Institutional Requirements for Influenza Vaccination of Healthcare Personnel: Results From a Nationally Representative Survey of Acute Care Hospitals—United States, 2011

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**Background.** Many health professional organizations now endorse influenza vaccination as a condition of employment in healthcare settings. Our objective was to describe institutional requirements for influenza vaccination of healthcare personnel (HCP) among US hospitals during the 2010–2011 influenza season.

**Methods.** A survey was mailed in 2011 to a nationally representative sample of 998 acute care hospitals. An institutional requirement was defined as “a policy that requires HCP to receive or decline influenza vaccination, with or without consequences for vaccine refusal.” A weighted analysis included univariate analyses and logistic regression.

**Results.** Of responding hospitals (n = 808; 81.0%), 440 (55.6%) reported institutional requirements for influenza vaccination. Although employees were uniformly subject to requirements, nonemployees often were not. The proportion of requirements with consequences for vaccine refusal was 44.4% (n = 194); where consequences were imposed, nonmedical exemptions were often granted (69.3%). Wearing a mask was the most common consequence (74.2% of 194 requirements); by contrast, 29 hospitals (14.4%) terminated unvaccinated HCP. After adjustment for demographic factors, the following characteristics remained significantly associated with requirements: location in a state requiring HCP to receive or decline influenza vaccine, caring for inpatients that are potentially vulnerable to influenza, use of ≥9 Advisory Committee on Immunization Practices–recommended, evidence-based influenza vaccination campaign strategies, and for-profit ownership.

**Conclusions.** Influenza vaccination requirements were prevalent among hospitals of varying size and location. However, few policies were as stringent or as comprehensive as those endorsed by health professional organizations. Because influenza vaccination requirements are a viable alternative for hospitals unable to achieve high coverage through voluntary policies, there is still substantial room for improvement.

Each year, on average, influenza results in 226 000 hospitalizations and 24 000 deaths in the United States [1, 2]. To reduce transmission of influenza viruses within healthcare settings and to reduce employee absenteeism resulting from influenza illness, the Advisory Committee on Immunization Practices (ACIP) has recommended annual influenza vaccination for healthcare personnel (HCP) since 1984 [3, 4]. Influenza vaccination of HCP can reduce HCP-to-patient influenza transmission [5]. Influenza outbreaks are particularly problematic in hospitals, long-term care facilities, and dialysis centers, where many inpatients have serious underlying conditions [6]. Although the benefits of HCP vaccination include well-documented reductions in patient morbidity and mortality from influenza [7–10], healthcare institutions have largely been unsuccessful in achieving high influenza vaccination coverage when vaccination is optional; annual vaccination coverage among US HCP had never exceeded 50% before the 2009–2010 influenza season.
METHODS

Sample Selection
Nonfederal, US acute-care hospitals providing general medical and surgical services were identified using the 2008 American Hospital Association (AHA) Annual Survey Database (n = 4512). Based on similarly designed studies [20], we anticipated that infection preventionists were most likely to complete the questionnaire. Contact information for infection preventionists was purchased from 2 external vendors (Billions HealthData and APIC) and matched to hospitals in the sampling frame. Contact information of hospital administrators, available through the AHA database, was used for hospitals unable to be matched with an infection preventionist.

To ensure that sampled hospitals were sufficiently diverse, we stratified on bed size (<100, 100–300, >300) and US Census Bureau region (Northeast, Midwest, South, West). Because we hypothesized that hospitals matched with affiliated infection preventionists (80.1%) would be more likely to respond than unmatched hospitals (19.9%), we stratified further based on matching status. A random sample was drawn with selection probability proportional to stratum size and without replacement. The final sample consisted of 998 hospitals.

Survey
Surveys were mailed 1 week after a prenotification letter, during the first week of January 2011. A mailed reminder was sent after 4 weeks to nonresponders, and telephone follow-up continued thereafter for 6 additional weeks. Mailings included a cover letter that described the study, invited participation, and instructed that materials be forwarded to the most knowledgeable person on the subject matter, if not the designated addressee. The survey could be completed online via a secured website or returned by mail in an enclosed, prepaid envelope. The study was deemed to be exempt from review by the institutional review board of the Centers for Disease Control and Prevention.

