Impact of NHAP Guideline Implementation Intervention on Staff and Resident Vaccination Rates

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Objectives: Determine whether a comprehensive approach to implementing national consensus guidelines for nursing home acquired pneumonia (NHAP), including influenza and pneumococcal vaccination, improves resident subject and staff vaccination rates.

Methods: Quasi-experimental, mixed-methods multifaceted intervention trial conducted at 16 nursing homes (NHs) from 1 corporation (8 in metropolitan Denver, Colorado; 8 in Kansas and Missouri) during 3 influenza seasons, October to April 2004 to 2007. Residents with 2 or more signs and symptoms of systemic lower respiratory tract infection (LRTI) and NH staff and physicians were eligible. Subjects’ NH records were reviewed for vaccination. Each director of nursing (DON) completed a questionnaire assessing staffing and the number of direct care staff vaccinated against influenza. DONs and study liaison nurses were interviewed after the intervention. Bivariate analysis compared vaccination outcomes and covariates between intervention and control homes, and risk-adjusted models were fit. Qualitative interview transcripts were analyzed using content coding.

Results: No statistically significant relationship between the intervention and improved resident vaccination rates was found, so other factors associated with improved rates were explored. Estimated direct patient care staff vaccination rates were better during the baseline and improved more in the intervention NHs. Qualitative results suggested that facility-specific factors and national policy changes impacted vaccination rates.

Conclusions: External factors influence staff and resident vaccination rates, diluting the potential impact of a comprehensive program to improve care for NHAP on vaccination. (J Am Med Dir Assoc 2010; 11: 365–370)

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Nursing home–acquired pneumonia (NHAP) causes excessive morbidity, mortality, hospitalization, and loss of function, partly because many nursing home staff and residents are not appropriately immunized. Influenza vaccination of staff and residents has been shown to prevent infections and reduce mortality.14–18 Outbreaks of pneumococcal disease have been associated with low pneumococcal vaccination rates in nursing homes in at least 2 states,5,6 and at least 1 study found that vaccination reduced the incidence of pneumococcal pneumonia in elderly people at risk for pneumonia.19 Influenza and pneumococcal vaccination of nursing home residents and, particularly, influenza vaccination rates for direct care staff are suboptimal. In a multistate survey of influenza vaccination rates, 99% of nursing homes offered vaccine to residents, and 86% offered vaccination to staff, but the average vaccination rate was 83% for residents and only 46% for staff.8 The national nursing home pneumococcal vaccination rate was 37.4%9 in 2005.

Both individual nursing home and peer review organization (PRO)-initiated interventions that target resident vaccination have been shown to be effective in increasing vaccination rates,9–12 but changes in state health department policy have not.13 Attempts to increase staff vaccination rates have been limited to individual nursing homes,11 in spite of the fact that staff vaccine uptake is critically important in preventing influenza outbreaks.1,14

The current study was designed to determine whether a comprehensive approach to improving care for NHAP by implementing national consensus guidelines15 that included, but did not focus exclusively on, vaccination against influenza and pneumococcal infections, would improve vaccination rates for both residents and staff.
METHODS

Overview

This quasi-experimental, mixed-methods study tested the effects of a multidisciplinary intervention implementing national evidence-based guidelines on care for NHAP. The multifaceted intervention included (1) institutional change to facilitate immunization and the availability of appropriate treatment and testing, (2) interactive educational sessions to improve vaccination rates and nursing assessment, and (3) academic detailing to physicians to impact diagnostic and prescribing practices.

Setting

Sixteen nursing homes that are members of 1 multifacility corporation participated in the study. Eight homes are located in the Denver, Colorado, metropolitan area, and 8 homes are located in Kansas and Missouri. Baseline data were collected during influenza season, October to April, 2004 to 2005; the intervention was conducted in the Denver area facilities during influenza season 2005 to 2006 and 2006 to 2007. Both intervention and control facilities were paid $1000/year to help cover costs of participating in the study.

Subjects

Details of subject recruitment have been reported elsewhere.16 Because this was an intervention aimed at improving the care of NHAP, only nursing home residents who developed 2 or more signs and symptoms of a systemic lower respiratory tract infection (LRTI) were eligible. Eligibility was based on LRTI rather than pneumonia, since a definitive pneumonia diagnosis requires the presence of an infiltrate on chest x-ray, and many episodes of NHAP are treated without a chest x-ray being obtained.17 Residents who refused to participate, who had been in the facility fewer than 5 days, or whom the charge nurse believed to be within 48 hours of dying were excluded. Health Insurance Portability and Accountability Act (HIPAA) authorization and informed consent were elicited from all subjects, or if they were not competent to consent, from their proxy health care decision maker. Information about each facility was collected by asking each facility’s director of nursing (DON) to complete a questionnaire. The Colorado Multiple Institutional Review Board approved the study (COMIRB #03–1243), and the corporation’s 2 respective divisional offices provided Federal Wide Assurances for the Protection of Human Subjects.

