

Improving immunization practices in United States hospitals and health systems

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Abstract

Purpose – Payment for healthcare services in the USA has shifted from fee for service to compensation based on value and quality. The indicators used for payments are a variety of clinical measures, including administration of vaccines to patients. The purpose of this paper is to describe the implementation of programs in health systems to improve vaccination rates and patient outcomes.

Design/methodology/approach – A search of the literature was conducted to find examples of vaccine programs in US health systems, and also to identify policies to improve immunization rates.

Findings – Successful programs for improving vaccination rates require advocacy and support of leadership, a systematic and multidisciplinary approach, and an evaluation of local resources and capacity. Numerous examples exist of medical, nursing, and pharmacy led programs that improve vaccination rates. The department in charge has relied on the support of other groups to ensure the success.

Social implications – Mandatory vaccination of healthcare personnel (HCP) in the health system has been a growing trend in the USA. Although there has been some resistance to mandatory vaccinations for HCP, the standards and requirements have resulted in improved rates in health systems, which ultimately improve efficiency and protects patients.

Originality/value – This review describes considerations for implementing a successful vaccination program in a health system and provides examples of specific strategies. An overview of mandatory vaccinations for HCP is also described.

Keywords Public health, Continuous quality improvement, Health policy, Infectious diseases, Vaccines or vaccination, Surveillance or screening

Paper type General review

The World Health Organization (2000) describes a health system of a country as the organizations, institutions, and resources dedicated to the production of successful health actions. World Health Organization provides a framework to implement system building blocks to achieve goals and measurable outcomes for health systems (Duran *et al.*, 2011) which strive for four primary goals: improved overall community health, responsiveness, financial risk protection, and improved efficiency (Duran *et al.*, 2011; Lahariya, 2015). Improving health includes ensuring equity and access, responsiveness refers to meeting needs and expectations of patients, risk protection is provided to protect individuals from financial consequences of disease, and efficiencies are achieved through minimal cost and maximum output.

The American Hospital Association (2017) in the USA describes a health system as either a multihospital or a diversified single hospital system. A multihospital system is two or more hospitals that are owned, leased, sponsored or managed through contract by a central organization. Single, freestanding hospitals can be categorized as a health system if it brings into membership at least three of the owned or leased non-hospital pre-acute or post-acute healthcare organizations. Health systems are common in the USA due to mergers and consolidation in an effort to control costs and improve the quality of patient care. Health systems also provide greater negotiating power with payers based on an increase in the number of patients using the system. The health system structure can be useful in meeting core quality measures set by the US Centers for Medicare and Medicaid Services (CMS) and to provide excellent care.

This review provides a brief discussion of the US healthcare system as it relates to the coverage and provision of services for patients but largely focuses on vaccination policies and programs in individual hospitals and health systems that improve their performance and provision of care. The current healthcare environment in the USA is characterized by mergers and consolidation in which ambulatory medical practices often join health systems and their operations are consistent with institutional policies. Although freestanding and private medical practices do exist, evidence and data regarding their efforts and successes in improving vaccination rates is less well documented and not discussed in detail here.

US healthcare system

The Affordable Care Act (ACA) of 2010 currently represents the law of healthcare for the USA. The ACA stipulates insurance requirements for the US public and the general services that should be available. The largest insurers in the USA are the Federal Government through the Medicare and Medicaid programs; however, there are many private insurance companies that provide medical insurance benefits, largely for employed individuals and their families.

