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Update on immunizations for healthcare personnel in the United States☆

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ABSTRACT

Healthcare personnel (HCP) play a pivotal role in the transmission of contagious pathogens in the healthcare setting, and HCP are themselves at risk for infection with such pathogens due to the nature of their occupation. Many practices are important in order to reduce infection transmission, including HCP immunization. Unfortunately, HCP immunization rates in the United States (U.S.) have not reached recommended levels, so new strategies are being used to improve HCP coverage, including mandatory immunization and the use of immunization rates as measures of quality and safety. This article will review current practices, policies, and issues surrounding HCP immunization in the U.S.

Healthcare personnel (HCP) play a pivotal role in the transmission of contagious pathogens in the healthcare setting. As such, HCP immunization is a foundational practice, in combination with basic infection control measures such as hand hygiene and use of isolation precautions, to prevent healthcare-associated transmission of pathogens to patients and coworkers and to protect the individual HCP from morbidity. The rationale for recommending (and in several cases requiring) immunization of HCP centers upon several core concepts: (1) the role HCP play in healthcare-associated pathogen transmission to their patients and other HCP, (2) the HCP's increased personal risk for infection with certain pathogens, and (3) the role of HCP as vaccine advocates for their patients. HCP, by nature of their occupation, come into contact with patients who are infected with various pathogens, patients who are at higher risk for complications if infected with these pathogens, and other HCP. An infected HCP can serve as a vector for transmission of these pathogens, and published nosocomial outbreaks of vaccine-preventable infections in which HCP are implicated as the index case are so extensive that identifying such an outbreak is now rarely deemed a novel or publishable event [1–8]. In addition, HCP presenteeism, or working while ill, plays a key role in the transmission of pathogens in healthcare settings [9]. In several published surveys, approximately 75% of HCP who develop an infectious illness (i.e. influenza-like illness [ILI] or gastrointestinal infection) have reported working while ill [9,10]. Reasons for presenteeism have included concerns for how the HCP will be perceived by colleagues, a desire not to burden colleagues to cover a shift, and an overriding responsibility to care for the individual's patients [11]. Absenteeism of unimmunized HCP who contract a vaccine-preventable illness, while not responsible for pathogen transmission in a healthcare facility, can also negatively impact patient safety by increasing nurse-to-patient ratios and requiring temporary HCP to perform patient care in an unfamiliar environment.

HCP are also at increased risk for some infections simply by the nature of their occupation. Exposures to blood and body fluids place HCP at risk for hepatitis B and other blood borne pathogens. The risk of pertussis among HCP has been noted to be 1.7-times that of the general adult population [12], while Wright et al. identified an annual pertussis incidence rate among emergency department HCP of 1.3% (95% confidence interval [CI95], 0–3.5%) [13]. Somewhat more controversial and less established is the notion that HCP are at increased risk of contracting influenza as a result of their occupation. The fact that HCP may be in increased contact with infectious patients has been used as a rationale for advocating HCP influenza vaccination, but evidence supporting such an increased risk has

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been scarce with several studies finding no increased influenza risk for HCP as a result of their occupation [14,15]. In 2012, however, the first analysis noting a specific increased risk in HCP for influenza was published. Kuster et al. performed a systematic review and meta-analysis of observational studies and clinical trials reporting influenza infection rates and noted that HCP had significantly higher incidence rates of influenza infection when compared to adults working in non-healthcare settings [16].

Finally, HCP can be key advocates for immunization of their patients [17–19], and this advocacy may vary by the HCP's immunization status. A study of maternity care HCP found that 86.4% of influenza-vaccinated HCP would recommend influenza vaccine to their patients, compared to only 44.3% of unvaccinated HCP [20]. These findings were mirrored in another survey of HCP at 23 Veterans Affairs spinal cord injury centers in which HCP influenza immunization was significantly associated with recommending vaccination to coworkers, patients, or patients' families [21]. The role of immunized HCP in promoting and ensuring immunization of their patients should not be underestimated and provides an additional rationale for promoting HCP immunization.