Data Collection Protocol

Details of data collection have also been reported elsewhere.16 Briefly, resident and NHAP characteristics, comorbidity, and processes of care data were gathered by trained nurse data collectors using a previously tested, systematic chart review instrument on laptop computers in Microsoft Access 2000 (Seattle, WA) with built-in range and logic checks.18,19 Process of care data included evidence for resident vaccination. Six data collectors visited the facilities every 7 to 10 days during 3 influenza seasons, October through April 2004 to 2005, 2005 to 2006, and 2006 to 2007, to enroll residents with LRTIs referred by the charge nurse on each unit within 10 days from symptom onset. Every tenth chart was copied and rereviewed by the project manager and by 1 other data collector to ensure reliable data extraction. Only items with inter-rater reliability scores of 0.7 or better by Cohen’s kappa or percentage agreement are reported here.

The DON at each facility completed the facility questionnaire at the end of each study year, where she estimated the number of licensed nurses (RNs and LPNs) and the number of CNAs who worked during a 24-hour period; the average daily facility census; the number of licensed nurses and CNAs hired during the preceding year; the current number of licensed nurses and CNAs on staff; and the number of direct care staff who were vaccinated against influenza during or just before influenza season. Data from both the chart abstraction protocol and facility questionnaire were combined into an analytic file matched at the patient-case (episode) level for analysis using the SAS (Cary, NC) and Stata (College Station, TX) statistical software packages.

Following the intervention, a qualitative study was undertaken to better understand the successes, challenges, and barriers to the main study intervention.20 DONs from each nursing home, study liaison nurses from the intervention homes, and the 2 nurses who are the corporate Divisional Directors of Clinical Care (DDCC) were invited to participate in a semi-structured interview using a prepared script and a single interviewer. The 30- to 60-minute interviews were audiotaped with permission and transcribed verbatim into Word documents. No technical difficulties with the tape-recording device occurred. A gift card to a local retailer was provided to thank participants for their time. Because there was substantial nursing management turnover from the time of the study’s inception to the qualitative follow-up, a number of the current DONs did not have direct experience with the study, and 1 control home DON declined to participate. Twenty-two interviews with 31 participants were completed over 3 months approximately 9 months after the end of the intervention in 15 of the 16 nursing homes. Of the 22 interviews, 16 were with DONs, 2 with assistant DONs, 9 with liaison nurses, 2 with staff development coordinators, and 2 were with the DDCCs of each corporate division. Assistant DONs and staff development coordinators were interviewed in some of the facilities in an effort to speak with at least 1 person in each facility who had direct experience with the study.

Intervention

The parts of the multifaceted intervention relevant to vaccination included the following activities. The intervention facilities were paid an additional $2000/year during the 2 intervention years to incentivize guideline compliance and early detection of lower respiratory tract signs and symptoms. The nurse educator investigator (K.S.O.) met with the DON and administrator of each facility to present the guidelines, contract for the facility’s participation, identify implementation barriers, and identify and meet the study liaison nurse, who was the facility’s change agent for the study. The liaison nurse was paid an honorarium of $100 per quarter and was
lytic process. After removing personal identifiers, verbatim using content coding and a qualitative descriptive data analysis and control facilities during the intervention period. Lines from the intervention and control facilities' baseline variables were used to compare adherence to the guideline. Qualitative findings were confirmed by the investigator who conducted with DONs and liaison nurses revealed that most DON respondents did not believe that the state survey process impacted vaccination rates. However, most respondents believed that the new F-tag emphasized the importance of asking about vaccination when the resident was admitted to the facility (see Figure 4). The following comments emphasized that more tracking of vaccinations is occurring in all facilities:

- “We look at vaccinations, now, more closely,” said one control home DON.
- “A vaccination record is used in all facilities now,” the control homes’ DDCC reported.
- “It is a very positive thing that every day immunizations are discussed in the morning meeting, how many residents have been immunized … I think there is a more heightened sense of awareness in the nursing home industry to make

### RESULTS

Subjects in the intervention and control facilities were older women with similar degrees of cognitive impairment and illness severity. There were more African American subjects in the control homes and more Latina subjects in the intervention homes. Intervention home subjects were more functionally impaired, and were more likely to have COPD and an order limiting aggressive care (DNR orders). There were, however, no significant correlations between patient factors and vaccination rates.

NH size was similar, but staff turnover was higher in every study year in the control homes. Although baseline resident influenza vaccination rates were similar, baseline resident pneumococcal vaccination and staff influenza guideline compliance were markedly better in the intervention than the control homes.

The impact of the multifaceted guideline implementation process on vaccination rates can be seen in Figures 1 to 3. Figure 1 demonstrates that pneumococcal vaccination rates improved more in the control homes than in the intervention homes: from 20.8% to 59.0% in the control homes and from 56.5% to 83.8% in the intervention homes. In contrast, influenza vaccination rates were similar in the intervention and control homes during the baseline year, but improved somewhat more in the intervention than in the control homes, as shown in Figure 2.

Estimated direct patient care staff vaccination rates (Figure 3) were significantly better at baseline in the intervention homes than the control homes, and improved more in the intervention facilities.

