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Electronic Solutions to Enhance Tracking and Compliance with Mandatory Influenza Vaccination for All Hospital Staff

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In implementing a hospital mandatory influenza vaccination policy, we developed an automated, real-time tracking and reminder system. Of 6,957 policy-covered individuals automatically identified, automated reminders left only 5 requiring counseling. This decreased Occupational Health workload in contacting noncompliant individuals and hosting vaccination events while simultaneously facilitating a 96% vaccination rate.

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Influenza causes up to 49,000 deaths annually in the United States.1 The sickest influenza patients receive care in hospitals and nursing homes, which have reported difficult-to-control outbreaks.2 Efforts to address infectious spread have included vaccination of healthcare workers (HCWs). Despite the association of HCW influenza vaccination with decreased in-patient mortality,3 years of voluntary promotion have only moderately increased HCW vaccination levels.4 Thus, mandatory influenza vaccination (MIV) programs have been increasingly advocated by professional organizations5 and adopted.6 In 2009, we implemented an MIV policy.7

To properly enforce and reap the benefits of an MIV policy, several logistical challenges must be managed. Mandatory campaigns require compilation of a list of those required to participate across different systems or institutions (“covered individuals”).8 Once a list is compiled, a tracking and notification system is needed to alert noncompliant individuals and their supervisors.9,10 We therefore developed automated solutions to aid implementation of our MIV policy.

METHODS

We adopted a “safe-campus” MIV policy that applied to all employees present on the University of California (UC) Irvine Medical Center grounds, including physicians, nurses, ancillary staff, other UC Irvine School of Medicine faculty and staff, interns, residents, students, temporary workers, volunteers, and vendors. These individuals are required to participate by being vaccinated or by submitting a written declination and wearing a mask during annual flu seasons. The deadline for compliance is the first week of December, and masking is required from December through March for those who decline the vaccine. All influenza vaccines are provided free of charge.

To identify and compile a list of covered individuals, we created an MIV database linked to human resources payroll databases for all Medical Center and School of Medicine employees and trainees as well as lists of login accounts for medical and nursing students. Human resources data were used to identify all those working at the Medical Center campus or outlying clinics. All industry vendors were tracked through a separate system, which generated daily temporary access badges only if they wore a mask or had been vaccinated. Agencies for temporary workers ensured that only vaccinated workers were assigned to our medical campus. Our MIV database was automatically updated daily for students and employees of the Medical Center and School of Medicine and was updated manually for volunteers and visiting trainees or students.

Tracking policy compliance required real-time electronic recording of vaccinations and a method for recording declinations. Roving, unit-based, or Occupational Health clinic nurses directly entered data into the MIV database using point-of-use computers or iPads. To capture required written declinations for those who refused vaccination, an electronic declination form was made available by computer login to record an acknowledgement of influenza vaccination information and their reason(s) for declination, which have been previously reported.7

We created an internal portal with an integrated e-mail alert system to provide feedback on participation and vaccination status to individuals and supervisors. In addition to their own status,
supervisors could review a detailed list of participation status and masking requirements for all persons reporting to them and access real-time department-level per- cent vaccination for comparison. Beginning in October, the alert system sent automated e-mail reminders every 2 weeks to eligible staff who had not yet participated, increasing to every week in November. Supervisors were also automatically e-mailed a summary list of nonparticipant names and were encouraged to ensure participation.

Consequences of nonparticipation were communicated to all policy-covered individuals. Nonparticipant employees would be taken off the work schedule after the compliance deadline passed. Nonparticipants and supervisors received automated e-mailed warnings of potential disciplinary action 4 weeks before the deadline, with individualized letters e-mailed to supervisors 2 weeks later that were to be printed and signed by the employee and the supervisor as evidence of final notice. For School of Medicine nonparticipants, departments lost good-standing funding if their participation rate was too low. Faculty nonparticipants were counseled in person by their department chair and could lose “good-citizen” standing and bonus pay. Nonparticipant interns, residents, and fellows were taken off duty, and medical students were not allowed to take part in clinical rotations.

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Unvaccinated participants (ie, those who declined) were required to wear a mask while at work for the entire flu season. Vendor identification badges for vendors who did not have a confirmed vaccination had “MUST WEAR MASK” printed on their badge during the influenza season.

