2013

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Hitoshi Honda
Tokyo Metropolitan Tama Medical Center

Yumiko Sato
Teine Kejinaki Medical Center

Akinori Yamazaki
Teine Kejinaki Medical Center

Simi Padival
Beth Israel Deaconess Medical Center

Akira Kumagai
Teine Kejinaki Medical Center

See next page for additional authors

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Author(s): Hitoshi Honda, MD; Yumiko Sato, RN, CIC; Akinori Yamazaki, PharmD; Simi Padival, MD; Akira Kumagai, MD; Hilary Babcock, MD, MPH

Source: *Infection Control and Hospital Epidemiology*, Vol. 34, No. 11 (November 2013), pp. 1194-1200

Published by: The University of Chicago Press on behalf of The Society for Healthcare Epidemiology of America

Stable URL: http://www.jstor.org/stable/10.1086/673452

Accessed: 07/11/2013 21:41

ORIGINAL ARTICLE

A Successful Strategy for Increasing the Influenza Vaccination Rate of Healthcare Workers without a Mandatory Policy Outside of the United States: A Multifaceted Intervention in a Japanese Tertiary Care Center

Hitoshi Honda, MD;[1,2] Yumiko Sato, RN, CIC;[2] Akinori Yamazaki, PharmD;[2] Simi Padival, MD;[3] Akira Kumagai, MD;[2] Hilary Babcock, MD, MPH[4]

OBJECTIVE. Although mandatory vaccination programs have been effective in improving the vaccination rate among healthcare workers, implementing this type of program can be challenging because of varied reasons for vaccine refusal. The purpose of our study is to measure improvement in the influenza vaccination rate from a multifaceted intervention at a Japanese tertiary care center where implementing a mandatory vaccination program is difficult.

DESIGN. Before-and-after trial.

PARTICIPANTS AND SETTING. Healthcare workers at a 550-bed, tertiary care, academic medical center in Sapporo, Japan.

INTERVENTIONS. We performed a multifaceted intervention including (1) use of a declination form, (2) free vaccination, (3) hospital-wide announcements during the vaccination period, (4) prospective audit and real-time telephone interview for healthcare workers who did not receive the vaccine, (5) medical interview with the hospital executive for noncompliant (no vaccine, no declination form) healthcare workers during the vaccination period, and (6) mandatory submission of a vaccination document if vaccinated outside of the study institution.

RESULTS. With the new multifaceted intervention, the vaccination rate in the 2012–2013 season increased substantially, up to 97%. This rate is similar to that reported in studies with a mandatory vaccination program. Improved vaccination acceptance, particularly among physicians, likely contributed to the overall increase in the vaccination rate reported in the study.

CONCLUSIONS. Implementation of comprehensive strategies with strong leadership can lead to substantial improvements in vaccine uptake among healthcare workers even without a mandatory vaccination policy. The concept is especially important for institutions where implementing mandatory vaccination programs is challenging.

Infect Control Hosp Epidemiol 2013;34(11):1194-1200

Influenza vaccination for healthcare workers (HCWs) is a key component of programs to prevent nosocomial influenza transmission.[1] Although the Centers for Disease Control and Prevention and the World Health Organization have recommended influenza vaccination for all HCWs, the influenza vaccination rate among HCWs remains suboptimal.[2,3] Although the reported vaccination rate among HCWs varies by countries or regions, 1 survey from France revealed that the influenza vaccination rates among HCWs was lower than 30%.[4] In a response to the lower vaccination rates in Canadian hospitals, the Association of Medical Microbiology and Infectious Disease Canada has published a position article promoting mandatory influenza vaccination of HCWs.[5] Discrepancies between ideal and actual vaccination rates have created controversy over how to improve the vaccination rate of HCWs.[6] This challenge has led to the implementation of mandatory vaccination policies for HCWs in some hospitals, and the vaccination rate among HCWs has substantially improved at several institutions in the United States as a result.[7-15] However, a mandated policy can be difficult for a single institution in the absence of a governmental initiative (ie, legislation or regulation requiring HCWs' vaccination),[16,17] and there are concerns about overriding personal autonomy and responding to HCWs who refuse vaccination

Affiliations: 1. Department of Infection Prevention, Tokyo Metropolitan Tama Medical Center, Fuchu, Tokyo, Japan; 2. Department of Infection Prevention, Teine Keijinkai Medical Center, Sapporo, Hokkaido, Japan; 3. Division of Infectious Diseases, Department of Internal Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts; 4. Division of Infectious Diseases, Department of Internal Medicine, Washington University School of Medicine, Saint Louis, Missouri.

