



# VACCINATION FOR HCWS

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*This is the first article in a series about workplace safety and health for healthcare institutions.*

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## Introduction

Healthcare workers (HCWs) are at higher risk of acquiring infectious diseases as a result of their work environments and prolonged time of contact with infectious patients, whether known or unknown to them. This has always been viewed as an occupational hazard, and many would just shrug it off as just part and parcel of being a HCW. However, this risk can be significantly reduced with a combination of good infection control practices and vaccinations. In addition, vaccinating HCWs will also reduce their risk of becoming sources of vaccine-preventable infections.

## Definition of HCWs

HCWs are those who are involved with patient care (paid or unpaid) and have direct contact with patients in the course of carrying out their work. This would include (but not restricted to) the following personnel:

1. Doctors
2. Nurses
3. Dental personnel
4. Nursing aides/healthcare assistants
5. Physiotherapists
6. Pharmacists
7. Phlebotomists
8. Front-line hospital receptionists/admission clerks
9. Medical social workers
10. Counsellors
11. Radiographers
12. Medical/laboratory technicians

This is not an exhaustive list and would include those who have potential exposure to infectious materials including body substances, contaminated medical supplies, equipment, environmental surfaces, contaminated air and laboratory materials. Hence, laboratory researchers, housekeeping, laundry, transport, security, volunteers, medical students, autopsy personnel, etc, would also be included if their specific job responsibilities place them at risk of exposure.

## What are the infectious risks?

### Airborne/droplet-borne infections

1. Respiratory viruses: eg, SARS, MERS CoV, rhinoviruses and parvovirus B19
2. Vaccine-preventable viruses: eg, chickenpox, influenza, and measles, mumps and rubella (MMR)
3. Bacteria: eg, mycoplasma
4. Vaccine-preventable bacterial infections associated with meningitis: eg, meningococcus, pneumococcus and Haemophilus
5. Mycobacteria: eg, tuberculosis
6. Quarantinable infections: eg, plague

## Contact-borne infections

1. Viruses of public health importance: eg, Ebola
2. Healthcare associated bacteria: eg, Methicillin-resistant Staphylococcus aureus, Carbapenem-resistant enterobacteriaceae and vancomycin-resistant enterococci
3. Enteropathogens which cause diarrhoeal diseases: eg, dysentery, cholera, salmonella and rotavirus
4. Syphilis (secondary syphilis with rash being highly infectious)
5. Parasites: eg, scabies (especially Norwegian scabies)
6. Mycobacteria: eg, leprosy
7. Blood-borne viruses: eg, HIV and hepatitis B/C (contact with blood and body fluids)
8. Viral conjunctivitis: eg, adenovirus

## Procedures associated with substantial infectious risks

1. Exposure prone procedures/ invasive surgeries
2. Procedures involving generation of aerosols
3. Close contact: eg, intubation, collection of respiratory specimens, induced sputum, laryngeal swabs, and suction
4. Specimen handling: eg, lab workers

## Vaccine-preventable diseases in the healthcare environment

1. Hepatitis A
2. Hepatitis B
3. Chickenpox
4. MMR
5. Influenza
6. Pneumococcal disease
7. Meningococcal disease
8. Diphtheria, pertussis and tetanus (DPT)
9. Typhoid

## Prevention

HCWs need to know the risks of transmission and be conversant with standard preventive measures. There is no vaccine available for all infectious risks and preventive measures are the

only protection in certain instances. The cornerstone of any HCW infection prevention programme is the practice of universal precaution.

The basic tenet of universal precaution is the assumption that all patients are infectious until proven otherwise. In handling patients, we must take full precautions to prevent exposure to infectious agents.

Gloves must be worn if there is a likelihood of contact with infectious fluids. Non-permeable gowns, masks, protective eyewear and splash guards must be used if splash, aerosolisation or direct contact with possible infected body fluids is anticipated.

The US Centers for Disease Control and Prevention (CDC) adopts standard precautions, which covers all recognised or unrecognised sources of infection, including:

1. Blood
2. All body fluids/secretions/excretions except sweat
3. Non-intact skin
4. Mucous membranes

## Vaccination programmes as prevention

All healthcare institutions must put in place schemes to prevent, manage, follow up and redeploy HCWs with regard to infectious exposures.

