



### September 2007: VOLUME 1, NUMBER 11

*How can we improve vaccination rates and what are the barriers?*

#### In this Issue...

Annual influenza vaccination has proven to be the most effective intervention in preventing infection. While the indications for vaccination have expanded, and there has been special interest in promoting the vaccination of healthcare workers, the overall vaccination rate remains lower than anticipated.

In this issue, we compare interventions that have been applied to increase vaccination rates in both inpatient and outpatient settings, review the current epidemiology of healthcare worker vaccination, and identify the misperceptions about the vaccine which limit our ability to vaccinate clinical staff.

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## LEARNING OBJECTIVES

**At the conclusion of this activity, participants should be able to:**

- Describe the current recommendations for influenza immunization
- Identify strategies that encourage and promote influenza vaccination in patients and healthcare workers
- Discuss the potential barriers to influenza vaccination in healthcare workers

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## COMMENTARY

Over the past decade, there has been increased promotion of influenza vaccine, as well as increased access and availability, in both medical settings and non-traditional community settings. The US Healthy People 2010 coverage goals look to achieve vaccination rates of 90% in persons >65 and nursing home residents.<sup>1</sup> Data from the National Health Interview Survey in 2006<sup>2</sup> and the CDC Behavioral Risk Data Surveillance system in 2005<sup>3</sup> found that vaccination rates for these groups were 66% and 65%, respectively—representing substantial increases over previous years. Further, vaccination promotion has increasingly become part of patients' interaction with the healthcare system: the interventions studied (and reviewed herein) include the institution of standing orders during inpatient admissions (Dexter), engaging staff as vaccination promoters in long-term care facilities

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(Hayward), and implementing a patient assessment and vaccination reminder system in outpatient clinics (Fishbein).

### **Expansion of Influenza Indications**

The 2007 recommendations for influenza vaccination were recently published by the CDC, and represent a continued expansion of influenza vaccination to near universal levels.<sup>1</sup> As condensed below, the CDC currently recommends vaccination for:

- All persons, including school-aged children, who want to reduce the risk of becoming ill with influenza or of transmitting influenza to others (in effect, a recommendation for universal vaccination);
- All children age 6 months through 4 years;
- All persons >50 years;
- Women who may be pregnant during the influenza season;
- Adults and children with a variety of chronic diseases;
- Adults and children with immunosuppression, either caused by innate disease and/or medications, or by infections such as HIV;
- Adults and children with respiratory compromise (chronic pulmonary condition or risk for aspiration);
- Residents of nursing homes and long-term care facilities;
- Healthcare personnel;
- Health household contacts of any of the above groups with chronic illness or other indication.

### **A Move to Improve Vaccination Rates Among Healthcare Workers**

While the current recommendations include stronger language regarding vaccination of healthcare workers, who have been in the past been identified as a priority group, the CDC document recognizes the challenges inherent in achieving compliance: *"Although annual vaccination is recommended for HCP and is a high priority for reducing morbidity associated with influenza in health care settings and for expanding influenza vaccine use, national survey data indicate a vaccination rate of only 42% in HCP."*<sup>1</sup>

Consistent with the CDC data, an article by Hofmann et al in *Infection*,<sup>4</sup> reviewed the literature of healthcare workers' attitudes and beliefs towards vaccination, and found that, as of 2005, most reporting institutions in the US had uptake rates no higher than 50%. One key structural barrier identified is the lack of free vaccine - primarily an access issue, which by in large has been ameliorated by the implementation of employer-based and workplace-based free vaccination programs. The authors further identified a number of attitudinal barriers to developing effective workplace vaccine programs, including a perceived lack of vaccine efficacy, a fear of adverse reactions, and a misperception about the severity and transmissibility of influenza. Specific results from the various studies show that 8-54% of respondents feared adverse events, 45% feared getting influenza from the vaccine, 6-58% believed they were not at risk, and 3-32% considered the vaccine to be ineffective. The authors recommend that educational campaigns address these concerns. The studies conducted over the past 3 years by Gazmararian, Kimura, Christini, and Tapiainen (reviewed herein) show that these patterns and attitudes continue, are found in a variety of health care settings, appear to be most prevalent among nurses and ancillary staff, and have persisted despite vaccine education and outreach campaigns.