Received March 11, 2013; accepted July 10, 2013; electronically published September 19, 2013.

 0899-823X/2013/3411-0010$15.00. DOI: 10.1086/673452

without appropriate justification.[18,19] Nonadherence to a mandatory policy has resulted in controversial outcomes, such as termination of employment of HCWs or suspension of admitting privileges in physicians who refused vaccination.[7-14]

Questions remain about how best to improve vaccination rates among HCWs if mandatory vaccination programs are not feasible. Although influenza vaccination for HCWs has been recommended,[5,20,21] the vaccination rate of HCWs under voluntary programs remains suboptimal. Furthermore, mandatory vaccination programs have been reported from only select North American institutions (United States and Canada),[22] suggesting that there may be difficulties with mandatory vaccination policies outside of the United States. Reasons for this difficulty may be due to HCWs' individual conflicts (ie, religious, philosophical, or medical reasons) and legal challenges (ie, beyond jurisdiction).[16] Thus, a combination of effective and pragmatic interventions without a mandate may be a more acceptable approach.

In Japan, universal influenza vaccination of HCWs has been promoted by national guidelines and Japanese infectious diseases organizations.[23,24] However, a mandatory vaccination program for HCWs has never been instituted because it is not culturally acceptable. Given this limitation, the study institution agreed to implement a voluntary intervention rather than a mandatory program. The purpose of our study is to measure improvement in the vaccination uptake rate from a multifaceted intervention at a Japanese tertiary care center where implementing a mandatory vaccination program is difficult.

METHODS

Setting and Participants

A before-and-after study was conducted at Teine Keijinkai Medical Center. This facility is a 550-bed (including a 12-bed intensive care unit) tertiary care center in Sapporo, Japan, with a total of 27 subspecialties. The institutional review board at Teine Keijinkai Medical Center approved this project.

The new vaccination policy was applied to all employed HCWs, including staff physicians, residents, nurses, hospital administrative personnel, and other medical personnel (eg, pharmacists, paramedical staff) directly employed by Teine Keijinkai Medical Center. HCWs who were not employed by the study institution (eg, rotating medical students, medical volunteers) were not included in the study. Exclusion criteria included HCWs who were on long-term leave (ie, maternity leave and long-term sick leave) during the vaccination period for the 2012–2013 season (October 2012). The exclusion criteria were not applied before the interventional year, since information was not previously documented. Before the intervention year, the total number of employed HCWs included in the study ranged from 1,186 to 1,489. In the 2012–2013 season (ie, intervention year), the total number of employed HCWs was 1,616. Thirty-five HCWs met the exclusion criteria, leaving 1,581 employed HCWs recommended for influenza vaccination.

Influenza Vaccination Strategies before Intervention

Before this intervention, influenza vaccination for HCWs was voluntary. Influenza vaccination was made available to the HCWs for a 2-week period between October and November of each year. During the 2009–2010 pandemic season, HCWs received the seasonal and H1N1 vaccines in 2 separate 2-week periods. The cost of vaccination was partially subsidized by the hospital, with the remaining fee (1,050 Japanese yen, or US$11) covered by the HCW from the 2005–2006 season through the 2010–2011 season.

Influenza vaccines were provided at a temporary vaccination clinic exclusively for HCWs. HCWs were directed there at specified time periods during regular working hours. HCWs who were unwilling to receive the influenza vaccine were not required to submit a declination form. HCWs who received the influenza vaccine outside the study institution were regarded as vaccinated if they submitted a receipt for vaccination. Submission of a vaccination document was not required.