Questionnaire development was informed by detailed pre- and postdevelopment interviews with 8 infection preventionists, each of whom represented a unique US hospital with a mandatory influenza vaccination policy. The final, 23-item questionnaire that included standardized definitions of commonly used terms was pilot tested with an additional 5 infection preventionists affiliated with hospitals with mandatory vaccination policies.

Because the definition of “mandatory” can vary [21], an inclusive definition of “vaccination requirement” was used for this study: any institutional provisions that require HCP to either receive or decline influenza vaccination, with or without consequences for refusing vaccination. All participants were asked about current use of ACIP-recommended, evidence-based strategies to increase influenza vaccination coverage among HCP (eg, provision of free vaccine, education, tracking vaccination uptake) [22] and whether the hospital had a current influenza vaccination requirement for HCP. If applicable, respondents were asked about consequences that applied to HCP who refused vaccination, which HCP were subject to the requirement, and exemptions permitted. Lastly, participants were asked the first influenza season the institutional requirement was implemented, as well as factors leading to implementation.

Outcome Measures and Independent Variables
The primary outcomes of interest were (1) prevalence of influenza vaccination requirements among US hospitals during the 2010–2011 influenza season and (2) among hospitals with requirements, the proportion that imposed consequences for vaccine refusal. The following characteristics were obtained from the AHA database: region, number of beds, teaching status (ie, membership in the Council of Teaching Hospitals of the American Medical Association or the Council for Graduate Medical Education), hospital ownership (public, for profit, or not for profit), urban (Core-Based Statistical Area [CBSA] codes: division, metropolitan) or rural (CBSA codes: micropolitan, rural) location, accreditation by the Joint Commission, provision of care to inpatient populations who may be immunocompromised (eg, transplant recipients, therapeutic oncology patients) or too young to receive influenza vaccine (eg, infants in obstetrical or neonatal intensive care units), and network or system affiliation. Location in a state with laws requiring hospital-based HCP to receive or decline influenza vaccination was also considered [23].
**RESULTS**

**Characteristics of Responding Hospitals**

Of 998 sampled hospitals, 808 (81.0%) responded. Response rates did not differ significantly between hospitals depending on whether infection preventionists were or were not identified. Nonresponding hospitals were more likely than respondents to be located in the West ($P < .001$), located in an urban location ($P < .001$), or have >300 beds ($P = .02$). Table 1 shows weighted characteristics of responding hospitals, which did not significantly differ from nonsampled hospitals eligible for study inclusion (data not shown).

**Outcome Measures: Univariate Analyses**

Among responding hospitals, 440 (55.6%) reported having an institutional requirement for influenza vaccination during the 2010–2011 influenza season (Table 2). Hospitals with the following characteristics were more likely to have requirements: location in the West, >300 beds, private ownership, urban location, and Joint Commission accreditation. Requirements were also more prevalent in states with a law requiring HCP influenza vaccination or declination ($73.2\%$ vs $51.2\%; P < .001$), and among hospitals that provided care to >1 potentially vulnerable inpatient population ($59.7\%$ vs $39.5\%; P < .001$). Among 440 hospitals with requirements for influenza vaccination of HCP, 194 (44.4%) reported that consequences applied to HCP who refused vaccination; this proportion was lower among hospitals located in the Northeast ($P = .02$).

**Use of Advisory Committee on Immunization Practices—Recommended Strategies to Increase Healthcare Personnel Influenza Vaccination**

ACIP-recommended vaccination campaign strategies related to vaccine accessibility, as well as provision of education and free vaccine, were widely used by responding institutions (Table 3). Hospitals without institutional requirements for influenza vaccination were less likely to use ≥9 strategies (ie, 75th percentile) (22.4%) than hospitals with requirements, with or without consequences for vaccine refusal (42.5% and 35.7%, respectively). Hospitals without requirements were also less likely to use strategies related to tracking vaccination or involving hospital administration or key personnel. Most hospitals with requirements reported that no additional strategies were concurrently introduced with the requirement ($n = 286, 69.7\%$; data not shown).