RESULTS

During the 2012-2013 influenza season, our MIV database automatically identified a total of 6,957 individuals covered by the MIV policy, including 2,677 non-HCWs and 4,280 HCWs. In the first week of November, 4 weeks prior to the compliance deadline, our automated reminder system sent out approximately 4,000 reminder e-mails to nonparticipants. The number of reminders sent progressively decreased each week as the December 1 deadline approached.

Shortly before the deadline, warnings detailing impending consequences for noncompliant individuals were issued. In 2012, the total number of warnings, which were given directly to the employee and signed by his or her manager, was 130. Thus, of the 6,957 individuals covered by the policy, only 130 had to be contacted by Human Resources for potential disciplinary action. In total, 5 Medical Center staff and no School of Medicine staff had to be counseled and removed from work schedules until they participated.

Electronic feedback and documentation shifted the responsibility of participation to covered individuals and their supervisors, who were able to individually look up participation status (Figure 1). There was a 40% reduction in Occupational Health overtime hours corresponding to the seasonal flu vaccination campaign seen in the 2011-2012 season when automated e-mail notifications were instituted.

figure 1. Snapshot of the influenza vaccination portal, which provides to supervisors lists of all their covered employees as well as information on whether these individuals have participated and whether they are required to wear a mask. Blank cells indicate that the staff member has not yet participated.
com- pared with 2010-2011. Overtime hours decreased from 263 hours in the 2010-2011 season to 116 in 2013-2014, rep- resenting a 56% reduction in dedicated personnel effort.

Our online portal and automated e-mail notifications improved the Occupational Health workload. In the first year of the policy, prior to implementation of the automated sys- tem, Occupational Health held 50 poorly attended influenza vaccination events, resulting in high expenses for staffing and overtime. The number of events hosted by Occupational Health declined from 50 events to 3 (Figure 2), which were well attended. Instead of events, Occupational Health trained designated unit and clinic nurses to obtain, administer, and document receipt of vaccination for their unit employees. Occupational Health also provided unlimited walk-in vaccinations for staff as well as roving nurses who could be scheduled to be in a unit or attend events (eg, grand rounds or other scheduled meetings) to provide vaccination.

Our electronic system for MIV participation tracking, re- minders, and enforcement improved our documentation of influenza vaccination, decreased Occupational Health work- load, and increased vaccination rates. Vaccination increased from 58% to 85% in 1 year and increased to 96% within 3 years of implementing the MIV policy (Figure 2).

DISCUSSION
We demonstrate the role played by electronic solutions in successfully implementing an MIV policy. When tracking thousands of employees, trainees, students, and vendors from different affiliated systems, we found that an electronic database and automated alert system were essential to the integrity of a mandatory vaccination program. This electronic solution resulted in high rates of participation and vaccination while simultaneously decreasing Occupational Health workload in hosting

![OH Events and Vaccination Rate](image1)

figure 2. Graph showing annual percent vaccination (gray bars) and the number of large vaccination events hosted by Occupational Health (OH; black bars). The arrow indicates 2009 as the first year of the mandatory influenza vaccination policy.
This decreased workload resulted from a shift in responsibility for ensuring participation from Occupational Health to individuals and their supervisors, prompted by automated alerts. This real-time feedback streamlined the vaccination process and drastically decreased the need for labor-intensive vaccination events and Occupational Health overtime hours. While Occupational Health and Human Resources still played vital roles, their efforts were made more efficient by reviewing an automated list of nonparticipants each week and targeting departments with low participation. Only near the participation deadline did Human Resources contact each nonparticipant individually.

In addition to electronic solutions, we found that leadership support for an MIV policy was crucial. Establishing these critical support structures by enlisting the support of Medical Center leadership and the dean of the School of Medicine allowed us to establish clear consequences of nonparticipation for all covered individuals regardless of their employer. Furthermore, the support of supervisors at all levels was required to review weekly nonparticipation lists and encourage participation by individuals.

Implementation of an MIV policy can be greatly enhanced by integrating automated solutions for tracking, feedback, and enforcement in the context of support from supervisors and facility leadership. We provide an example of automated feedback directly to individuals and supervisors to enlist their ownership and support of the process and reduce tracking and reminder efforts by Occupational Health and Human Resources. Automated solutions streamlined efforts to identify and address nonparticipation, ensuring a successful and efficient MIV policy.

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