Intervention (2012–2013 Influenza Policy)

During the 2012–2013 season, the multifaceted intervention was planned as a quality improvement project by the department of infection prevention (Table 1). The project was approved by the infection control committee at the study institution. In September 2012, the declination form (in Japanese) was distributed to all HCWs. The declination form informed HCWs about the availability of the influenza vaccination and the requirement for use of the declination form during the 2012–2013 season. The declination form consisted of 2 questions. The first question was a yes/no question asking whether the HCW had a history of adverse reactions. A yes answer required documentation of the adverse reaction. The second question was open-ended and asked HCWs who refused vaccination without a prior adverse reaction for their primary reason for refusal. HCWs who submitted the declination form without documenting the primary reason were contacted by phone to obtain their reasons. Declination responses were evaluated after the 2012–2013 vaccination period ended. The cost of the vaccine was totally subsidized by the study institution, starting with the 2011–2012 season and continuing into the 2012–2013 policy. The influenza vaccine was given again at a temporary vaccination clinic during a 2-week period from October 15, 2012. On day 8 of the vaccination period, another written announcement promoting influenza vaccination was distributed in all of the HCWs' mailboxes and posted in all departmental and division offices. This announcement also explained that all HCWs who did not adhere to the 2012–2013 policy for influenza vaccination would be interviewed by the hospital vice president after the vaccination period. These HCWs were identified at the end

TABLE 1. Multifaceted Intervention for Influenza Vaccination among Healthcare Workers (HCWs) at a Japanese Tertiary Care Center in the 2012–2013 Season

Intervention	Description
Declination form use	Declination form was distributed to all HCWs, and they were required to submit the form before the influenza vaccination period.
Vaccine fee coverage	Cost of vaccination was totally subsidized by the hospital (since the 2011–2012 season).
Written announcement during vaccination period	Written reminder of influenza vaccination requirement was distributed to all HCWs on day 8 of the influenza vaccination period.
Prospective audit and telephone feedback	We tracked the HCWs who had not been vaccinated or had not submitted the declination form at days 5, 8, and 11 of the vaccination period. Real-time telephone feedback was provided for those who had not received vaccination on the last day of vaccination period.
Medical interview by hospital executive with additional vaccination opportunities	Unvaccinated HCWs who had not submitted the declination form were interviewed by the hospital vice president. They were required to either accept vaccination at the interview or submit the declination form. Interviews were held over 3 days, and vaccination was provided at the time of the interview if they accepted.
Mandatory submission of vaccination document from other institutions	HCWs who received vaccination outside the study institution were required to submit a receipt or certificate of vaccination.

of days 5, 8, and 11 during the vaccination period. On the last day of the vaccination period, real-time feedback was provided. All unvaccinated HCWs who had not submitted a declination form were called by telephone to expedite vaccination. Noncompliant HCWs (no vaccination and no declination form) were interviewed by the hospital vice president soon after the 2-week vaccination period. The reason for nonadherence to the 2012–2013 vaccination policy was documented during the interview, and they were required to either accept vaccination or submit the declination form at the time of the interview. HCWs who received vaccination outside of the study institution were required to submit a document (ie, a receipt or certificate of vaccination) to prove vaccination status.

Data Sources/Collection

Annual influenza vaccination rates of HCWs at the study institution were available for each season starting with the 2005–2006 influenza season and were obtained from the hospital's occupational health service database. In the 2009–2010 season, the seasonal vaccination rate and H1N1 vaccination rate were reported separately. The annual vaccination rate was defined as the number of employed HCWs vaccinated divided by the total number of employed HCWs at the study institution (employed HCWs described in "Setting and Participants"). Influenza vaccination rates among HCW subgroups—including physicians, nurses, administrative personnel, and other HCWs—were available only starting from the 2008–2009 season (employed HCWs described in "Setting and Participants").

