equivalent employees, more than \$45 million in annual revenue, and community access hospital type. The first 3 variables have negative coefficients, indicating that large or urban hospitals have lower vaccination rates than other Iowa hospitals. Specifically, in season 1, urban hospitals had vaccination rates that were 6.3 percentage points lower than hospitals in other locations; during season 2, this difference was 7.6 percentage points.

All of the significant variables are highly correlated. The first 3 variables are positively correlated: urban hospitals are also most likely to be large hospitals. In contrast, community access hospitals are least likely to be large and located in urban locations, producing a negative correlation with the 3 other variables. Because of these correlations, no multivariable model

that included all significant variables from the univariable regressions for season 1 had any coefficients that differed significantly from zero.

The third survey was only administered during season 2, and 15 variables were collected (Table 1). However, all hospitals that provided complete data gave free vaccination to all HCWs, so the first 2 items, “Influenza vaccine free of charge to all HCWs with direct patient care” and “Influenza vaccine free of charge to all HCWs” were uninformative. These variables were subsequently dropped from further analysis. The remaining 13 items were used as univariable predictors in the model of season 2 immunization rates. Some of the 115 hospitals did not respond to the third survey, so the number of responses in these models was 80 (69.6%), except for declination statements, for which the number of responses was 79 (68.7%). Most of the questionnaire items were statistically insignificant in these models, except for the presence of declination statements ($P < .001$). The univariable results for these items are presented in Table 1. A variable that contained the sum of the number of questions to which the hospital replied “yes” was also considered, and its coefficient was significantly different than zero ($P = .042$).

Using adjusted R^2 as the criterion, the best multivariable model for the season 2 data included urban location, the “sum” variable, and the use of declination statements. The results of this model are presented in Table 3. As in the univariable results, urban location is associated with lower levels of staff influenza vaccination. The perception of respondents that their hospital administration was committed to staff vaccination and the use of declination forms were both factors associated with higher levels of staff influenza vaccination. Specifically, controlling for the other variables, declination statements were associated with an increase in influenza vaccination rates of 12.6 percentage points.

DISCUSSION

Influenza outbreaks in hospitals can cause devastating outcomes for patients and significant staff shortages.^{1,14-17} Despite the long-standing recommendations for annual HCW vaccination,^{1,17-19} the overall national rates continue to be unacceptably low. HICPAC and ACIP recently suggested requiring HCWs who refused vaccination to sign a declination statement,⁷ and reports from single centers indicate that declination statements might increase vaccination rates. A recent report indicated that declination statements, especially ones without consequences for HCWs who refuse vaccination, may have a modest effect on influenza vaccination rates.¹¹ Our results also seem to indicate that declination statements are associated with modestly higher vaccination rates.

Out of a sense of frustration with persistently low rates, some have suggested a mandatory approach to influenza immunization for HCWs.²⁰ In contrast, hospitals in Iowa have adopted a voluntary provider-based approach to improve rates. Between seasons, IHC provided hospitals with evidencebased recommendations designed to help increase HCW vaccination rates. HCW vaccination rates were also given as feedback to the hospitals. We observed that hospitals increased rates by a mean of 7.5 percentage points to a median rate of 82%.

Limitations of this reporting system are related to the definition of HCWs: employees receiving a paycheck. Because many physicians are not employed directly by Iowa hospitals, they are not currently counted as HCWs. Clearly, given their contact with patients, physicians and also volunteers are important to consider, and future IHC efforts will need to capture their vaccination status. Another limitation is that the current IHC network does not include employees in nursing homes and outpatient clinics. Finally, the baseline vaccination rates we observed were very high relative to national averages. Thus, our results might not be generalizable to other states.