Implementation of the ACA effectively changed the method by which physicians, hospitals and health systems receive payment for the provision of medical care services in the USA. Since 2013, payments are based on a method called value-based purchasing (VBP) which is essentially based on quality rather than quantity of care (Department of Health and Human Services, 2015). Payments are also affected by incremental improvements in quality. The performance of hospitals and health systems is based on defined measures in domains that include patient experiences, safety, clinical care (process and outcomes) and efficiency (Department of Health and Human Services, 2015). The basis for payments are achievement in performance on specific measures, and improvement in performance compared to a baseline period. The measures fall into a variety of domains including clinical processes and outcomes, patient experiences, and efficiencies and cost reduction (Department of Health and Human Services, 2015). Vaccines are represented routinely among the clinical measures, although similar to other measures, the specifics vary depending on the year. The changes in payment for medical services from fee for service models to VBP have impacted practice in health systems, ambulatory clinics, physician offices, and all aspects of practice as greater attention is given to the measures and metrics of quality care which are related to compensation for services. US healthcare is not a single payer system and is evolving. Although many private insurers adopt similar payment policies to the government-sponsored insurance (e.g. Medicare and Medicaid), health systems are challenged to consider the coverage of the population that they serve in order to develop the optimal service model.

Immunization services and the US healthcare system

Immunizations are one of the most successful and well-known public health programs in reducing morbidity and mortality from vaccine-preventable diseases (Lahariya, 2015).

The terms immunization and vaccination are often used interchangeably, although immunization technically means that the administered vaccine was effective in eliciting an immune response in the recipient. Disease prevention through vaccination is a valuable and cost-effective public health strategy (Jit *et al.*, 2015; Plotkin, 2005; Szucs, 2000).

Within the health system, immunization programs are a strong indicator of health system performance and represent one factor that assists health systems in achieving their goals through priority health interventions. There have been significant increases in immunization program investment over the past two to three decades (Institute for Health Metrics and Evaluation, 2016). Improvements in immunization programs not only strengthen immunization services against vaccine-preventable diseases for each individual, but also have a substantial impact on the delivery of other essential components including maternal and child health services. The provision of vaccines to infants and children are a routine activity in the USA, partly because of laws and regulations regarding attendance at public schools. Although recommendations regarding vaccination of other populations (adolescents and adults) have been available for decades, these services are often overlooked in busy medical practices and health systems. Progress toward achieving the nation's goals for vaccination rates with most adult vaccines has lagged as a result (Healthy People 2020, 2017).

It is important to recognize the challenges and barriers to the provision of vaccines in healthcare settings. Coverage and compensation for administering vaccines to patients is often inadequate and inconsistent. The health system may not be adequately incentivized to focus on the patient's vaccine needs when other health related issues are more immediate. The patient may bear some of the responsibility for the cost of the vaccine. In addition, the acute care environment is a hectic, fast pace, practice environment that includes volume as one of several criteria for success. Considering vaccine needs may not rank high on a scale of acuity needs. Finally, in practice to date, the focus has been for influenza and pneumococcal vaccines, largely because of their inclusion in core measures. Nonetheless, there are other unmet needs among adult vaccines, including herpes zoster, tetanus-diphtheria-acellular pertussis (Tdap), and hepatitis B where consideration is warranted.

The implementation of the ACA and the shift to VBP resulted in more attention given to vaccines, which is one of several different hospital VBP targeted measures. Influenza vaccination is under the clinical care and processes domain of health system VBP targeted measures. Provision of influenza vaccine at hospital discharge and pneumococcal vaccination have been core measures in the past; process and outcome measures change annually, so other vaccines may appear in the future. Adherence to vaccine recommendations from the Centers for Disease Control and Prevention (CDC) can be cost effective in preventing disease and illness, and improve compensation rates for health systems. Meeting the defined metric and showing evidence of improvement is important in ensuring the financial health of the institution.

Strategies for implementing successful vaccination programs

Immunization programs and health systems are dynamic and interacting. Major adjustments in an immunization program are likely to have a greater impact on less established health systems. Likewise, immunization programs may achieve greater outcomes when they occur within a strong and supportive health system. The relationship between immunization programs and health systems is complex and non-linear. Successful immunization programs require strong health system leadership and collaboration, financial resources, service delivery, education, and reliable reporting. Strong health system leadership and collaboration allow for a robust foundation to implement policy decision-making processes and regulations. This helps health system staff plan and manage immunization activities and available resources to meet the demands of the population. Leadership has the responsibility to ensure appropriate production, analysis, and distribution of accurate information across the health system regarding immunization programs. Additionally, health systems must have a

systematic process in place to ensure appropriate financial resources are available to supply vaccines in multiple settings within the health system and implement efficient reimbursement processes for these services.