Infection control programmes must not only protect patients admitted into healthcare facilities from acquiring nosocomial infections, but must also prevent their HCWs from being exposed to infectious patients.

Essential components of a HCW-based prevention programme include:

1. Pre-employment evaluation and vaccination
2. Employee health
3. Needlestick injury clinic
4. Workmen's compensation
5. Avenue for redeployment
6. Annual flu vaccination

A basic vaccination programme would include:

1. Pre-employment screening for hepatitis A/B status, immunity to chickenpox, MMR, chest X-ray (for tuberculosis) or Mantoux test
2. Vaccination for the non-immune:
  - a. Hepatitis B (+/- hepatitis A)
  - b. Chickenpox
  - c. MMR
  - d. Acellular DPT
  - e. Meningococcal, pneumococcal (optional)
  - f. Annual influenza vaccination
3. Regular follow-up of antibody titre to detect waning immunity and booster vaccination if indicated.

For small GP or specialist clinics, staff should be educated on basic infection control and undergo pre-employment screening for hepatitis B and offered vaccination if non-immune. This would constitute the minimum basic requirement for HCWs' welfare. Although there is no legislation in Singapore with regard to HCW screening requirements, this is highly recommended. Clinics with high staff turnover and/or employ locum doctors, temporary clinic staff, etc, may find it challenging to monitor their HCWs' vaccine status and keep records.

Despite the existence of recommendations and published guidelines, preventive vaccination in HCWs has been reported to be embarrassingly low in certain areas. In December 2014, the Ministry of Health published a circular on their recommendations for the immunisation of HCWs. The reasons for such low uptake range from lack of commitment by senior management, unclear policies, lack of knowledge and denial of risk. This ambivalent risk perception has prompted calls to make certain vaccinations mandatory rather than voluntary.

### **Hepatitis B - the single most important vaccine-preventable disease**

Almost every developed and

developing nation in the world has a universal childhood vaccination programme for hepatitis B today. Of course, some countries have suboptimal coverage due to problems with access to healthcare, poor documentation or compliance issues. In Singapore, our childhood vaccination programme coverage for this disease is close to 100%. This has helped to dramatically decrease the incidence of hepatitis B virus associated liver disease and liver cancer.

The vaccine schedule is a primary course of three doses given at zero, one and six months. The seroconversion rate is 85% to 90%, which is reasonably good. For the 10% to 15% who do not seroconvert after the primary series, a repeat vaccination course will result in seroconversion for more than half of them. The remaining 5% to 7% are either true non-responders or they have had subclinical hepatitis B infection not detected during routine screening. A true non-responder is defined as the failure to seroconvert after two primary series of hepatitis B vaccination (ie, six vaccinations).

HCWs are considered immune after completion of three doses of hepatitis vaccination if they have a protective anti-HBs (Hepatitis B surface antibodies) titre of 10 IU/L or more, and repeat vaccine boosters may be necessary if they fall below this level. In theory, there is an anamnestic response mounted by the body when re-exposure occurs, but it is unclear if this is a consistent and reliable response that we can depend upon in the healthcare setting.

For those who are non-responders, options include redeployment to less exposure prone procedures and injection with hepatitis B immune globulin post-exposure (passive immunisation).

All HCWs also have a duty of care not to transmit infectious diseases to their patients. Those performing exposure prone procedures should ensure that they have protective antibodies to hepatitis B and check their titres regularly. They must refrain from performing invasive

procedures on patients if they are infected with blood-borne infections such as hepatitis B/C or HIV.

### **Influenza vaccination**

Influenza can be a very serious disease with major complications and even death. In the elderly, it is complicated by significant debilitation, superimposed bacterial pneumonia, prolonged hospitalisation and a high rate of morbidity and mortality. In the healthcare setting, influenza is a major cause of absenteeism from work with loss in productivity. In a more worrisome situation, if healthcare workers transmit their infections to susceptible patients, patient safety can be compromised.

In theory, if all healthcare workers are vaccinated against influenza, it will indirectly protect their patients from catching the disease as a result of their interaction with them. However, this potential to reduce influenza morbidity in patients has not been borne out in well-designed studies. Nevertheless, all healthcare institutions should strongly recommend HCWs to be vaccinated against influenza before the flu season.

