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Factors Associated with Resident Influenza Vaccination in a National Sample of Nursing Homes

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Abstract

Influenza vaccination remains the cornerstone of influenza prevention, yet national goals for nursing home residents and staff vaccination have not been met. Few studies have examined associations between facility and resident characteristics; employee processes, such as staff vaccination policies; and resident influenza vaccination. In this national survey of nursing homes, employee processes were not associated with resident influenza vaccination; however, various facility and resident characteristics were.

Keywords

influenza; vaccination; nursing home; policies; healthcare worker

Introduction

Approximately 1.5 million people reside in US nursing homes (NHs) and are disproportionately exposed to infections.^{1,2} Although preventable through influenza vaccination, a primary infection in NHs and 8th leading cause of overall US deaths is influenza.^{3,4}

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To prevent influenza transmission among residents, it is recommended that at least 90% of NH residents and staff are influenza-vaccinated. However, recent estimates have shown only 72% of NH residents and 59% of NH personnel receive the vaccination.^{3,5,6} Factors associated with resident vaccination may include resident characteristics, facility characteristics, and employee processes/policies; yet data are limited linking these factors to the likelihood of influenza vaccination. To understand factors associated with influenza vaccination among NH residents we aimed to: 1) assess influenza vaccination prevalence among a national sample of NH residents and 2) identify factors associated with higher facility prevalence of influenza-vaccinated residents.

Methods

A paper-based, cross-sectional survey of 2,514 randomly sampled non-specialized US NHs was conducted in 2014 using a modified Dillman technique. Personnel in charge of the infection control program were invited to complete the survey and a \$20 gift card was sent with each survey as an incentive. Participants were also given the chance to enter a raffle to win an Apple iPad. Further details about the survey are reported elsewhere.⁷

Survey results were linked to concurrent Certification and Survey Provider Enhanced Reporting (CASPER) data that contains facility characteristics and aggregated resident health information (See Table A1 in the Supplementary Appendix for detailed list of variables). The outcome of interest was resident influenza vaccination prevalence within the past year for each facility, based on CASPER data. Vaccination prevalence was categorized as low (<75%) and high (≥75%) based on median prevalence. Survey data included whether influenza was ranked as one of the three greatest infection challenges for the facility (i.e., perceived as a challenge) and employee vaccination processes/policies regarding influenza vaccination (i.e., completing a declination statement, wearing a mask, and/or not being permitted to work if staff refuses vaccination).

Differences in facility characteristics, resident health status, and employee processes/policies for NHs with high versus low vaccination prevalence were explored using t-test, Wilcoxon, or chi-square tests. Variables with p-value <0.10 in the bivariate analyses were included in a multivariable logistic regression model; variables with p-value <0.05 in the multivariable analysis were considered significantly associated with vaccination prevalence. Sensitivity analyses were performed with clustering by state. Stata version 13 (StataCorp, College Station, TX) was used to conduct all analyses. The Institutional Review Boards at Columbia University Medical Center and University of Pittsburgh approved this study.

Results

Completed surveys were received from 990 NHs (39% response); an analysis of responses with complete data for all variables of interest was performed (n=872 surveys). Surveys with missing values for the variables of interest were not significantly different with respect to facility characteristics compared to those with complete responses. Less than half of participating NHs (48%) had ≥75% influenza-vaccinated residents. On average, 70% of residents were vaccinated (median=73.4%, range=0–100%, standard deviation=21.8%).

Table 1 shows bivariate analysis results. Influenza was ranked as a top infection challenge in 13% of NHs, but this was not associated with vaccination prevalence, nor were staff vaccination policies. Table 2 presents multivariable analysis results. NHs with high vaccination prevalence were more likely to be small (0–85 beds vs. >120 beds; odds ratio [OR]=1.48, $p<0.05$), government or nonprofit (vs. for-profit; OR=1.58, $p=0.01$), located in the Northeast (vs. in the Midwest; OR=1.73, $p=0.01$), and had higher proportions of dementia residents (OR=1.43, $p=0.02$). Moreover, NHs with high vaccination prevalence were less likely to be chain-affiliated (OR=0.71, $p=0.02$), had lower proportions of Medicare residents (OR=0.98, $p=0.002$), and were less likely to be located in metropolitan settings (vs. nonmetropolitan with urban population; OR=0.56, $p=0.002$). Sensitivity analysis results did not differ from the main analysis.