There are several mechanisms for implementation of an immunization program. It is important to have leadership and key personnel support and an individualized approach is required to meet the needs of that particular health system. Healthcare staff education is essential to ensure competency and common goals are agreed upon for the health system immunization program including but not limited to policies, procedures, access, appropriate candidates for specific vaccines, according to CDC recommendations, and administration technique (Dolen *et al.*, 2013). Providers and non-providers need to be aware of the importance of immunizations for not only the patients, but for healthcare staff and employees as well. Adequate education and awareness can be achieved through a variety of methods including orientation training, annual training sessions, or required training videos. Peterson and colleagues demonstrated a drastic improvement in both influenza and pneumococcal immunization rates among hospitalized patients following implementation of a required educational presentation for healthcare staff (Peterson *et al.*, 2015). Adequate vaccine supply and accessibility are needed to facilitate an organized immunization program. This requires appropriate formulary management to ensure the health system has the necessary vaccines on formulary. A lack of supply or access to vaccines allows for a disruption in the immunization program workflow and can leave individuals unvaccinated. For example, health systems need to estimate the number of influenza vaccines required to administer to patients within influenza season. If this is not done, patients may go unvaccinated and acquire influenza infection, which may have been a vaccine-preventable disease.

There are multiple strategies for health systems to target patients for appropriate immunizations. Routine patient history and screening is effective to address proper vaccination status (Williams *et al.*, 1987). Health systems may also incorporate required vaccinations into the discharge process. Therefore, patients would receive the appropriate vaccine based on their immunization record and current health status prior to leaving the hospital to ensure sufficient documentation occurred. This allows the required vaccine information sheet in the USA and immunization education to be incorporated into the discharge paperwork. Immunizations administered within the health system can be documented to monitor and evaluate the immunization process within the health system. The documentation of administered immunizations may be facilitated by the use of an electronic medical record (EMR) to improve monitoring and evaluation processes of the immunization program within the health system (Au *et al.*, 2010; National Vaccine Advisory Committee, 2015; Centers for Disease Control and Prevention, 2016). The EMR may also use alerts and automatic order sets for certain patient populations to improve immunization rates for patients.

Health systems should use all available resources and strategies in order to optimize the vaccination status of patients. A multidisciplinary approach is important to achieve success. It is important to evaluate the role of available personnel because the optimal model in each health system may vary. Depending on the current workload, availability, and enthusiasm for vaccine advocacy, the department or discipline taking the lead on vaccine programs will vary.

The status of adult vaccination efforts in the USA was described in a recent report (Woods *et al.*, 2016). In this report from the National Center for Immunization and Respiratory Diseases from the CDC, the authors noted that adult vaccination rates are low and not achieving Healthy People 2020 goals, partly due to a lack of focus and resource allocation. Continued monitoring, intervention, and reporting were recommended. This report highlighted the importance of engaging all medical providers and partners in order to improve adult immunization rates.

The CDC has published a report that summarizes the available resources and evidence about reminder systems and strategies for improving childhood immunization rates (Centers for Disease Control and Prevention, 2017). They encourage participation in immunization information systems (IIS) or registries when available, and using reminder and recall systems, both for patients as well as medical providers. Although the document focuses on childhood vaccines, it does reference a 2012 report about administering seasonal influenza vaccine during home visits for older patients. Finally, it describes the role of standing orders and protocols to facilitate vaccine administration in health systems. The Agency for Healthcare Research and Quality (2016) also published an evidence-based report about the impact of reminder systems for immunization services in 2013 and updated the evidence in 2016. This report describes numerous examples and models for using reminders about recommended vaccines in improving vaccination rates.

