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Association of facility vaccination policy with influenza vaccination among healthcare personnel in acute care hospitals — National Healthcare Safety Network, 2021–22 influenza season

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Abstract

We examined the association between influenza vaccination policies at acute care hospitals and influenza vaccination coverage among healthcare personnel for the 2021–22 influenza season. Mandatory vaccination and masking for unvaccinated personnel were associated with increased odds of vaccination. Hospital employees had higher vaccination coverage than licensed independent practitioners.

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Keywords

Influenza vaccination; Healthcare Personnel; Acute Care Hospitals

Introduction:

The Advisory Committee on Immunization Practices recommends that healthcare personnel receive seasonal influenza vaccination annually.¹ Data reported by acute care hospitals to the Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN) indicate declining influenza vaccination coverage among healthcare personnel in acute care hospitals in recent years.²

Previous research found that mandatory vaccination and multifaceted strategies, including vaccination campaigns and vaccinate-or-mask policies, increase vaccination among healthcare personnel in regional health systems in the U.S. and other countries.³ However, it is unclear how facility-level policies affect coverage among healthcare personnel in hospitals throughout the U.S. This study examines facility-level influenza vaccination policies and their association with vaccination coverage among employees and licensed independent practitioners in U.S. acute care hospitals during the 2021–22 influenza season.

Methods:

Data reported by acute care hospitals to NHSN were used for this study, which included healthcare personnel working in the hospital for ≥ 1 day from October 1, 2021, to March 31, 2022. Analysis was limited to facilities that submitted vaccination data and completed an optional survey about influenza vaccination programs and policies and which types of healthcare personnel they apply to.

Employees included full- and part-time staff paid directly by the facility. Licensed independent practitioners included physicians, advanced practice nurses, and physician assistants affiliated with but not directly employed by the facility. Vaccination coverage was calculated by dividing number of vaccinated healthcare personnel by total number of healthcare personnel and pooled by facility policy and healthcare personnel category.

Bivariate analysis was conducted to determine which policies (i.e., facility influenza vaccination policies, methods to deliver vaccines to healthcare personnel, and strategies used by facility to promote personnel influenza vaccination) had the highest association with vaccination coverage. The final model was a multivariable logistic regression model using the Williams scale to account for overdispersion. The model included facility influenza policies outlining consequences for declining vaccination at reporting facilities [<https://www.cdc.gov/nhsn/forms/57-215-Seasonal-Survey-form.pdf> (Appendix A-question #5)] and classified as (1) employment termination, (2) masking if unvaccinated, (3) recommended, no consequence, (4) other consequence, and (5) no influenza vaccination policy. Masking was a dominant theme in the category other, specify and obtained by extracting the word “mask” in free response text for facilities that required masking for unvaccinated personnel. Less prominent themes included medical/religious exemption and signed declination.

Other facility-level factors in the final model included facility size (tertile distribution of healthcare personnel per facility), urbanicity (urban: metropolitan statistical areas with ≥ 1 million population, suburban: metropolitan statistical areas with $\geq 50,000$ –999,999 population, and rural: counties within and outside of micropolitan statistical areas) using the National Center for Health Statistics urban-rural classification scheme for counties, acute care hospital type, CDC/Agency for Toxic Substances and Disease Registry county-level social vulnerability index tertile, U.S. Department of Health and Human Services (HHS) region (1–10) and the interaction between healthcare personnel category and vaccination policy.^{2,4–6} All analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC).

Results:

A total of 3,238 facilities (84.4% of acute care hospitals that reported healthcare personnel vaccination coverage to NHSN) with 5.4 million employees and 1.1 million licensed independent practitioners were included. Pooled vaccination coverage was 79.4%: 82.5% for employees and 64.5% for licensed independent practitioners (Table 1). Facilities with an employment termination policy reported the highest vaccination coverage for employees (94.0%) and licensed independent practitioners (81.2%).

In the multivariable model, healthcare personnel working in urban areas had slightly lower odds of vaccination (adjusted odds ratio [aOR], 0.80; 95% CI, 0.70–0.90) compared with those working in rural areas. Healthcare personnel working in oncology hospitals had the highest odds of vaccination (aOR, 3.4, 95% CI, 1.6–7.6) compared with those working at women's hospitals. Healthcare personnel working in HHS Region 1 had the highest odds of vaccination (aOR, 2.6, 95% CI, 2.1–3.3) compared with those working in HHS Region 4 (Table 2).