Statistical Analyses

Vaccination rates were compared by year and by HCW subgroup using Epi Info (ver. 7.0.9.34; Centers for Disease Control and Prevention). Comparisons of each vaccination rate between the 2009–2010 H1N1 season and the 2010–2011 season (ie, changes in postpandemic year), between the 2010–2011 season and the 2011–2012 season (ie, changes after free vaccine coverage), and between the 2011–2012 season and the 2012–2013 season (ie, changes after a multifaceted intervention) were calculated using χ^2 tests. A 2-sided $P < .05$ was considered to be statistically significant.

RESULTS

The overall influenza vaccination rates of HCWs since the 2005–2006 season are shown in Figure 1. An increase in the rate of influenza vaccination of HCWs was observed before the postpandemic years (ranging from 63.3% to 92.3%), but this rate decreased in the postpandemic influenza year (ie, 2010–2011 season) when compared with the 2009–2010 H1N1 vaccination rate ($P < .001$). The 2011–2012 vaccination rate with free vaccine coverage did not significantly increase from the 2010–2011 season ($P = .30$). During the interventional period (ie, 2012–2013 season), the overall influenza vaccination rate of HCWs reached 96.9%, which was the highest vaccination rate over the past 7 years. This was statistically significant ($P < .001$) when comparing the overall vaccination rate of the 2012–2013 season to the rates of the 2011–2012 season.

Influenza vaccination rates by HCW subgroups since the 2008–2009 season are shown in Table 2. Before the interventional year, lower acceptance rates among physicians were observed in contrast to the high vaccination rates of all other HCW subgroups in the 2012–2013 season.

During the 2012–2013 season, 1,532 out of 1,581 HCWs (96.9%) received vaccination, and 48 HCWs (3.1%) submitted a declination form. The compliance rate with the