Agency for Healthcare Research and Quality also published a report more than 15 years ago promoting the value of vaccination against pneumococcal disease prior to discharge from the hospital (Agency for Healthcare Research and Quality, 2001). The document was part of a larger report entitled, "Making healthcare safer: a critical analysis of patient safety practices." This report describes the extent of the problem and the opportunities for impact with improved vaccination. It summarizes the results of meta-analyses which documented both vaccine effectiveness as well as the impact of programs focusing on improving pneumococcal vaccination rates among susceptible patients.

Examples of quality improvement strategies for improving vaccination rates

Implementation of improved vaccination rates by health system immunization programs has been well-established. Metzger and colleagues describe their multifaceted intervention to improve pneumococcal immunization rates among hospitalized patients prior to discharge (Smith and Metzger, 2011). These interventions included a revised nurse screening tool, vaccine order rescheduling to improve timely administration, vaccine storage in automated dispensing cabinets on nursing units, and development of a vaccine tracking system. Among hospitalized adult patients, the rate of pneumococcal immunization significantly improved post-implementation compared with pre-implementation over a four-month period (74.2 vs 19.1 percent, respectively, $p < 0.001$). While this describes the implementation of a health system immunization program for pneumococcal immunization only, a similar model may be extrapolated to improve immunization rates for other available vaccines.

Palmore *et al.* (2009) described the implementation of a mandatory influenza immunization program for healthcare staff with direct patient care using an electronic tracking system. A total of 2,754 healthcare personnel (HCP) with direct patient care were identified who either received the influenza vaccine or who formally declined vaccination. A total of 2,424 of the 2,754 (88 percent) eligible HCP received influenza vaccination after the intervention. The authors experienced a considerable increase in immunization rates among healthcare staff with the implementation of an electronic tracking process for required influenza vaccination. This represents a voluntary program that focused on identification of eligible persons, and an educational and awareness program to improve vaccine rates.

The success of an immunization program within an existing health system largely depends on the leadership, structure, accessibility, and service delivery in a given set of socio-economic, institutional, and cultural circumstances. Appropriate adjustments and resolution of knowledge gaps are necessary to achieve a positive impact of established and newly developed vaccine administration within health system immunization programs. The degree of cost savings largely depends on the immunization program methodology and service delivery (Bartlett *et al.*, 2007).

In one health system, Lean Six Sigma processes were utilized to improve pneumococcal and influenza vaccine administration rates (Hina-Syeda *et al.*, 2013). Lean Six Sigma is a style of

management that utilizes methods and tools to improve quality in production and organizational processes by eliminating wasted time, effort, and resources as well as reducing variation in practices. In this study, this style was used to optimize the process of vaccinating patients with the appropriate vaccine or ensuring documentation of a patient's refusal. A multidisciplinary team at the health system met weekly during the six month project. Each department and step in the process of ensuring that appropriate patients received the vaccine was assessed. The assessment suggested that the greatest area of variation was vaccination of patients, ages 6-64 years, who were considered at high risk for pneumococcal infection. The quality improvement process implemented by the health system steadily improved influenza and pneumococcal vaccination rates overall, particularly in this age group considered at high risk for pneumococcal infection. In this group, the vaccine administration rate improved from less than 50 to 93.5 percent during the study period. The multidisciplinary team involved in the effort indicated that the process was a positive learning experience (Hina-Syeda *et al.*, 2013).

A pediatric primary care practice in Boston implemented a quality improvement project to improve the immunization rates for children (Bottino *et al.*, 2014). The group identified a goal of achieving a 95 percent rate for complete vaccination according to the CDC-recommended vaccines by the age of two years. Utilizing a multidisciplinary team approach, three interventions were implemented: systematic identification and capture of patients, use of a tracking registry, and patient outreach with care coordination. Prior to the intervention, the overall and modified immunization rate for 3,298 patients was 90 and 93 percent, respectively. The modified rate included exclusions based on refusals or practice transfers who were not counted among those eligible for vaccination. After the intervention, the modified immunization rate was 95 percent. There were no significant differences in immunization rates before and after the initiative. The authors noted that the patient population for this study was largely socioeconomically disadvantaged, yet the baseline vaccination rates were good. The results of this work indicate that implementation of a quality improvement process can incrementally improve vaccination rates to a desired goal. The authors also emphasized the importance of multicomponent interventions.