**Features of Institutional Requirements for Influenza Vaccination**

Employees were most likely to be subject to influenza vaccination requirements (Table 4). Institutions that imposed consequences for vaccine refusal were more likely than other institutions to require nonemployee vaccination; few hospitals required all HCP to be vaccinated. Where consequences were applied, nonmedical exemptions were commonly allowed. Requiring HCP to wear a mask was the most common consequence for vaccine refusal ($74.2\%$); by contrast, 29 hospitals (14.4%) terminated unvaccinated HCP. Nearly all hospitals with requirements used declination forms (93.4%). The content of the declination forms was highly uniform between institutions. Forms often requested a signature (93.1%), prompted the reason for declination (90.1%), and informed HCP of the risks of not being vaccinated, including both personal risk (79.8%) and risk of transmission to patients (79.8%) (data not shown).

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**Table 1. Characteristics of Responding Hospitals (n = 808)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Hospitals, no. (%)a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>100 (12.9)</td>
</tr>
<tr>
<td>Midwest</td>
<td>269 (30.1)</td>
</tr>
<tr>
<td>South</td>
<td>296 (37.4)</td>
</tr>
<tr>
<td>West</td>
<td>143 (19.7)</td>
</tr>
<tr>
<td><strong>No. of beds</strong></td>
<td></td>
</tr>
<tr>
<td>0–99</td>
<td>416 (49.5)</td>
</tr>
<tr>
<td>100–299</td>
<td>271 (34.2)</td>
</tr>
<tr>
<td>&gt;300</td>
<td>121 (16.3)</td>
</tr>
<tr>
<td><strong>Ownership</strong></td>
<td></td>
</tr>
<tr>
<td>Not for profit</td>
<td>485 (59.9)</td>
</tr>
<tr>
<td>Private, for profit</td>
<td>119 (15.2)</td>
</tr>
<tr>
<td><strong>Public</strong></td>
<td>204 (24.9)</td>
</tr>
<tr>
<td><strong>Locationb</strong></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>430 (54.6)</td>
</tr>
<tr>
<td>Rural</td>
<td>378 (45.4)</td>
</tr>
<tr>
<td><strong>Teaching hospital</strong></td>
<td>125 (16.1)</td>
</tr>
<tr>
<td><strong>Accredited by Joint Commission</strong></td>
<td>495 (62.8)</td>
</tr>
<tr>
<td><strong>Network or system affiliated</strong></td>
<td>503 (62.4)</td>
</tr>
</tbody>
</table>

a Data include unweighted sample sizes (no.) and weighted proportions (%).  
b Locations were defined according to Core-Based Statistical Area codes (urban: division, metropolitan; rural: micropolitan, rural).

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Factors Leading to Implementation of Institutional Requirements for Influenza Vaccination

The cumulative number of institutional requirements with consequences for vaccine refusal rose from 37 (5.0% of total sample) during the 2007–2008 influenza season to 183 (24.8%) during the 2010–2011 season (Table 5). Suboptimal influenza vaccination coverage of HCP during previous seasons was most commonly cited as leading to implementation of any requirement (52.4%) and was more commonly cited by hospitals with consequences than by those without consequences (51.4% vs 36.8%; \( P = .002 \)). State laws or statutes were cited less commonly (16.3%), and less frequently by hospitals with consequences than...
by those without them (10.7% vs 20.8%; \( P = .002 \)). H1N1 pandemic influenza also led to policy implementation (46.4% of institutional requirements implemented since 2009) but was cited with similar frequency by hospitals with consequences and those without consequences (data not shown).

