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## Major article

## The impact of influenza vaccination requirements for hospital personnel in California: Knowledge, attitudes, and vaccine uptake

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**Background:** Seasonal influenza infections are a leading cause of illness, death, and lost productivity. Vaccinating health care personnel (HCP) can reduce transmission of influenza virus to patients and reduce influenza-related absenteeism, enabling the health care system to meet elevated demand for care during influenza outbreaks.

**Objectives:** We evaluated the impact of California's 2006 influenza vaccination requirement for hospital workers (requiring vaccination or signed declinations) on uptake and vaccination-related attitudes, beliefs, and knowledge among hospital HCP.

**Methods:** We used a causal difference-in-differences approach to compare changes over the prior 10 years in the self-reported frequency of influenza vaccination for California hospital HCP and those from other states without similar laws using data from a stratified sample (N = 3,529) of HCP drawn from online survey panels. We also examined cross-sectional differences in awareness of vaccination policies, promotion efforts, and attitudes toward influenza vaccination. All analyses used propensity score weighting to balance the observable characteristics of the 2 samples.

**Results:** We found that compared with their counterparts in other states, California hospital HCP were (1) more likely to report working under a formal written policy for influenza vaccination, (2) no more likely to be vaccinated, and (3) less likely to report working for an employer who provided financial incentives for vaccination or rewarded or recognized employees for being vaccinated.

**Conclusion:** Our results suggest that state-level vaccination requirements such as those enacted by California, may not be sufficient to increase uptake among hospital HCP.

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Seasonal influenza infections are a leading cause of illness, death, and lost productivity.<sup>1</sup> Vaccinating health care personnel (HCP) can reduce transmission of influenza virus to patients<sup>2,3</sup> and reduce influenza-related absenteeism, enabling the health care system to meet elevated demand for care during influenza outbreaks.<sup>4,5</sup> The US Centers for Disease Control and Prevention's

(CDC) Advisory Committee on Immunization Practices has recommended annual influenza vaccination of all HCP.<sup>6</sup> For most of the past decade, however, less than half of all HCP received annual influenza vaccinations.<sup>7</sup> The perception that voluntary programs are insufficient to generate substantial increases in influenza vaccination has led numerous experts, professional societies, advocacy organizations, and others to call for making influenza vaccination a condition of employment and/or professional privileges.<sup>8-12</sup> However, data suggest that even vaccination requirements without strict penalties for noncompliance (defined here as job loss, loss of professional privileges, or visible identification of vaccination status) can increase vaccination among hospital HCP by 15 percentage points or more, depending on how they are implemented.<sup>13-16</sup>

The effectiveness of influenza vaccination requirements beyond those adopted by hospitals voluntarily remains unclear. The

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experience of California may provide lessons regarding the potential of relatively permissive state-level requirements. We define permissive requirements here as those that allow individuals to avoid vaccination by signing a *declination statement* without establishing an enforcement mechanism or penalties for noncompliance.

As part of legislation to strengthen prevention of hospital-acquired infections, California became one of the first states to require influenza vaccination of all hospital-based HCP in 2006.<sup>17</sup> As of March 2012, 7 other states have enacted similar laws.<sup>17,18</sup> Specifically, California Health and Safety Code 1288.7 requires all general acute care hospitals to offer annually on-site influenza vaccinations to hospital employees at no cost and to require their employees to be vaccinated or declare in writing that they have declined vaccination. In accordance with CDC's and the federal Healthcare Infection Control Practices Advisory Committee's recommendations, in 2008 California Department of Public Health clarified requirements for compliance with the statute, including the provision of education to employees and other nonemployee HCP and the reporting to California Department of Public Health of annual vaccination and declination rates.<sup>19–21</sup> The statute does not make vaccination a condition of employment, stipulate means through which hospitals should enforce requirements, or institute penalties for hospitals with low vaccination rates. As such, the California law can be considered a permissive state-level requirement in contrast to Rhode Island's 2012 law, which requires unvaccinated HCP to wear masks during periods where influenza is widespread and includes specific penalties for noncompliance.<sup>22</sup> Rhode Island's law is currently being evaluated; however, at this time an evaluation of California's law is critical to understanding whether success can be achieved without threatening HCP autonomy.