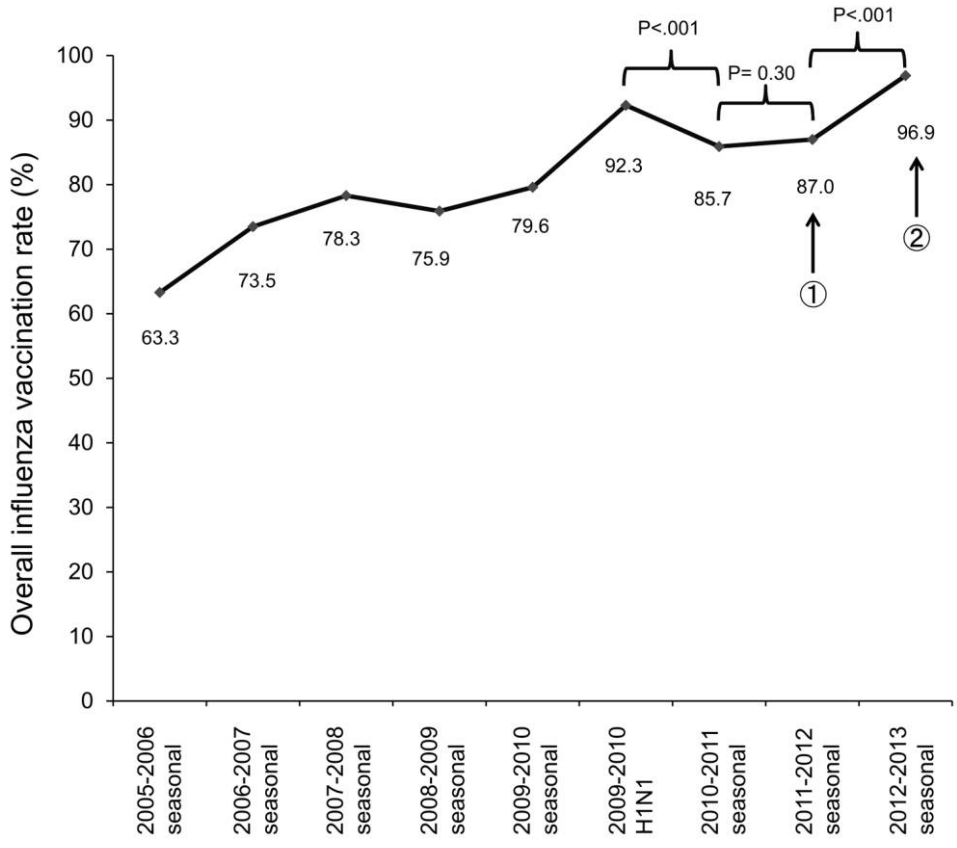

FIGURE 1. Annual overall influenza vaccination rate of healthcare workers at a Japanese tertiary care center. 1, Vaccine cost coverage started since the 2011–2012 season and continued during the 2012–2013 season as a part of multifaceted intervention. 2, All interventions were implemented.

2012–2013 policy was 99.9%. One HCW (0.1%) did not comply with the 2012–2013 policy.

Among the 1,532 vaccinated HCWs, 1,513 (98.8%) received vaccination during the vaccination period. Six HCWs (0.4%) who received influenza vaccination outside the study institution submitted documents as proof of vaccination.

Among 14 HCWs (12 physicians and 2 nurses) referred for the medical interview with the hospital vice president, 13 of them underwent the interview and subsequently accepted vaccination at the interview. For those 13 HCWs, the reasons for not obtaining vaccination before the medical interview included the inability to secure time for vaccination because of busy clinical schedules ($n = 9$), skepticism of vaccine efficacy ($n = 2$), absence from work due to mourning ($n = 1$), and medical illness during the entire vaccination period ($n = 1$). One HCW (physician) refused to attend the medical interview.

Reasons for declination among the 48 HCWs who submitted the declination form were as follows: 22 HCWs (45.8% of declination; 1.4% overall) had a history of constitutional symptoms (ie, fever, fatigue) after vaccination, 11 HCWs (22.9% of declination; 0.7% overall) had a history of local reaction at the injection site, 5 HCWs (10.4% of declination; 0.3% overall) had a history of symptoms suggesting anaphylaxis after vaccination, 5 HCWs (10.4% of declination; 0.3% overall) had a history of egg allergy, 4 HCWs (8.3% of declination; 0.3% overall) had skepticism regarding vaccine efficacy, and 1 HCW (2.1% of declination; 0.1% overall) was pregnant.

DISCUSSION

With the implementation of this multifaceted intervention in the 2012–2013 season, the influenza vaccination rate of HCWs substantially improved. The rate reached approximately 97% and was similar to previously reported vaccination rates observed in studies with a mandatory vaccination program.[7-14] Comparison of previously published vaccination rates under a mandatory policy (as of May 20, 2013) with the vaccination rate in this study is shown Table 3.

It remains unclear why the vaccination rate among physicians before the interventional year was lower at the study institution. In contrast, vaccine uptake of physicians is higher than vaccine uptake of nurses at US institutions.[25] It may be that physicians are not able to secure enough time for vaccination because of busy schedules. In this study, physicians

TABLE 2. Vaccination Rate by Year of Healthcare Worker (HCW) Subgroups from the 2008–2009 Season through the 2012–2013 Season

HCW subgroup	2008–2009	2009–2010 seasonal vaccine	2009–2010 H1N1 vaccine	2010–2011	2011–2012	2012–2013
Overall	1,031/1,358 (75.9)	1,153/1,449 (79.6)	1,338/1,449 (92.3)	1,276/1,489 (85.7)	1,279/1,470 (87.0)	1,532/1,581 (96.9)
Physicians	151/214 (70.6)	147/228 (64.5)	204/228 (89.5)	161/220 (73.2)	159/224 (71.0)	218/227 (96.0)[a]
Nurses	490/616 (79.5)	559/664 (84.2)	613/664 (92.3)	612/688 (89.0)	622/675 (92.1)	701/713 (98.3)[a]
Administrative personnel	226/333 (67.9)	274/351 (78.1)	328/351 (93.4)	318/372 (85.5)	313/362 (86.5)	381/402 (94.8)[a]
Other HCWs	164/195 (84.1)	173/206 (84.0)	193/206 (93.7)	185/209 (88.5)	185/209 (88.5)	232/239 (97.1)[a]

NOTE. Data are no. of vaccinated HCWs/total no. of employed HCWs (%).