Another group of investigators focused on improving influenza and pneumococcal vaccination rates for patients in critical access hospitals (CAHs) (Ellerbeck *et al.*, 2003). A CAH is located in a rural area, has 25 or fewer inpatient beds, is typically at least 35 miles from another hospital, provides emergency services 24 hours daily/7days a week, and has an average length of stay of 96 hours or less. Many patients receive care at CAHs and vaccination services are important in this setting. In all, 17 hospitals were recruited to participate in a rapid cycle quality improvement project to improve vaccination rates for inpatients. With this approach, data were collected simultaneously with an improvement intervention. The study focused simply documentation of vaccination status, as well as vaccine administration. At baseline, documentation of influenza and pneumococcal vaccination status was 17 and 36 percent, respectively. These data represent the documentation for all discharges during the study period. The majority of the patients studied were Medicare-eligible (69 percent) and there were no differences in documentation rates between Medicare and non-Medicare recipients. After project implementation, documentation rates increased to 62 and 51 percent, respectively. Despite improved documentation, only 3.4 percent of eligible patients received an influenza vaccine, and 1.3 percent received a pneumococcal vaccine prior to discharge. The investigators concluded that a barrier in the project was that nurses were able to document vaccine status, but only physicians could order vaccines. These results highlight the need for a multidisciplinary approach and engagement and the potential role for standing orders. They also highlight the importance of capturing vaccination information for patients at CAHs as this often may represent the patient's primary access to care.

A study in local health departments in Tennessee was conducted to determine if vaccination rates of preteens could be improved with a structured intervention (Moore *et al.*, 2016).

These individuals are candidates for Tdap, meningococcal and human papillomavirus vaccines. The intervention strategy included administering all vaccines at the same visit, providing strong vaccine recommendations, and periodic audits and feedback. Preteens who presented for a required Tdap vaccine received this intervention referred to as the “3-Star Visit.” Vaccination rates for the three recommended adolescent vaccines increased from 21.5 percent in 2013 to 41.7 percent in 2016.

The effectiveness of an interdisciplinary approach, involving resident physicians, to improve influenza and pneumococcal vaccination rates was evaluated at John Hopkins Hospital (Peterson *et al.*, 2015). The impetus for the program was the CMS core measure for vaccines implemented in 2012. The intervention consisted of developing an educational slide set to improve understanding and awareness of an immunization order set, which was not adequately used at the time. House staff were engaged as part of a House staff Patient Safety and Quality Council that collaborated with quality improvement staff on communication and review processes. At baseline, rates for influenza and pneumococcal vaccination were 84 and 78 percent, respectively. These rates refer to patients eligible for the vaccines according to the CDC criteria, and the percentage that were vaccinated. Following the intervention, the rates improved to 97.5 and 96 percent, respectively.

The value of providing performance feedback was demonstrated in a hepatology clinic in an academic transplant center (Loy *et al.*, 2016). A retrospective chart review was conducted to determine adherence to guideline vaccine recommendations for patients with cirrhosis. At baseline, vaccination rates were 51 and 47 percent for hepatitis A and B vaccines, respectively. The baseline data, as well as the guideline recommendations, were shared with clinical providers. Subsequent chart reviews were conducted at 30 days, 60 days, and one year after the intervention, and these results were shared with clinicians. This intervention improved the hepatitis A and B vaccination rates to 92 and 94 percent, respectively, demonstrating the benefit of performance feedback.