To learn from California's experiences, we evaluated the impact of California's 2006 influenza vaccination requirement for hospital workers (requiring vaccination or signed declinations) on uptake and vaccination-related attitudes, beliefs, and knowledge among hospital HCP. Our results may assist policy makers to understand the potential effectiveness of state policies that strive to make the promotion of influenza vaccination a high priority without imposing strict penalties for noncompliance.

## METHODS

### Data sources

In the absence of appropriate administratively documented vaccination coverage data, we drew a stratified sample of 3,529 hospital-based HCP in April 2010 from 3 online survey panels. These panels included (1) the Physicians' Consulting Network (PCN) (N = 846), a panel of approximately 70,000 HCP (mostly physicians) who agreed to participate in health care-related research in exchange for financial compensation; (2) eRewards (n = 2,113) and GMI (n = 99), which are 2 opt-in panels of Internet users and both of which include tens of thousands of individuals recruited through Web advertising who agreed to participate in surveys in exchange for small cash rewards and incentives; and (3) hospital-based HCP (n = 471) recruited from KnowledgePanel, a nationally representative, online research panel of 50,000 individuals, who completed the same survey instrument as part of a concurrent CDC study to measure influenza vaccination among US HCP.<sup>23</sup> All data sources are convenience samples with the exception of KnowledgePanel.

To ensure representation of a diverse range of health care professionals and vaccination-related attitudes and behaviors, we prospectively recruited 4 strata or categories of HCP employed by or

working in general acute care hospitals: (1) physicians typically employed by hospitals (eg, anesthesiologists, surgeons), (2) nurses, (3) allied health professionals, and (4) nonclinical support staff and administrators. We recruited physicians, nurses, and selected types of allied health professionals through targeted e-mails using occupational information collected at the time of recruitment into their respective panels. We recruited others using panel-wide e-mails.

When feasible, we balanced the number of sample members from each source residing inside and outside of California to minimize the potential for the confounding of sample source and exposure to CA's vaccination requirement.

Next, we excluded 297 respondents who resided in 7 states (Alabama, Illinois, Massachusetts, New Hampshire, Tennessee, Maine, and Oklahoma) that had laws similar to California's during our study period. This exclusion ensured that the non-California "control" arm of the study only included HCP who were not subject to state-wide legislation requiring vaccination. This exclusion did not change our results. We also excluded 421 respondents who reported working in hospital-owned, ambulatory care practices.

Seventy percent of eligible KnowledgePanel panelists and 22% of PCN panelists completed the survey. We cannot determine participation rates for opt-in panelists because the number of eligible people invited to participate is unknown. All 4 sample sources have been described in previous publications.<sup>23,24</sup>

After applying exclusion criteria, our analytic sample consisted of 1,201 California and 1,610 non-California hospital-based HCP. RAND's Institutional Review Board approved the study design and survey protocols.

### Measures

The survey measured vaccination-related behaviors, attitudes, and knowledge and exposure to workplace vaccination efforts. The survey asked 6 questions about influenza vaccination during the prior 10 years. We expected that HCP could accurately recall the frequency of influenza vaccination in the recent past, although not necessarily in specific terms. To aid recall, we started by asking about vaccination for seasonal and H1N1 influenza during the past season. We followed-up with 2 questions: (1) "Compared with ten years ago, are you more or less likely to get an influenza vaccination now than you were in the past?" and (2) "Please estimate how often you have been vaccinated for influenza over the past ten years."

We also gauged respondents' exposure to workplace vaccination efforts. We started by asking respondents whether their employer had a "formal, written policy on influenza vaccination." We measured respondents' perceptions of working under a vaccination requirement by asking, "During this past influenza season, did your work site recommend or require that you be vaccinated for seasonal influenza?" To detect the presence of a requirement we asked whether unvaccinated HCP were required to sign a declination statement or faced consequences for not complying with their employer's policy, including requiring a special badge, mask, or respirator, work reassignment, participation in an educational intervention, leave without pay, loss of benefits, and termination. The respondent was considered subject to a vaccination requirement if the respondent reported a declination requirement or any of the listed consequences of nonvaccination.

The survey asked about other efforts to promote vaccination. These included on-site vaccination, reminders, publicizing the risks and benefits of vaccination, public identification of vaccinated staff, financial incentives, other rewards, and publicizing employee vaccination rates.

We asked about vaccination-related attitudes and beliefs that could potentially be influenced by efforts to educate employees

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