Compared with licensed independent practitioners, employees had the highest relative odds of vaccination in facilities with an influenza policy of employment termination (aOR, 3.0; 95% CI, 2.6–3.5), followed by employees working in facilities with a policy of other consequences (aOR, 2.1; 95% CI, 1.9–2.4) and employees working in facilities with a policy of masking (aOR, 1.5; 95% CI, 1.1–2.1) (Table 2).

Among employees:

Compared to employees working in facilities with no influenza vaccination policy, employees working in facilities with a policy of employment termination had the highest odds of vaccination (aOR, 16.6; 95% CI, 10.1–27.5) followed by employees working in facilities with a policy of other consequences (aOR, 5.5; 95% CI, 3.4–9.1) and employees working in facilities with a policy of masking (aOR, 2.8; 95% CI, 1.7–4.8) (Table 2).

Among licensed independent practitioners:

Compared to those working in facilities with no influenza vaccination policy, personnel working in facilities with a policy of employment termination had the highest odds of vaccination (aOR, 8.4; 95% CI, 4.7–14.9), followed by personnel working in facilities with a policy of other consequences (aOR, 3.9; 95% CI, 2.2–6.9) and personnel working in facilities with a policy of masking (aOR, 2.8; 95% CI, 1.5–5.2) (Table 2).

Discussion:

During the 2021–22 influenza season, facility-level influenza policies including employment termination, other consequences, and masking for unvaccinated healthcare personnel were associated with increased odds of vaccination among both employees and licensed independent practitioners, consistent with a study examining campaign strategies.³ Healthcare personnel working in oncology hospitals were more likely to be vaccinated, as healthcare personnel working with immunocompromised patients may be more receptive to vaccination.⁷ Declines in vaccination coverage might have been affected by the decrease in influenza cases due to universal masking policies and the higher emphasis on COVID-19 vaccination during the COVID-19 pandemic.^{2,8} Regional differences in coverage underscore opportunities to improve vaccine uptake.

This demonstrates that even when a policy has consequences for non-compliance, there is variability in vaccine uptake among healthcare personnel in acute care hospitals. To supplement influenza vaccination policies, hospitals can consider other strategies shown to be effective at increasing vaccination coverage, including educational campaigns, free access to vaccines, incentives, flexible worksite vaccine delivery methods (e.g., mobile carts), and signed vaccination declinations for non-medical reasons.^{3,9}

This study is subject to several limitations. First, the study data do not address when hospitals enacted their influenza policies or change in vaccination coverage over time. Therefore, we could not determine whether facility influenza vaccination policy increased vaccination coverage. Second, the survey did not directly ask about masking, which may have led to underreporting of masking policies. Third, licensed independent practitioners may work at multiple facilities during the influenza season, creating challenges with tracking and leading to underreporting. Fourth, it was unclear how strictly influenza policies were enforced. Lastly, our analysis did not consider how multifaceted campaigns or state-level vaccination laws may have increased coverage, as suggested in another study.³

Influenza vaccination policies with consequences are effective for increasing the odds of vaccination among employees but less effective for licensed independent practitioners. The factors associated with this finding were not evaluated by this study and warrant additional investigation. To improve vaccination among healthcare personnel for future influenza seasons, it may be beneficial to combine multiple interventions (i.e., facility policy, education, and outreach to increase trust) and customize these for each healthcare personnel category.¹⁰

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Pooled influenza vaccination coverage of healthcare personnel in acute care hospitals for the 2021–2022 influenza season

	Pooled Coverage		
	No. of Healthcare Personnel vaccinated ^a	No. of Healthcare Personnel ^a	Vaccination Coverage %
Total	5,205,660	6,557,220	79.4
n=3,238 facilities			
Total Employees	4,476,785	5,426,308	82.5
Total Licensed independent practitioners	728,875	1,130,912	64.5
Coverage for Employees by facility influenza vaccination policy			
Employment termination	1,924,238	2,047,939	94.0
Masking	100,967	148,618	67.9
Recommended, no consequence	923,310	1,358,556	68.0
Other consequences	1,520,801	1,849,448	82.2
No policy	7,469	21,747	34.3
Coverage for Licensed independent practitioners by facility influenza vaccination policy			
Employment termination	319,071	392,885	81.2
Masking	13,658	28,741	47.5
Recommended, no consequence	148,522	308,181	48.2
Other consequences	246,584	394,001	62.6
No policy	1,040	7,104	14.6
Facility Size			
Small	339,892	452,669	75.1
Medium	1,070,511	1,423,176	75.2
Large	3,795,257	4,681,375	81.1
Urbanicity			
Urban	2,954,577	3,781,135	78.1
Suburban	1,818,667	2,224,573	81.8
Rural	432,416	551,512	78.4
Hospital Type			
Child	134,283	150,268	89.4
General	4,924,912	6,223,181	79.1
Oncology	70,343	81,105	86.7
Orthopedic	14,442	16,271	88.8
Surgery	34,803	49,996	69.6
Women and Children	17,098	20,660	82.8
Women	9,779	15,739	62.1
Social Vulnerability Index			
Low	1,844,864	2,234,119	82.6
Medium	1,885,952	2,403,221	78.5