### Outcome Measures: Multivariate Analyses

In an adjusted model including all responding hospitals, location in a state requiring HCP influenza vaccination or declination (odds ratio [OR], 2.5; 95% confidence interval [CI], 1.7–3.9), providing care to potentially vulnerable inpatient populations (OR, 1.7; 95% CI, 1.1–2.8), use of ≥9 ACIP-recommended campaign strategies (OR, 1.9; 95% CI, 1.3–2.7), and for-profit ownership (OR, 2.1; 95% CI, 1.2–3.7) remained significantly associated with institutional requirements for influenza vaccination.

In an adjusted model including only hospitals with institutional requirements, characteristics significantly associated with imposing consequences for vaccine refusal were providing care to potentially vulnerable inpatients (OR, 3.7; 95% CI, 1.1–13.7) and location in the Midwest, South or West (OR, 5.0; 95% CI, 2.0–12.1). Indicating that state laws were the impetus for the requirement (OR, 0.2; 95% CI, 0.1–0.6) was inversely associated with imposing consequences (data not shown).

### CONCLUSIONS

To our knowledge, this is the first nationally representative study to describe influenza vaccination requirements for HCP among US hospitals. High HCP influenza vaccination coverage can improve patient safety, promote employee health, and reduce employee absenteeism during the influenza season [4]. In recent years, escalating support for institutional requirements, as opposed to voluntary vaccination strategies, has foreshadowed a rise in prevalence of such requirements [21, 24]. According to our data, H1N1 pandemic influenza was a common impetus for requirements at institutions implementing such policies since the 2009–2010 influenza season. H1N1 pandemic influenza may have also indirectly influenced institutional vaccination strategies by drawing increased attention to influenza infection control measures.

Our results show that during the 2010–2011 influenza season, 55.6% of hospitals required HCP to receive or decline influenza vaccination. In light of the recent support by major healthcare professional organizations for mandatory influenza vaccination, it was surprising to find that only 29 (3.6%) of the responding hospitals required influenza vaccination as a condition of employment or work duty. Although most institutional requirements do not impose consequences for vaccination refusal, the
cumulative number of requirements with consequences in our sample rose precipitously in recent years. Working at a healthcare institution with an influenza vaccination requirement is associated with increased vaccine uptake among HCP [25]. Not surprisingly, suboptimal vaccination coverage of HCP during previous influenza seasons was commonly cited as a reason for implementation of requirements in our sample, particularly requirements with consequences for vaccine refusal. This finding probably reflects the inadequacy of strictly voluntary influenza vaccination at achieving optimal coverage of HCP at many hospitals [26–28].

The use of ACIP-recommended vaccination campaign strategies by US hospitals provides an interesting perspective into the evolution of voluntary policy to institutional requirement. Although providing access to vaccination was common, strategies that are key to a requirement’s success, such as those related to vaccination measurement and tracking, as well as leadership involvement [15, 29], were more common at hospitals with requirements. More often than not, however, requirements were implemented without concurrent introduction of additional strategies, suggesting that strategies shown in Table 2 often preceded rather than accompanied requirements. Although low vaccination coverage was reportedly an impetus for requirements, our data suggest that many hospitals elect to progressively increase the number of strategies used to increase vaccine uptake, rather than abruptly implementing a mandate, which some have called for [15]. It is unlikely, however, that institutions without requirements or robust influenza vaccination campaigns are able to consistently achieve high vaccination coverage [22].

In general, institutional requirements during the 2010–2011 influenza season were less stringent and less comprehensive than those now endorsed by healthcare professional organizations [15, 29]. Few institutions required vaccination as a condition of employment or work duty, and permitting nonmedical exemptions—a practice recommended by some but not all...
healthcare professional organizations [15]—was common. The most common consequences applied to HCP declining influenza vaccination were those intended to reduce influenza transmission (eg, mask wearing). Few institutions with requirements subjected all HCP to the policy, probably a reflection of the difficulty in identifying and tracking individuals who are not on payroll [30]. Institutions should strive to ensure that all HCP, not just those who can be easily accounted for, are protected against influenza viruses, because many have frequent contact with patients and other HCP.