The ability to assess vaccination status and improve vaccination rates was demonstrated in a busy, inner city emergency department (Slobodkin *et al.*, 1998). A standing order was administered by nurses for all non-urgent patients to receive influenza and pneumococcal vaccines according to CDC criteria. Immunizations were entered into the electronic record and the patients received an immunization record to carry with them. During the first project phase, 2,631 patients were screened, and 789 high-risk patients were identified. A total of 1,238 patients were reportedly immunized against influenza and 374 against pneumococcus, either by previous documentation or through onsite vaccination. Immunizations per shift per nurse varied from 0 to 24. Median time for immunization was four min (range 2-10.) The addition of an extra nurse at triage did not improve performance. During period 2, 1,907 patients were screened, 1,532 high-risk patients were identified, and 1,179 patients were immunized against pneumococcus.

The investigators in this study emphasized several aspects of their experience and results. First, they emphasized the importance of screening in the emergency department as their population was largely minority and economically disadvantaged. Second, they estimated that, despite their intensive efforts during the two study periods, documented screenings happened for only 25 percent of patients in period 1, and 10 percent of patients in period 2. Finally, they attributed the differences in the screening rates and the percentage of eligible patients to where the screenings occurred. In phase 1, screening was performed by a triage nurse at arrival and was felt to be a less vigorous strategy. In phase two, the screening was conducted by the treatment nurse at the patient’s bedside. They also hypothesized that the higher rate of eligible patients in phase 2 (30 vs 80 percent) was due to selective documentation by nurses, suggesting that in phase 2, nurses may have performed rapid screening and failed to document the activity for non-eligible patients. These results suggested that improved immunization rates could be achieved in a busy inner city,

emergency department setting, but that adequate planning is necessary and should involve the optimal program strategy to implement.

Finally, the effectiveness of a pharmacist in educating and advocating for influenza and pneumococcal vaccination was assessed in a small community hospital. Nurses initially offered eligible patients, according to CDC criteria, either influenza or pneumococcal vaccine upon admission. For patients who declined the initial offer for vaccination, a pharmacist or pharmacy intern visited the patient and discussed safety and efficacy information and provided written educational material. The patient was offered the vaccine after this session. Reported results showed that 23.4 percent (50/214) of patients agreed to receive the influenza vaccine and 26.5 percent (22/82) agreed to pneumococcal vaccination ($p = 0.06$). These increases were not statistically significant, possibly because of the sample size; however, the investigator reported that the percentage of patients who were influenced by the additional counseling was significant. For influenza, 39.2 percent and for pneumococcal (45.8 percent) of patients either were vaccinated or asked to have more time to consider the counseling and education ($p = 0.001$ and 0.01) (Queeno, 2017). An important message learned from this study relates to the benefit of follow-up with patients who initially refuse vaccine services.

In total, these various approaches to improve vaccination rates for patients in health systems demonstrates the importance of assessing resources and capacity, and determining which department or individuals are best suited to accomplish the organizational goals. The importance of a multidisciplinary approach and cooperation is also emphasized.

Immunization requirements for HCP

When discussing vaccination rates in health systems, it is also relevant and important to consider the vaccination rates for healthcare workers. Many hospitals in the USA have developed mandates requiring influenza vaccine for HCP and this is supported by regulatory bodies. The Healthy People 2020 target for influenza vaccination for healthcare professionals is 90 percent, a target that is higher than the general public and has not yet been achieved. Requirements for HCP to receive vaccines is a controversial issue about which there is much public debate, although there have been clear trends toward mandating vaccines by national accrediting bodies (Field, 2009).

In 2010, the Society of Healthcare Epidemiology for America (SHEA) updated their recommendations regarding influenza vaccination of HCP based on evidence that provided additional support to implement mandatory vaccinations. SHEA described influenza vaccine of HCP as a core patient and HCP safety practice. The policy recommends that annual influenza vaccination should be a condition of both initial and continued employment (Talbot *et al.*, 2010). Policies in health systems should be part of a comprehensive influenza infection control program; be broadly supported by leadership; with expectations and rationale clearly communicated to HCPs. Further, programs must be adequately resourced and apply to all HCPs independent of their role in direct patient care. Finally, SHEA recommended that health system policies should apply to all HCP, including students, volunteers, and contract workers, and only medical contraindications to vaccination be considered as valid. In instances when HCP are exempted, some institutions require they wear a mask while providing care to patients although the evidence supporting this strategy is lacking.