Discussion

Federal goals for resident influenza vaccination are to have rates of 90% and our findings indicate that, on average, we are not meeting these goals. Important factors associated with vaccination prevalence were identified and warrant further attention to achieve increased resident vaccination.

Lower influenza vaccination rates in for-profit versus nonprofit NHs has been reported in other studies.⁸ The 993,773 residents (71%) in for-profit US NHs are disproportionately placed at increased risk for poorer health outcomes.¹ Because Medicare and Medicaid cover the expense of influenza vaccination, this problem is unrelated to cost. Staff time constraints to administer vaccinations and lack of resources to monitor vaccination status and educate staff on resident vaccination administration likely contribute to coverage differences.

Regional differences between Northeastern and Midwestern states are expected as the latter have some of the lowest influenza vaccination rates of all states.⁵ Additionally, facilities with high vaccination prevalence had fewer Medicare residents, which is not surprising because Medicare residents typically reside in NHs for <100 days and are less likely to receive vaccinations.³ Thus, targeted vaccination interventions by region and payment source are warranted.

Although no associations between employee processes/policies and resident vaccination were identified, influenza vaccination policies/programs to ensure staff vaccination have important implications for resident safety and care quality. Higher staff vaccination decreases the likelihood of sick calls, influenza transmission, and resident mortality.³ Additionally, findings show that when >40% of NH staff are vaccinated, resident influenza vaccination increases.⁹ While examining staff vaccination rates was not possible in this study, only approximately one-third of surveyed facilities required staff vaccination, suggesting low emphasis on vaccination.

Because of limited resources and fewer capabilities to diagnose influenza in NHs compared to acute settings, increased reliance on prevention efforts is critical. Other researchers have also reported no association between employee processes/policies (e.g., declination statement) and resident vaccination, but additional findings indicate improvement of resident

vaccination when these processes take on a multifaceted approach.^{3,8} To further support resident vaccination administration, facilities might incentivize staff to appropriately assess for and administer the vaccination.¹⁰

Limitations

Temporality could not be established in this cross-sectional study. The survey data were selfreported and therefore subject to bias. While the response rate was moderate, to our knowledge this is one of the larger surveys of infection prevention and control programs in US NHs. Possibly due to selection bias, our sample of respondents was more likely to perform better in quality areas (i.e., administering influenza vaccination), be from the northeast, and nonprofit compared to non-respondents (data shown elsewhere).⁷ Even so, there was wide variation in resident vaccination among these better-performing facilities enabling us to identify factors associated with high resident vaccination prevalence.

Conclusion

Influenza is a challenge in NHs and resident vaccination remains low despite federal recommendations and NH policies. Because facility characteristics are associated with resident vaccination, understanding facility needs may improve resident vaccination. Implementing organized vaccination programs in facilities with low coverage and/or offering incentives for vaccination administration may be efficacious in meeting national goals.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Nursing homes are not meeting national resident influenza vaccination goals of 90%
- Staff vaccination policies were not associated with resident vaccination prevalence
- Targeted vaccination interventions by region and payment source may be warranted

Table 1

Bivariate analysis of associations between nursing home resident influenza vaccination and facility and aggregate resident characteristics and employee processes