[a] Vaccination rates of each HCW subgroup were highest in the 2012–2013 season compared with prior seasons, and statistical significance in the vaccination rate of HCW subgroups between the 2012–2013 and the 2011–2012 seasons was observed among all HCW subgroups ($P < .001$).

comprised the majority of HCWs who interviewed with the hospital vice president, and they noted scheduling conflicts as the reason for not getting vaccinated. Increased vaccination rates overall were seen with our multifaceted intervention, especially among physicians. The study was also established as a quality improvement project at our institution because the decline of the HCW vaccination rate after the pandemic year's increase was concerning. This phenomenon was also reported in other studies in the postpandemic influenza year.[26-28]

Similar to this study, a small number of US studies previously demonstrated increased vaccination uptake among HCWs after a comprehensive voluntary campaign.[29-31] Comprehensive campaigns in these studies included prospective feedback, personal telephone calls, real-time audits, and interviews with hospital executives or committees. However, most voluntary programs were unable to achieve the high vaccination rates seen in the current study. Although it is unclear why these interventions were so effective in our institution, we believe these interventions were culturally more acceptable and contributed to the high vaccination rate.

Ideally, all HCWs would get vaccinated, since this represents a strong commitment to patient safety, and previous studies have demonstrated that vaccination of HCWs prevents patient mortality.[32,33] After years of voluntary efforts in the US that have resulted in stagnant vaccination rates, increasing numbers of facilities are turning to mandatory programs because they have had a great impact in enhancing the HCW vaccination rate. Although mandatory vaccination guidelines may vary by state and US medical organizations,[17,34] its use remains of interest in the United States.

However, it is unclear whether a mandatory vaccination program can be successful in other countries. Various challenges need to be overcome in order to implement a successful mandatory vaccination program, including cultural issues and concerns about the efficacy of the vaccine. A recent systematic review concluded that influenza vaccination provided modest protection against influenza.[35] It also remains unclear as to what proportion of vaccinated HCWs is needed to prevent influenza transmission in healthcare settings. Another concern regarding mandatory vaccination is the conflict with personal autonomy of HCWs.[16,17] As seen in Table 3, multiple previous studies evaluating mandatory influenza vaccination assigned penalties to noncompliant HCWs, including termination of employment or withholding admission privileges. Given these challenges, maximizing voluntary interventions to improve the influenza vaccination rate may be more practical and more acceptable if mandatory policies are difficult to implement.

The current study successfully demonstrated that the influenza vaccination rate could be improved without a mandatory program and with a multifaceted intervention including personal follow-up of noncompliant personnel. Use of a declination form resulted in increasing the vaccination rate by 55% in a previous study.[36] Since each intervention for this study was considered to be effective on the basis of prior published experiences, the implementation of a combination of interventions was felt to be important in achieving success. Implementing these strategies, however, required strong leadership at the institutional level, with increased recognition of the importance of vaccination of HCWs by the institution and financial support. Moreover, the content of each intervention also required a labor-intensive and time-consuming effort by the departments of infection prevention and occupational health. Besides planning the interventional strategies, a routine daily meeting was held during the vaccination period to review the real-time vaccination rate, make calls for real-time feedback, and establish the medical interview to improve adherence to the vaccination policy. These commitments were essential to improve the vaccination rate of HCWs without a mandatory program.

This study had some limitations. Although the influenza vaccination rate of HCWs was very high in this study compared with the rate in other studies without a mandatory vaccination program,[29-31] these interventions may not be applicable to other healthcare systems, given that it is a single-center study of a single year and also given cultural differences in attitudes regarding influenza vaccination of HCWs in dif-

TABLE 3. Comparison of Healthcare Worker (HCW) Vaccination Rate in This Study with Rate under Mandatory Vaccination Policy in Previous Studies (Published Data)