According to the US CDC, the take-up rate of flu vaccine coverage among American HCWs in 2013/2014 was about 75%. In Singapore, vaccine coverage varies according to the policy in each healthcare institution. Although there is no legislation mandating influenza vaccine for HCWs in any part of the world, it is known that vaccination take-up rates are higher in healthcare settings with well-established policies on influenza vaccination.

### **BCG vaccination**

There is no recommendation for BCG vaccination for HCWs. Tuberculosis prevention in healthcare settings is based on baseline screening of HCWs by chest X-rays, skin testing or interferon gamma release assays for mycobacteria tuberculosis (eg, QuantiFERON-TB Gold and T-SPOT TB tests), and good infection control measures which include rapid identification of infective individuals, isolation of patients, good

## Recommended vaccinations for HCWs

Vaccines	Recommendations
Hepatitis B	Primary series: three doses at zero, one and six months at pre-employment if non-immune. Check anti-HBs one to two months post-completion to document immunity. Booster can be given post-infectious exposure.
Influenza	Annual vaccination. Give inactivated influenza vaccine for all if no contraindication. Live attenuated vaccine can be given to healthy, non-pregnant staff less than 50 years old.
MMR	For those born after 1957 who have no serologic evidence of immunity, two doses four weeks apart.
Varicella (Chickenpox)	For non-immune HCWs, two doses four to eight weeks apart.
DPT	TDaP for those who have not received TDaP and Td every ten years thereafter.
Meningococcal meningitis	One dose for those who are exposed to isolates of <i>Neisseria meningitidis</i> in the laboratory. MCV4 (conjugate vaccine) preferred to MPSV4 (polysaccharide vaccine).

environmental control and early treatment.

### Pertussis vaccination

Newborns and infants are most susceptible to pertussis with sometimes fatal outcomes. The resurgence of pertussis in recent years have led to a shift in prevention strategy from that of a primary prevention centred on childhood vaccination to a “cocooning” strategy centred on vaccination of close contacts of the infants, ie, HCWs, mothers, household contacts and caregivers. All HCWs who come into contact with newborns and infants should get one dose of Tdap and thereafter Td every ten years.

### MMR vaccination

HCWs who have no documented immunity against the three diseases should be vaccinated with MMR – two doses with one to two months’ interval.

### Meningococcal vaccination

HCWs who are handling isolates of meningococcus in the lab should get vaccinated against the disease with meningococcal vaccine, preferably with the conjugate vaccine. Post-exposure vaccination and antibiotic prophylaxis may be given to HCWs who are exposed to confirmed cases of meningococcal

meningitis especially for high risk exposures, eg, intubation, resuscitation or aerosol-generating procedures or inadvertent contact without the use of personal protective equipment.

### Conclusion

HCWs have a job to do but they also have a life to live. In the course of performing their duties, care should be taken to prevent occupational exposure to infectious diseases. Every HCW has a part to play in maintaining their own health, and indirectly, the health of patients under their charge. Healthcare institutions must also play their part in ensuring their employees are practising in a safe environment and that if an unfortunate event occurs, they have a programme in place to handle this.

The programme must have a strong preventive element emphasising education and preventive action (eg, vaccination), as well as a structured system for post exposure management. There must be a framework to enable corrective action, to prevent future occurrence of sentinel events. Management at the highest level must also be supportive of such programmes and have the political will to push through the required changes to ensure that HCW vaccination is the keystone of workplace safety in healthcare. ■

### Further reading

1. US Centers for Disease Control and Prevention (CDC). *Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP)*. MMWR 2011; 60(RR07):1-45. Available at: <http://www.cdc.gov/mmwr/pdf/rr/rr6007.pdf>. Accessed 18 December 2014.
2. Immunization Action Coalition. *Healthcare personnel vaccination recommendations*. Available at: <http://www.immunize.org/catg.d/p2017.pdf>. Accessed 18 December 2014.
3. US CDC. *Recommended vaccines for healthcare workers*. Available at: <http://www.cdc.gov/vaccines/adults/rec-vac/hcw.html>. Accessed 18 December 2014.
4. Ministry of Health (MOH) Singapore. *Immunisation of healthcare workers – updated recommendations*. Singapore MOH Circular No. 45/2014, 2 December 2014.



Dr Lam is an infectious disease physician in private practice. She has an interest in vaccine-preventable diseases and is a strong advocate for vaccination as she believes that prevention is better than cure.