	Total (n=872)	Low, <75% vaccinated (n=454)	High, 75% vaccinated (n=418)	P-value
	mean (std)	mean (std)	mean (std)	
Facility Characteristics				
Total residents	97 (65)	97 (59)	96 (71)	0.02
Number of nursing home beds	118 (70)	120 (64)	115 (77)	<0.0001
Percent occupancy	82 (16)	81 (15)	83 (16)	0.01
Ownership				<0.0001
For-profit	601 (68.9)	350 (77.1)	251 (60.1)	
Government/nonprofit	271 (31.1)	104 (22.9)	167 (40.0)	
Multi-facility organization	473 (54.2)	274 (60.4)	199 (47.6)	<0.0001
Staffing				
RN hrd	0.75 (0.38)	0.74 (0.43)	0.75 (0.33)	0.05
LPN/LVN hrd	0.81 (0.49)	0.83 (0.46)	0.79 (0.51)	0.07
CNA hrd	2.49 (0.98)	2.42 (0.92)	2.56 (1.04)	0.003
Payment source				
% of residents on Medicaid	61 (21)	60 (21)	62 (21)	0.50
% of residents on Medicare	14 (13)	16 (13)	12 (12)	<0.0001
% of residents with Other**	25 (18)	24 (17)	26 (18)	0.01
	n (%)	n (%)	n (%)	
Setting				<0.0001
Nonmetropolitan with urban population	213 (24.4)	90 (19.8)	123 (29.4)	
Metropolitan	629 (72.1)	357 (78.6)	272 (65.1)	
Rural	30 (3.4)	7 (1.5)	23 (5.5)	
Region				0.005
Midwest	315 (36.1)	158 (34.8)	157 (37.6)	
Northeast	185 (21.2)	79 (17.4)	106 (25.4)	
South	261 (29.9)	152 (33.5)	109 (26.1)	
West	111 (12.7)	65 (14.3)	46 (11)	
Received infection control citation	299 (34.3)	167 (36.8)	132 (31.6)	0.11
Received quality of care citation	533 (63.4)	302 (66.5)	251 (60.1)	0.05
Influenza perceived as top infection challenge	110 (12.6)	56 (12.3)	54 (12.9)	0.82
Resident Health Status				
Dementia				<0.0001
<50%	425 (48.6)	254 (56.0)	171 (40.7)	
50%	449 (51.4)	200 (44.1)	249 (59.3)	
NHs with residents receiving tracheostomy care	218 (24.9)	122 (26.9)	96 (22.9)	0.17

	Total (n=872)	Low, <75% vaccinated (n=454)	High, 75% vaccinated (n=418)	P-value
	mean (std)	mean (std)	mean (std)	
NHs with residents receiving suctioning	267 (30.6)	151 (33.3)	116 (27.6)	0.07
Employee Processes/Policies				
Staff vaccination for seasonal influenza required	328 (37.5)	170 (37.4)	158 (37.6)	0.96
Declination statement required if staff refuse vaccination	684 (78.3)	349 (76.9)	335 (79.8)	0.30
Mask use required if staff refuses vaccination	224 (25.6)	113 (24.9)	111 (26.4)	0.60
Staff not permitted to work if staff refuses vaccination	55 (6.3)	29 (6.4)	26 (6.2)	0.91

** Other included all of those who did not pay by Medicare or Medicaid e.g., private pay, self-pay

Note: std= Standard Deviation; RN= Registered Nurse; LPN/LVN= Licensed Practical Nurse/Licensed Vocational Nurse; CNA= Certified Nursing Assistant; hrd= Hours Per Resident Day; NHs= Nursing Homes

Table 2

Multivariable logistic regression of associations between prevalence of nursing home resident influenza vaccination and facility and resident characteristics

Characteristic	Adjusted OR	P-value*
Facility Characteristics		
Number of nursing home beds		
121+ (ref)	–	–
86–120	1.00	0.99
0–85	1.48	0.05
Percent occupancy	1.30	0.61
Ownership		
For-profit (ref)	–	–
Government/nonprofit	1.58	0.01
Multi-facility organization	0.71	0.02
Payment Source		
% Medicare	0.98	0.002
% Other**	1.00	0.94
Staffing		
RN hrd	1.06	0.81
LPN/LVN hrd	0.84	0.36
CNA hrd	1.21	0.08
Setting		
Nonmetropolitan with urban population (ref)	–	–
Metropolitan	0.56	0.002
Rural	1.82	0.21
Region		
Midwest (ref)	–	–
Northeast	1.73	0.01
South	1.00	0.99
West	1.10	0.71
Received quality citation	0.81	0.16
Resident Health Status		
50% Dementia	1.43	0.02
Receiving Suctioning	1.05	0.77

* All p-values <0.05 were considered statistically significant

** Other included all of those who did not pay by Medicare or Medicaid e.g., private pay, self-pay

Note: RN= Registered Nurse; LPN= Licensed Practical Nurse/Licensed Vocational Nurse; CNA= Certified Nursing Assistant; hrd= Hours Per Resident Day