Reports of institutional experience with influenza vaccination requirements—with or without consequences for refusal—are almost exclusively confined to large hospitals or health systems [17, 19, 31, 32]. In our study, multivariate analysis showed that hospital size and location were not associated with having an institutional requirement, indicating that successful implementation of requirements, and possibly their effectiveness, is reproducible in different settings. As expected, location in a state requiring influenza vaccination of HCP was associated with having an institutional requirement, although not all respondents in such states reported requirements. Hospitals reporting that a state law was the impetus for the requirement were less likely to impose consequences for vaccine refusal, suggesting that such policies were simply compliant with a directive rather than an institutional initiative; however, just 7 states had such laws in 2011. A perceived threat of labor union pushback, although difficult to quantify by region, may explain why requirements in the Northeast were less likely than others to entail consequences. Union challenges to institutional vaccine mandates have been successful [33]. A controversial, highly publicized, and, to date, unimplemented legislative requirement in New York State would have mandated influenza vaccination for HCP in 2009. This legislation was opposed by the New York State Nurses Association, among others [33, 34]. Furthermore, states in the Northeast had the highest percentage of unionized workers in 2010 [35]. Characterization of barriers to implementing requirements with consequences, such as union challenges and HCP resistance, is needed [19].

The findings of this report have implications for both national and institutional-level influenza vaccination coverage. The Healthy People 2020 objective for HCP influenza vaccination is 90% [36]. Seasonal influenza vaccination coverage for hospital-based HCP during the 2009–2010 season was 68.5% nationally; however, coverage ranged from 98% among HCP for whom consequences for vaccine refusal were applied to just 35.2% among HCP not required or recommended to receive vaccine [25]. Coverage among hospital-based HCP during seasons before 2009–2010 was ~45%–55% [20, 26]. Our study showed not only that more than half of hospitals have institutional requirements for influenza vaccination but also that the cumulative number of hospitals with consequences for vaccine refusal has more than tripled over several seasons, particularly in larger hospitals. Because >70% of hospital-based HCP are employed at institutions with >1000 workers [37], it is plausible that the reported rise in national vaccination coverage during the 2009–2010 influenza season was partially attributable to the number of HCP working at institutions with requirements. Indeed, interim data for the 2010–2011 season, compiled through an Internet panel survey, seems consistent with this hypothesis; influenza vaccination coverage among hospital-based HCP was already 68.3% in November 2010 [38]. However, because vaccination coverage reported at the institutional level is rarely comprehensive of all HCP, and often calculated using a variety of methods [20], our study was unable to provide additional insight on this matter.

This study has possible limitations. First, although the survey achieved an excellent response rate, response differed significantly by region, bed size, and urban location. After weighting, respondents did not significantly differ from nonresponding hospitals; however, unmeasured characteristics may have differed. Second, we did not ask whether requirements applied only to those with direct patient contact. Some organizations have recommended that only HCP with direct patient contact be mandated to receive influenza vaccination [15]. Finally, although our study described the cumulative number of requirements with consequences for vaccine refusal over the course of several influenza seasons, we were unable to confidently estimate the number of new institutional requirements each year.

In a nationally representative sample, more than half of US hospitals have implemented requirements for influenza vaccination of HCP. Although application of consequences for vaccine refusal is becoming more prevalent, requirements to date are less stringent and less comprehensive than those endorsed by healthcare professional organizations. Our data suggest that influenza vaccination requirements remain a viable option for hospitals unable to achieve high vaccination coverage of HCP using other strategies and that hospitals of various size and location have implemented such policies and will probably continue to do so. Therefore, this study can serve as a baseline for future assessment of institutional influenza vaccination requirements. Future research is needed on influenza vaccination requirements, as well as other strategies to promote HCP vaccination, in a diverse selection of healthcare settings. Priorities should include characterization of institutional policy effectiveness and sustainability in achieving high vaccination coverage, decreasing HCP work absence, and reducing influenza transmission.

**Notes**

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All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References