	Pooled Coverage		
	No. of Healthcare Personnel vaccinated ^a	No. of Healthcare Personnel ^a	Vaccination Coverage %
High	1,474,844	1,919,880	76.8
Region ^b			
HHS 1	360,189	390,127	92.3
HHS 2	517,534	702,761	73.6
HHS 3	527,311	608,242	86.7
HHS 4	926,106	1,264,648	73.2
HHS 5	974,999	1,127,662	86.5
HHS 6	571,760	779,406	73.4
HHS 7	229,447	261,058	87.9
HHS 8	242,116	273,758	88.4
HHS 9	680,823	917,228	74.2
HHS 10	175,375	232,330	75.5

Pooled vaccination coverage is the sum of vaccinated healthcare personnel divided by total healthcare personnel for all acute care hospitals

^aHealthcare personnel refers to both employees and licensed independent practitioners.

^bHHS = U.S. Health and Human Services Region (<https://www.hhs.gov/about/agencies/iea/regional-offices/index.html>).

HHS Region 1- Boston includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

HHS Region 4 – Atlanta includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee

Source: National Healthcare Safety Network, United States.

Table 2.

Results of multivariate analyses of the associations of facility-level characteristics, facility influenza vaccination policies, and healthcare personnel employment status with odds of influenza vaccination among healthcare personnel for the 2021–22 influenza season

Facility Characteristics adjusted odds ratio		
Characteristic	aOR ^a	95% CI
Facility Size		
Small	Ref ^C	
Medium	0.9	0.8–0.9
Large	0.9	0.9–1.0
Urbanicity		
Urban	0.8	0.7–0.9
Suburban	1.0	0.9–1.1
Rural	Ref	
Hospital Type		
Child	1.8	1.0–3.2
General	1.0	0.6–1.7
Oncology	3.4	1.6–7.6
Orthopedic	1.6	0.8–3.0
Surgery	1.0	0.6–1.7
Women and Children	1.4	0.6–3.1
Women	Ref	
Social Vulnerability Index		
Low	Ref	
Medium	0.9	0.8–1.0
High	0.9	0.8–1.0
Region ^b		
HHS 1	2.6	2.1–3.3
HHS 2	1.2	1.0–1.3
HHS 3	1.6	1.4–1.8
HHS 4	Ref	
HHS 5	1.4	1.2–1.5
HHS 6	1.2	1.1–1.3
HHS 7	2.1	1.8–2.5
HHS 8	2.2	1.8–2.6
HHS 9	1.7	1.5–1.9
HHS 10	1.6	1.3–1.9
Relative adjusted odds ratio policy and healthcare personnel		
Coverage for Employees vs. Licensed independent Practitioners by facility influenza vaccination policy		
Employment termination	3.0	2.6–3.5
Masking	1.5	1.1–2.1
Recommended, no consequence	1.3	1.2–1.5

Facility Characteristics adjusted odds ratio		
Other consequences	2.1	1.9–2.4
No policy	1.5	0.7–3.2
Coverage for Employees by facility influenza vaccination policy		
Employment termination	16.6	10.1–27.5
Masking	2.8	1.7–4.8
Recommended, no consequence	2.3	1.4–3.8
Other consequences	5.5	3.4–9.1
No policy	Ref	
Coverage for Licensed independent practitioners by facility influenza vaccination policy		
Employment termination	8.4	4.7–14.9
Masking	2.8	1.5–5.2
Recommended, no consequence	2.6	1.5–4.6
Other consequences	3.9	2.2–6.9
No policy	Ref	

^aaOR= adjusted odds ratio

^bHHS = U.S. Health and Human Services Region (<https://www.hhs.gov/about/agencies/iea/regional-offices/index.html>).

HHS Region 1- Boston includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

HHS Region 4 – Atlanta includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee

Source: National Healthcare Safety Network, United States.

^cRef = reference group