1. Current HCP immunization guidelines and U.S. HCP immunity/immunization rates

Table 1 lists the specific vaccines and immunity requirements recommended for HCP by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP). In 2011, the ACIP also released a summary document of all immunizations recommended for HCP [22], which serves as an excellent point reference for all current guidelines on this topic. HCP immunity/immunization rates vary by the specific vaccine, and, unfortunately, up-to-date national data on levels of immunity and immunization rates of U.S. HCP against measles, mumps, rubella, and varicella are lacking [22]. Assessments of Tdap and hepatitis B immunization coverage are also scarce, but a CDC report using data from the National Health Interview Survey noted that 37.3% of HCP aged 19–64 years reported receipt of the Tdap vaccine in the previous 6 years, while 63.8% of adult HCP reported receipt of at least 3 doses of the hepatitis B vaccine [23]. Longitudinal data on HCP influenza immunization from the past decade, on the other hand, are readily available. The most recent report, based on respondent's self-report of immunization, highlights several key findings: (1) HCP influenza immunization rates, while increasing (72.0% for the 2012–2013 influenza season), remain below national targets (>90%); (2) rates are highest among physicians (92.3%); and (3) rates are lowest among non-clinical personnel (such as housekeeping, maintenance, and food service staff; 64.8%) and among HCP working in long-term care facilities (58.9%) [24].

2. Improving HCP immunization coverage

While rates for many of the recommended HCP immunizations are increasing, they have not yet reached desired targets. To that end, a number of strategies have been recommended and successfully implemented to improve HCP immunization coverage. These include, but are not limited to, ready access to vaccines at no cost to the HCP, visible promotion of and explicit expectation for vaccination by facility leaders, feedback of immunization rates with clear institutional targets, comprehensive education programs, and assessments of reasons for vaccine refusal to help address misconceptions [4]. Recently in the U.S., additional strategies and concepts have been promoted in order to improve HCP immunization rates. Used primarily for influenza immunization, these include the use of immunization mandates, the linkage of HCP immunization as a measure of quality and safety, public reporting of healthcare facility HCP immunization rates, and highlighting immunization as a professional responsibility of HCP. These will be discussed in detail below.

3. Mandating HCP immunization

3.1. Institutional mandates

The concept of requiring HCP to provide proof of immunity against certain vaccine-preventable diseases and, if non-immune, to become immunized against these pathogens is not novel. At many, if not most, healthcare facilities, proof of immunity or immunization against measles, mumps, rubella, varicella, and hepatitis B upon initial hire and credentialing is a standard practice for occupational health programs. Such requirements are even ingrained early in HCP training as part of entry requirements for medical and nursing schools. Miller et al. surveyed the leaders of all entry-level baccalaureate nursing programs and accredited medical doctor (MD)-granting and doctor of osteopathic medicine (DO)-granting medical schools in the United States and Puerto Rico regarding institutional requirements for immunity against specific vaccine-preventable diseases [25]. Immunity requirements directed toward measles, mumps, rubella, hepatitis B, and varicella were present in over 90% of the 563 responding programs; however, only 67% reported a requirement for pertussis vaccination for students. Only 18.4% included influenza on the list of VPDs meriting a vaccination requirement.

Low immunization rates combined with concerns about HCP's role in transmission of VPD in healthcare settings, specifically influenza, have led an increasing number of facilities to consider

Table 1
Summary of CDC Advisory Committee on Immunization Practices Healthcare Personnel (HCP) Immunization Recommendations [22].

Vaccine	Recommendations in brief
Hepatitis B	HCP who perform tasks that may involve exposure to blood or body fluids should receive a 3-dose series of hepatitis B vaccine at 0-, 1-, and 6-month intervals. Test for hepatitis B surface antibody (anti-HBs) to document immunity 1–2 months after dose #3.
Influenza	All HCP should receive 1 dose annually
Measles Mumps Rubella (MMR)	All HCP should be immune to measles, mumps, and rubella. For HCP born in 1957 or later without serologic evidence of immunity or prior vaccination, give 2 doses of MMR, 4 weeks apart. For HCP born prior to 1957, healthcare facilities should consider recommending 2 doses of MMR vaccine routinely to unvaccinated HCP born before 1957 who do not have laboratory evidence of disease or immunity to measles and/or mumps, and should consider one dose of MMR for HCP with no laboratory evidence of disease or immunity to rubella. For these same HCP who do not have evidence of immunity, healthcare facilities should recommend 2 doses of MMR vaccine during an outbreak of measles or mumps and 1 dose during an outbreak of rubella.
Varicella (chickenpox)	All HCP should be immune to varicella. For HCP who have no serologic proof of immunity, prior vaccination, or history of varicella disease, give 2 doses of varicella vaccine, 4 weeks apart.
Tetanus, diphtheria, pertussis	All HCP who have not received Tdap previously should receive a one-time dose of Tdap
Meningococcal	Vaccinate microbiologists who are routinely exposed to isolates of *N. meningitidis*

Adapted from Healthcare Personnel Vaccination Recommendations, Immunization Action Coalition [74].