### **Policy Impact—A Call For Mandatory Vaccination**

Because of the difficulty in implementing influenza vaccine in employees, there has been an increasing call for mandatory vaccine. In the heart of this controversial issue are Dr. Gregory Poland<sup>5</sup> from Mayo Clinic and Howard Backer from California Department of Health Services.<sup>6</sup> Poland and Backer have stated that - based on the facts that influenza is a serious disease, that health care workers can transmit the disease, that flu vaccine prevents worker disruption and saves money - prevention of

influenza is an element in the standard of care, and, therefore, healthcare workers and healthcare systems have an ethical duty to vaccinate. Going even further, Poland suggests that unless healthcare workers and healthcare systems take responsibility for curbing epidemics and, in particular, eliminating nosocomial influenza transmission, they will be forced to do so through regulation.

Data accumulated over the past decade clearly show that providing structural interventions in the medical practice setting, large scale vaccine promotion, and increased access have substantially increased vaccination coverage among patient populations, and there is clear movement towards universal vaccination. However, aggressive promotion of vaccine in healthcare workers (HCWs) appears to have limited impact. While the current ACIP recommendations suggest that "active declination" or other types of "opt out" measures should be implemented, it is very likely these would result in pushback from employees. As the data presented in this issue show, there are clearly misperceptions about influenza vaccine in subsets of HCWs that present major challenges, indicating a pressing need to research the basis of these beliefs and develop effective interventions.

## References

1. Centers for Disease Control and Prevention. [Prevention and Control of Influenza - Recommendations of the Advisory Committee on Immunization Practices \(ACIP\) 2007](#). *MMWR* 2007; 56 (RR-6) 1-54.
2. Centers for Disease Control and Prevention. Early Release of Selected Estimates Based on Data From the 2006 National Health Interview Survey. (unpublished data).
3. Centers for Disease Control and Prevention. [Influenza and Pneumococcal Vaccination Coverage Among Persons Aged >65 Years --- United States, 2004-2005](#). *MMWR* 55 (39);1065-1068.
4. Hofmann F, Ferracin C, Marsh G, Dumas R. [Influenza vaccination of healthcare workers: A literature review of attitudes and beliefs](#). *Infection* 2006 Jun;34(3):142-147.
5. Poland GA, Tosh P, Jacobson RM. [Requiring influenza vaccination for health care workers: Seven truths we must accept](#). *Vaccine* 2005 Mar 18;23(17-18):2251-2255.
6. Backer H. [Counterpoint: In favor of mandatory influenza vaccination for all health care workers](#). *Clin Infect Dis* 2006;42:1144-1147.

## STRUCTURAL INTERVENTION: INPATIENT COMPUTER-GENERATED STANDING ORDERS

Dexter PR, Perkins SM, Maharry KS, Jones K, McDonald CJ. **Inpatient computer-based standing orders vs physician reminders to increase influenza and pneumococcal vaccination rates: A randomized trial**. *JAMA* 2004 Nov 17;292(19):2366-2371.

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Dexter and colleagues at Indiana University evaluated the impact of inpatient computer-based standing orders as an intervention to increase influenza and pneumococcal vaccine rates, as compared to a control group where simple computerized reminders were sent to the attending physician. This study was conducted in 1998-99 flu season on the general medicine wards. The computer system considered patients eligible for vaccination if there was no evidence that the vaccine had already been given during the current season, the patient was older than 65, and/or the patient had a diagnosis of chronic disease (i.e. COPD, CHF). Standing orders were computer-generated for each of these patients, and nurses were authorized to administer vaccine in response after screening for specific adverse reactions.