The American Academy of Pediatrics (AAP) also supports policies for mandatory vaccination with influenza vaccine for all HCP, and promotes nationwide implementation (Committee on Infectious Diseases, 2015). They describe mandatory vaccination policies as ethical, just and necessary, based on the rationale that HCP have an obligation to cause no harm and to act in the best interest of health for their patients. The AAP acknowledges the importance of medical exemptions, but does not support philosophical or religious exemptions, which are often stated to avoid vaccination.

Health systems may utilize employee health services to immunize HCP for required vaccinations as well as set up influenza immunization fairs throughout influenza season to ensure HCP are immunized against influenza. Influenza vaccination rates for HCP have been reported for the 2015-2016 influenza season and are reported in Table I (Black *et al.*, 2016).

There is evidence supporting the concept that vaccinating HCP can reduce morbidity and mortality among patients (Ahmed *et al.*, 2014) This research reported a 29 percent reduction in all cause death and a 42 percent reduction in influenza-related illness. The quality of the evidence was variable; however, the investigators concluded that that the benefits outweigh the harms and can increase patient safety.

The value of standardized measures for reporting influenza vaccination rates of HCP within an institution was evaluated (Lindley *et al.*, 2013). The project was based on a CDC-sponsored measure of HCP influenza vaccine rates, which had a provisional endorsement, by the National Quality Forum. The intent of the measure was to insure that it resulted in collection of valid HCP influenza rates, was comprehensive, and comparable across facilities using the measure. The results suggested that barriers existed to reporting complete vaccination rates for all HCP, including vaccines administered outside the institution, or reported contraindications or declinations. There were also issues related to gathering data on non-employees who might be contractors or vendors in the facility.

The impact of a mandatory influenza vaccination program for employees using an electronic tracking system was evaluated in the NIH Clinical Center (Palmore *et al.*, 2009). The mandatory program was adopted in 2008 and all employees with patient contact either were vaccinated or signed a declination statement indicating the reason for refusal. HCP who refused the vaccine appeared before a Medical Executive Committee to explain their reasons. Administration or refusal of vaccine was captured by badge scanning and bar coding that provided continuous updates for follow-up with non-adherent HCP. This system was able to capture all 2,754 HCP: 88 percent of whom were vaccinated, 1.3 percent reported medical contraindications, and 10.7 percent who declined with side effects as the most common reason.

In 2013, the CMS implemented a requirement that selected health systems report influenza vaccination rates for HCP (Kalayil *et al.*, 2012). Influenza vaccination rates for HCP at specific health systems are reported by CMS through the Hospital Compare program and are available for public viewing (data.medicare.gov). The data collected from health systems includes employees, volunteers, and trainees who are present in the facility during the influenza season. Experience with reporting data has uncovered challenges, which include tracking vaccinations for healthcare workers who work in numerous hospitals and employees who receive the influenza vaccine elsewhere. These rates are reported to the National Healthcare Safety Network (NHSN) and are available to the public. This standard was endorsed by the

Overall	79%
<i>Site of practice</i>	
Hospital workers	91.2%
Ambulatory Care/MD offices	79.8%
Long-term care setting	69.2%
<i>Profession-based</i>	
Physician	95.6%
Physician assistant/Nurse practitioner	90.3%
Nurse	90.1%
Pharmacist	86.5%
Other clinical HCP	84.7%
Non-clinical HCP	77.7%

Sources: Black *et al.* (2016) and Centers for Disease Control and Prevention (2016)

Table I.
Influenza vaccination rates for healthcare personnel (2015-2016); national goal 90 percent

National Quality Forum and the Centers for Disease Control and Prevention. An example report of influenza vaccination rates for specific health systems is available (Maryland Health Care Commission, 2016). HCP can decline the influenza vaccine if they have a medical contraindication. Some healthcare systems also allow declination based on religious or philosophical beliefs although this is less common. These requirements increased influenza vaccine coverage rates to 90 percent in settings with mandates requiring vaccination.