It is important to note that during the intervention period the MDS was changed to include documentation of pneumococcal and influenza vaccination status for all residents, and an F-tag for state health department monitoring of vaccination rates was instituted. Qualitative analysis of interviews conducted with DONs and liaison nurses revealed that most DON respondents did not believe that the state survey process impacted vaccination rates. However, most respondents believed that the new F-tag emphasized the importance of asking about vaccination when the resident was admitted to the facility (see Figure 4). The following comments emphasized that more tracking of vaccinations is occurring in all facilities:

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sure vaccinations are given,” an intervention home DON shared.

- Another intervention facility related that there had been more of a focus on vaccination after a mock survey from the corporate office personnel. “When they came and didn’t like what they saw with regard to vaccination, I had to get out there and audit every chart to see where we were, to make sure we were offering it, and actually give an in-service to staff on the vaccination process.”

Interviews also revealed that there was pressure and positive support from the nursing home corporation to improve resident and staff vaccination rates in both divisions, but vaccination appeared to be more heavily emphasized in control homes. According to many DONs, continual education of staff, residents, and their families on the importance of vaccination is critical because of staff turnover. DONs at homes with higher vaccination rates noted that influenza vaccinations were made available free, or less commonly at low cost, to nursing home employees and the residents’ family members/significant others. Many of the control and intervention facilities held flu shot clinics, which improved access to vaccination. In one of the intervention homes where vaccination rates improved significantly, the DON stated that when a resident refused vaccination, written and verbal education was provided to the resident and family detailing the importance and benefits of vaccination, and the vaccine was then reoffered. This DON stated, “Our vaccination rates improved to almost 99%.” In addition, there was a statutory change in 1 of the 2 control states permitting vaccination without written informed consent.

Nurse respondents in 2 intervention facilities also suggested that medical director promotion of vaccination played an important role in increasing vaccination rates.

**DISCUSSION**

This multifaceted implementation of comprehensive guidelines for managing NHAP had mixed impacts on compliance with resident vaccination guidelines and staff influenza vaccination. For staff vaccination rates, which are notoriously low and critically important in preventing influenza outbreaks, the intervention was significantly associated with increased compliance rates to greater than 50% in the intervention homes. Both the absolute and relative improvement in staff vaccination was better in the intervention than in the control homes.

Resident vaccination appears to have been more influenced by secular trends produced by national governmental pressure to improve vaccination rates and differing corporate and facility leadership practices across the homes involved in the study than by the intervention. In fact, there has been a concerted national effort to improve resident vaccination rates during the past 10 years, and pneumococcal vaccination rates nationally improved from 24% in 1995 to nearly 40% in 2005. This external effort likely diluted the contrast between intervention and control homes. Both the absolute and relative improvement in staff vaccination was better in the intervention than in the control homes.

Previously published studies have demonstrated multiple ways to improve nursing home resident vaccination compliance, including both individual NH and state PRO initiatives. The current study demonstrates that
a comprehensive program to improve care for NHAP deployed at multiple facilities of a single nursing home corporation can also improve staff vaccination rates, but our analysis suggests that any potential impact of the intervention was overwhelmed by other forces.

The study's strengths include its multistate, multifacility focus, prospective data collection, and comprehensive approach to improving care for NHAP. The study's generalizability is limited by having enrolled only subjects with LRTI. It is not known whether the intervention affected vaccination of residents not enrolled in the study. Although it is possible that residents willing to enroll in a study might have been more willing to be vaccinated, this increased willingness among subjects is unlikely to have been different between intervention and control homes. Moreover, 87% of eligible residents agreed to participate in the study, and they did not differ significantly in age, gender, or ethnic background from residents who declined to participate.

The study was also limited by significant differences between intervention and control homes in baseline vaccination rates. Relatively simple administrative and facility policy changes may elicit improvements in very low rates, whereas more intense educational efforts for residents and families may be required to improve vaccination rates above current national averages. Finally, facility characteristics including nursing resident staffing ratios and nursing staff turnover were significantly better in the intervention than in control homes. We have previously demonstrated the impact of nurse/resident staffing ratios and turnover on NHAP guideline compliance rates. Although the interviewees did not comment on this issue, it is likely that it is easier to improve staff influenza vaccination rates with a relatively more stable staff.

An additional weakness of the study is that we relied on the DON's annual estimate of staff vaccination rates. Because NH staff may be vaccinated in many locations, NHs do not typically keep accurate records of which staff are vaccinated.

**CONCLUSION**

Although significant gains in vaccination rates have been made in the past 10 years, current rates, particularly for staff influenza vaccination, are still too low. One of the risks of a multifaceted intervention is that the need to continue improving vaccination rates could become lost in the effort to improve other care processes. This did not occur in the intervention homes, and moreover, staff vaccination rates improved significantly. The qualitative findings further suggest that it is important to continually educate staff, residents, and their families about the importance of vaccination and to include the medical director in that education process. Future studies will need to focus on the impact of these improved vaccination rates on attack rates of influenza and
pneumonia, and ways to more widely disseminate staff influenza vaccination.

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