During the influenza season, 848 hospitalized patients were eligible; 385 were assigned to the standing order group and 463 to the physician reminder group. In the latter, physicians were reminded on an electronic basis - however, no vaccination order was entered unless the physician specifically did so. These physicians received a mean 5.3 flu shot reminders per patient hospitalization, and

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tended to wait to vaccinate until later the hospital stay.

After correcting for patients who reported already receiving the vaccine, 52% of patients in the standing order group and 36% of patients in the physician reminder group were vaccinated. These data indicate that during an acute hospitalization, using a standing order approach, to be implemented directly by nurses, can substantially increase vaccination rates. Although the criteria for influenza vaccination have been expanded since 1999, this study clearly shows that an administrative or "structural" intervention can be a critical element in ensuring vaccination and improving guideline adherence.

## THE CHALLENGE OF INFLUENZA VACCINATION AMONG HEALTH CARE WORKERS

Gazmararian JA, Coleman M, Prill M, et al. **Influenza vaccination of health care workers: Policies and practices of hospitals in a community setting.** *Am J Infect Control* 2007 Sep;35(7):441-447.

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Gazmararian's group evaluated influenza rates at 12 Atlanta area hospitals, representing the spectrum of university and community facilities, and encompassing 52,000 healthcare workers. Individual interviews were conducted with senior managers, and program areas evaluated included the modalities for vaccine distribution, promotion, employee education efforts, vaccination rates, and computerized tracking data of vaccinated employees.

All facilities provided free vaccine and held scheduled vaccination clinics. There were 4 additional attempts at outreach: vaccine carts circulated to the wards, priority vaccination outreach directly to clinical care employees, provision of live attenuated vaccine, and free vaccination for family members. None of the facilities had implemented active declination policies, as senior staff were concerned this type of intervention might cause "pushback" from employees. Further, no records of any employee's refusal to vaccinate appeared in either their medical or human resource department documentation.

The vaccination rates at the 12 hospitals ranged from 27%-59%, with an average of 41%. The researchers found that the hospitals with the highest rates were those that had also implemented the largest number of different outreach efforts: for example, the hospitals that implemented at least 3 of the 4 outreach strategies had rates between 46-59% (the top quartile assessed).

## VACCINATION OF HEALTH CARE WORKERS TO REDUCE MORBIDITY AND MORTALITY IN NURSING HOME PATIENTS

Hayward AC, Harling R, Wetten S, et al. **Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: Cluster randomised controlled trial.** *BMJ* 2006 Dec 16;333(7581):1241.

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During the 2003-5 seasons (2 winters), Hayward et al conducted a very large vaccine promotion evaluation among the staff at a large private chain of UK nursing homes. In the intervention facilities, active promotion of vaccine for staff included

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engaging head nurses as vaccine promotion advocates using a variety of communications tools. In addition, the staff received direct mail and other communications from the employer, which also offered free vaccine to a local occupational health service. In the control facilities, the staff was sent a letter informing them of the study, and advising them of Department of Health recommendations that adults with chronic illness should be vaccinated. A unique feature of this study was that outcomes were measured as influenza-like illness incidents in facility patients, with data collected weekly via a uniform collection system implemented by the nurses. The analysis plan used outcomes as a cluster, essentially pairing intervention and control nursing facilities, and then using each patient population as a cluster for comparison. This method essentially eliminated much of the bias incumbent in these types of studies.

Sixteen nursing home facilities participated, including 2 matched pairs, with between 1200-1400 residents in the intervention and control homes during each season. The investigators found that among full time employees in the intervention facilities, vaccination rates were 43-48%, compared to vaccination rates of 3-6% in the control facilities. Overall, intervention facilities had significantly lower all-cause mortality; secondary outcomes included lower rates of influenza-like illness, lower rates of physician referral for influenza-like illness, and lower rates of hospitalization for influenza-like illness. Specifically in 2003-2004 season, which was a heavy influenza season, mortality rate in the intervention facilities was 0.112 compared to 0.153 in the controlled facility, and incidence of influenza-like illnesses was 0.114 compared to 0.227 (all of these were significant differences). Further, these disparities did not exist during the non-influenza periods. Also, there was an embedded serendipitous control in that the 2004-2005 influenza season was extremely light.