We are hopeful that increases in vaccination rates can be sustained and improved. The ultimate goal of the IHC project is a 95% vaccination rate within the next 2 seasons. In a single-center study, giving feedback about vaccination rates to groups without any other intervention increased vaccination rates.²¹ Thus, to help sustain the increase, IHC will continue to give feedback about individual rates to institutions, along with reports of rates at other centers. Currently, rates for the other centers are de-identified. However, we anticipate that the individual hospital vaccination rates may soon be available to the public, and this may add an additional incentive for influenza vaccination. The IHC will also share the practices associated with higher rates. For example, we found that institutions implementing declination policies were more likely to have higher rates ($P = .001$). Thus, IHC will continue to encourage hospitals to adopt declination policies and other HICPAC and ACIP recommendations to improve influenza vaccination rates. Our results also suggest that larger hospitals located in more-urban locations are at a disadvantage, compared with smaller hospitals. Perhaps the inherent complexity of immunizing employees in larger hospitals accounted for some of the differences. Thus, we will focus our efforts on these larger institutions. Interestingly, there were no discernible (ie, statistically significant) differences in the characteristics of the 18 hospitals for which rates decreased, compared with the remaining hospitals.

Mandatory programs for influenza vaccination of HCWs are under discussion at the national, state, local, and hospital level. If Iowa's vaccination rates can be increased by a voluntary provider-based system, a mandatory approach may not be necessary in Iowa. However, sustainability of HCW immunization rates has proven difficult in the past,²² and it is too early to determine whether requiring influenza immunization of Iowa's HCWs may be necessary in order to sustain high vaccination levels over time.

Finally, we think that this voluntary IHC reporting initiative can be expanded to provide a venue and platform for reporting and improving other statewide measures of healthcare quality, including healthcare-associated infection rates, process measurements, and other quality and safety measures.

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TABLE 1

Responses by 80 Hospitals in Iowa to Survey of Implementation of Recommendations of the Healthcare Infection Control Practices Advisory Committee and the Advisory Committee on Immunization Practices

Question	No. (%) answering "yes"	Univariable <i>P</i>
My hospital currently provides influenza vaccine free of charge to all HCWs with direct patient care	80 (100)	NA
My hospital currently provides influenza vaccine free of charge to all HCWs	80 (100)	NA
My hospital currently provides influenza vaccine free of charge to all volunteers	54 (68)	.770
My hospital currently provides adequate staff and resources for influenza vaccine campaigns	67 (84)	.276
My hospital currently provides vaccination in wards, clinics and/or common areas (out-side cafeteria)	60 (75)	.556
My hospital currently provides off-hours vaccination clinics	57 (71)	.896
My hospital currently provides vaccination at any staff and departmental meetings	43 (54)	.511
My hospital currently provides visible vaccination of any key personnel	37 (46)	.135
My hospital currently provides tracking of unit-based vaccine compliance for at least some units	48 (60)	.131
My hospital currently provides feedback of vaccination rates to HCWs and administration	73 (91)	.442
My hospital currently provides a mechanism for recording if HCWs are vaccinated off-site	64 (80)	.195
My hospital educates targeted groups of HCWs to increase influenza vaccination rates	71 (89)	.148
My hospital requires that HCWs sign a declination form if they decline influenza vaccination for reasons other than medical contraindication ^a	70 (89)	<.001
My hospital performs some prospective active surveillance for healthcare-associated influenza	22 (28)	.226
My hospital has a formal surveillance program for healthcare-associated influenza in place	37 (46)	.853

NOTE. HCW, healthcare worker; NA, not applicable.

^aOnly 79 hospitals answered this question.

TABLE 2

Results of Univariable Regression Analysis for Influenza Vaccination Rates of Healthcare Workers

Variable	Season 1 rates		Season 2 rates	
	Coefficient	P	Coefficient	P
No. of FTEs >1,000	−.057	.090	−.083	.006
Community access hospital	.043	.094	.066	.003
Urban location	−.063	.039	−.076	.005
Annual revenue >\$45 million	−.050	.060	−.065	.005

NOTE. FTE, full-time-equivalent employee; season 1, 2006–2007; season 2, 2007–2008.

TABLE 3

Results of Multivariable Regression Analysis for Influenza Vaccination Rates of Healthcare Workers for Season 2

Variable	Coefficient (95% CI)	P
Urban location	−0.093 (−0.150 to 0.036)	.002
Number of “yes” responses to questionnaire	0.006 (−0.004 to 0.015)	.251
Declination statements	0.125 (0.056 to 0.195)	.001
Constant	0.652 (0.561 to 0.744)	<.001