Mandatory influenza vaccination programs for HCP have become common in healthcare settings, partly due to rules and regulations of accreditation requirements. However, national organizations have promoted broader requirements. In 2013, the Infectious Diseases Society of America, SHEA, and the Pediatric Infectious Diseases Society issued a joint policy statement supporting universal immunization of HCP based on the Advisory Committee on Immunization Practices (ACIP) of the CDC recommendation (IDSA, SHEA and PIDS, 2013). These organizations note that voluntary vaccination programs can be effective when there is strong institutional leadership support and educational campaigns, but support mandatory programs as the most effective strategy. The organizations recommended comprehensive educational efforts for HCP regarding the benefits of vaccination and the risks of not maintaining up to date immunity. The organizations cited numerous advantages described as follows.

Rationale for health system policies regarding mandatory vaccines for HCP:

- immunization of HCP against vaccine-preventable diseases protects patients and HCP from illness and death from these diseases;
- immunization of HCP reduces work absences, especially during outbreaks, which would adversely affect patient care;
- vaccination rates for HCP remain below national goals
- mandatory vaccination programs are necessary when voluntary programs fail to achieve adequate vaccination rates;
- CDC-recommended vaccinations are safe, effective, and cost-saving;
- education improves HCP vaccination rates, but alone do not consistently achieve adequate vaccination rates;
- the provision of vaccination at no cost in the occupational setting improves vaccination rates; and
- physicians and other HCP are obligated “to do good or to do no harm” when treating patients and they have an ethical and moral obligation to prevent transmission of infectious diseases to patients.

Source: IDSA, SHEA and PIDS (2013).

The American Nurses Association (2015) published a position statement in support of mandatory vaccination requirements for nurses and HCP under certain conditions. The statement endorsed vaccination against several CDC-recommended vaccines except in situations of medical exemptions or religious beliefs. The CDC has general recommendation regarding immunization status for HCP published as part of the CDC 24/7 initiative Recommended vaccines depending on specific situations which are described as follows.

Recommended vaccines for HCP in specific situations:

- Hepatitis B (HCP who could potentially have contact with blood or contaminated body fluids);
- Influenza;
- Measles, Mumps and Rubella (administered as MMR);

- Varicella;
- Tetanus, Diphtheria, and Acellular Pertussis (Tdap); and
- Meningococcal A,C,Y,W and Meningococcal B (Microbiology lab personnel).

Source: Centers for Disease Control and Prevention, available at: www.cdc.gov/vaccines/adults/rec-vac/hcw.html

Broader recommendations for mandatory vaccines have been evaluated in health systems that have initiated mandatory vaccination programs for employees beyond influenza. In response to expanded recommendations for Tdap vaccination among adults, an academic medical center adopted a policy requiring mandatory receipt of the Tdap vaccine (Weber *et al.*, 2012). The only exception to vaccination was a medical contraindication. Current HCP were given two years to receive the vaccine and all new employees were vaccinated as a condition of employment. The implementation included an education and awareness campaign regarding the risk of pertussis infection and the benefits of vaccination. By the end of the policy implementation, 93 percent of HCP were vaccinated with 7 percent maintaining a medical contraindication.

Summary

The provision of vaccines are an important core measure of performance for health systems. Meeting vaccination goals for susceptible patients improves performance and compensation, as well as provides protection against vaccine-preventable diseases. Proven strategies exist for developing successful vaccination program that should be considered for site-specific planning. Multidisciplinary programs that engage clinicians and managers have been most successful. Mandatory programs requiring vaccination of HCP have a goal to improve overall health and protect patients of the health system.

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