These data strongly indicate that vaccination of health care staff, even at rates considered lower than optimal, can effectively reduce transmission of disease within long-term care facilities. From a behavioral standpoint, the study shows the efficacy of engaging "peers" (in this case the head nurses) to promote the vaccine-a strategy widely used in other areas of behavioral intervention. Furthermore, these data indicated that a series of simple interventions can increase vaccination rates to above 50%. Another important issue is that all of the nursing home patients were offered, and most received, vaccinations, thus avoiding a potential confounding variable. It is important to note, however, that the systematic evaluation of the impact of these types of studies is incumbent on a cluster analysis approach.

## ASSESSMENT/REMINDER (A/R) TOOLS IN OUTPATIENT PRIMARY CARE PRACTICE SETTINGS

Fishbein DB, Willis BC, Cassidy WM, Marioneaux D, Winston CA. **A comprehensive patient assessment and physician reminder tool for adult immunization: Effect on vaccine administration.** *Vaccine* 2006 May 1;24(18):3971-3983.

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Fishbein's 2006 study evaluated the utility and impact of a patient self-assessment/provider reminder (A/R) tool, which assessed for all recommended adult vaccinations in the outpatient setting. The study was conducted during the 2003-4 season, in the venues of a Georgia private health clinic, 6 community health centers in New Mexico, and a clinic in Louisiana. The A/R tool ([available online](#)) ascertains a patient's immunization needs by simplifying the ACIP recommendations for each of the 8 adult vaccines (influenza, pneumococcal, meningococcal, tetanus, MMR, hepatitis A and B, PPV, and varicella) into a series of simple yes/no questions. The objective is to determine vaccination risk factors, provide patient education, and notify the provider to administer or further evaluate vaccination needs.

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Each clinic site evaluated 200 patients who were not acutely ill, comparing intervention patients (where the reminder tool was used) to control patients (evaluated without reminder systems). Interestingly, influenza vaccine rates were similar in both groups were similar (at 60%). Vaccination rates did increase, however, for some of the other vaccines, such as tetanus. The authors note that since many of the clinics were community health centers, there was already a high level of vaccine awareness and promotion, and the proposed structural intervention therefore had minimal impact. An additional factor contributing to lack of impact may be that, because of time and reimbursement issues, these providers do not generally promote all 8 recommended ACIP recommended vaccines - influenza and pneumococcal vaccines, therefore, were already clearly prioritized in this setting.

## IDENTIFYING BARRIERS TO VACCINATION AMONG HCWS—WHY DO HEALTH CARE WORKERS REFUSE VACCINATION?

Kimura AC, Nguyen CN, Higa JI, Hurwitz EL, Vugia DJ. *Am J Public Health* **The effectiveness of vaccine day and educational interventions on influenza vaccine coverage among health care workers at long-term care facilities.** 2007 Apr;97(4):684-690.

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In 2002, Kimura et al surveyed health care workers at 30 California long-term care facilities (LTCFs), evaluating reasons for not obtaining vaccine. The results were then used to develop 2 interventions, a targeted multimedia educational campaign and a well-publicized Vaccine Day offering free influenza vaccination of all employees at the worksite. Prior vaccine rates were found to be 30%. The two areas targeted for intervention were vaccine misconceptions and vaccine access. The vaccine misconceptions included concern about side effects (17%), belief that the individual never got influenza (18%), the ineffectiveness of vaccine (17%), and concern that the vaccine causes influenza (39%). Interestingly, these misconceptions occurred predominantly in lower wage employees, of whom only 54% received sick leave, and 30% reported having had no health insurance.