Study	Institution, country	Year	Vaccination rate	Consequence of nonvaccination under mandatory vaccination policy
This study	Teine Keijinkai Medical Center, Japan	2012–2013	96.9 (1,532/1,581)	...
Babcock et al[7]	BJC Healthcare, USA	2008–2009	98.4 (25,561/25,980)	Termination of employment
Rakita et al[8]	Virginia Mason Medical Center, USA	2009–2010	98.9 (4,967/5,024)	Termination of employment
Karanfil et al[9]	Medstar Health, USA	2009–2010	98.5 (25,188/25,572)	Suspension of admitting privileges for noncompliant physicians
Septimus et al[10]	HCA, USA	2009–2010	95.6 (104,361/109,209)	Mandatory surgical mask required while in patient care areas
Feemster et al[11]	Children's Hospital of Philadelphia, USA	2009–2010	99.3 (9,234/9,300)	Termination of employment
Huynh et al[12]	Poudre Valley Health System, USA	2010–2011	95.5 (5,101/5,342)	Termination of employment
Kidd et al[13]	University hospital, USA	2009–2010	100 (more than 4,500)	Ineligibility for work[a]
Smith et al[14]	Aurora Health Care, USA	2011–2012	97.7 (29,355/30,048)	Termination of employment
Palmore et al[15]	National Institutes of Health Clinical Center, USA	2008–2009	89.2 (2,424/2,718)	Review in front of the medical executive committee[b]

NOTE. For vaccination rate, data are percentages (no. of vaccinated HCWs/total no. of HCWs).
[a] Details were not described.
[b] Mandatory vaccination program in this study did not note strict consequences for unvaccinated HCWs, since all employees complied with the vaccination policy.

ferent countries. We did not include on-site vaccination as part of the multifaceted intervention in this study because it was not promoted by the institution. However, a previous study demonstrated a positive impact of on-site vaccination for enhancing the influenza vaccination rate of HCWs.[37] Since the majority of HCWs who proceeded to have a medical interview with the hospital vice president noted that they were unable to secure time for vaccination because of their busy daily schedule, the vaccination rate in this study could be improved with on-site vaccination. Vaccination was offered by the study institution for only a short time period, and a more prolonged vaccination period could improve the overall vaccination rate. Exclusion criteria were applied only in the 2012–2013 season because information regarding maternal leave and long-term sick leave were unavailable for preinterventional years. This potentially underestimates the overall vaccination rate in preinterventional years. However, overall vaccination rates in the preinterventional years (ranging from 63% to 92%) were lower than that in the interventional year, and the 2012–2013 season vaccination rate significantly increased compared with the postpandemic period. This study also did not include all healthcare personnel; however, all healthcare personnel, including students/trainees and volunteers, should be included in influenza vaccination programs. Last, since the multifaceted intervention was not intended as a mandatory policy, we accepted all reasons for declination, regardless of the content. Reasons for exemption, as noted in "Results," were often based on personal beliefs instead of known contraindications. We also did not intervene with the one HCW who did not comply with the 2012–2013 vaccination policy. Further interventions to improve HCW compliance with influenza vaccination for those who submit declination forms with questionable rationale for declining vaccination or who did not comply with the policy may be of benefit.

Although improved influenza vaccination rates have been reported primarily from institutions where a mandatory policy has been implemented, this type of policy may not be generalizable to a global setting. Since influenza vaccination of HCWs remains one of the most important strategies in preventing the spread of influenza in the healthcare setting, every effort should be made to enhance the vaccine acceptance rate using multiple methods.

ACKNOWLEDGMENTS

We thank Koichi Mori, Noriyasu Sasaki, and Yoshiko Takahashi for their invaluable assistance in data collection and technical support.

Financial support. H.H. is supported by the Society for Healthcare Epidemiology of America International Ambassador Program Award 2012.

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article. All authors submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and the conflicts that the editors consider relevant to this article are disclosed here.

Address correspondence to Hitoshi Honda, MD, Department of Infection Prevention, Tokyo Metropolitan Tama Medical Center, 2-8-29 Musashidai, Fuchu, Tokyo 183-8524, Japan (hondah@hotmail.com).

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