Seventy facilities were recruited to participate in an intervention trial and randomly assigned to 4 study groups: group A was the control group and did not conduct either intervention, group B conducted the educational campaign only, group C conducted the Vaccine Day intervention only, and group D conducted both interventions. Using a non-controlled and non-cluster comparison analysis, the investigators found that the combination of Vaccine Day plus an educational campaign was most effective in increasing vaccine coverage (53% coverage; prevalence ratio [PR]=1.45; 95% confidence interval [CI]=1.24, 1.71), compared with 27% coverage in the control group). Vaccine Day alone was also effective (46% coverage; PR = 1.41; 95% CI=1.17, 1.71). The educational campaign alone was not significantly effective in improving coverage levels (34% coverage; PR=1.18; 95% CI=0.93, 1.50).

Despite the strength of these data, the authors note that convincing management (e.g., owners, administrators, medical directors) that vaccinating their employees is as important as vaccinating their residents remains a formidable challenge, due in part to the fact that providing influenza vaccine to all their personnel incurs a significant expense. Yet, the authors point out, costs from employee absenteeism during influenza outbreaks can be considerable, requiring increased shift overtime and/or the hiring of temporary workers (which may compromise care and lead to higher costs). Furthermore, when influenza outbreaks occur in LTCFs, standard guidelines dictate that all residents and any unvaccinated health care workers be placed on chemoprophylaxis, all unvaccinated residents and workers be vaccinated, and all ill residents be confined to the same area of the facility. Implementation of these measures can be much more costly to LTCFs than providing vaccine to their employees.

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## HEALTH CARE WORKERS AND VACCINE MISPERCEPTIONS-IMPACT, PROBLEM AND OPPORTUNITY

Christini AB, Shutt KA, Byers KE. **Influenza vaccination rates and motivators among healthcare worker groups.** *Infect Control Hosp Epidemiol* 2007 Feb;28(2):171-177.

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Tapiainen T, Bar G, Schaad UB, Heininger U. **Influenza vaccination among healthcare workers in a university children's hospital.** *Infect Control Hosp Epidemiol* 2005 Nov;26(11):855-858.

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Christini et al evaluated vaccination rates and motivators in a large number of health care worker (HCW) groups at two tertiary care hospitals in Pittsburgh, assessing vaccination behavior during the 2004-5 season. Different occupational groups were surveyed by self-report; data gathered included demographic variables, occupation class, motivating factors for vaccine acceptance or rejection, intention to get vaccination, perceived risk for side effects from live attenuated vaccine and inactivated vaccine, and self-reported illnesses. From the 1,042 surveys evaluated, the authors found the overall vaccination rate was 52%. Tapiainen performed a similar study in a University Children's Hospital in Basel, Switzerland, where 406 HCWs were surveyed. Remarkably, the overall vaccination rate in the Swiss HCWs was only 19% in 2004.

Both studies found that physicians and medical students were most likely to be vaccinated. In Pittsburgh, the odds ratios for these two groups were 3.0 and 2.4, respectively, with pediatricians the highest group at 84%. Rates among nurses were 42%, and rates among support staff ranged from 29-42%. Interestingly, among support staff and nurses who were not vaccinated, the reasons for not getting vaccinated included a subgroup of 25-27% who believed that they did not get influenza; one-third (34% of nurses and 36% of support staff) who were concerned about side effects, and 40-58% who were concerned about vaccine shortage, even though the hospitals repeatedly assured the staff that there was sufficient vaccine available (the vaccination season studied was the one in which there were major shortages of vaccine because of manufacturing problems). In the Basel study, a similar pattern was observed, although physicians had substantially higher rates of vaccine uptake at 43%.

In Pittsburgh, there was also a perception among respondents that both inactivated and live vaccine caused illness (46% and 54% respectively). In the Swiss study, of the nurses who refused vaccination, 75% reported that they were not convinced of efficacy and 55% were not convinced of the necessity of the intervention.

These low rates have substantial public health impact. On the symptom evaluation, only half of the HCWs who were not vaccinated and reported an influenza-like illness missed work, suggesting that there was tremendous potential for continued transmission within the health care setting.

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- Identify strategies that encourage and promote influenza vaccination in patients and healthcare workers
- Discuss the potential barriers to influenza vaccination in healthcare workers

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