Infection Prevention and Control.

Module 4. Patient and Health Care Worker Safety

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- Each drug, to verify the recommended dose, method of administration, and precautions for use
- Each device, instrument, or piece of equipment to verify recommendations for use and/or operating instructions

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# Module 4. Patient and Health Care Worker Safety

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Chapter 1. Injection Safety

Key Topics

- Risks to patients and health care workers (HCWs) from unsafe injection practices
- Transmission pathways from unsafe injection practices
- Safe injection practices

Key Terms

- **Administrative controls**, also known as “work practice controls,” are changes in work procedures such as written policies, rules, protocols, supervision, schedules, and training, with the goal of reducing the duration, frequency, and severity of exposure to hazardous situations and substances (e.g., blood, body fluids, chemicals).

- **Bloodborne pathogens** are infectious microorganisms (bacteria, viruses, and other microorganisms) contained in blood and other potentially infectious body fluids (including urine, respiratory secretions, cerebrospinal, peritoneal, pleural, pericardial, and synovial amniotic fluids, semen, vaginal secretions, breast milk, and saliva). The pathogens of primary concern are hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV.

- **Health care worker (HCW)**, in this manual, is someone who works in a health care facility and provides health care and services to people, either directly or indirectly as a clinician, nurse, midwife, aide, helper, laboratory or x-ray technician, cleaner, or waste handler.

- **Multi-dose vial** is a vial of liquid medication intended for parenteral administration (injection or infusion) that the manufacturer has prepared to contain more than one dose of a medication. Multi-dose vials are labeled as such by the manufacturer and typically contain an antimicrobial preservative to help prevent the growth of bacteria. The preservative has no effect on viruses and does not protect against contamination when HCWs fail to follow safe injection practices.

- **Post-exposure prophylaxis (PEP)** is a preventive medical treatment for which a person may qualify following potential exposure to a disease-causing pathogen, such as a HIV or HBV, to prevent becoming infected.

- **Safe injection** is one that does not harm the recipient, does not expose the HCW to any avoidable risks, and does not result in waste that is dangerous for the community.

- **Sharps** are instruments, needles, and any other objects that can easily penetrate through the skin.

- **Sharps injuries** are injuries from a “sharp” penetrating the skin. “Sharps” include syringe needles, scalpels, broken glass, and other objects that may be contaminated with blood or body fluids. These injuries potentially expose HCWs to infections from bloodborne pathogens.

- **Sharps injury prevention strategies** are measures taken to prevent injuries while handling sharps. These measures include elimination of hazards and the use of engineering controls, administrative controls, work space practices, and personal protective equipment.

- **Single-use or single-dose vial** is a vial of liquid medication intended for parenteral administration (injection or infusion) that is meant for use in a single patient for a single case/procedure/injection. Single-use or single-dose vials are labeled as such by the manufacturer and do not contain antimicrobial preservative.
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- **Standard Precautions** are a set of infection control practices used for every patient encounter to reduce the risk of transmission of bloodborne and other pathogens from both recognized and unrecognized sources. They are the basic level of infection control practices to be used, at a minimum, in preventing the spread of infectious agents to all individuals in the health care facility.

**Background**

The goal of safe health care services is to protect HCWs, patients, and the community from harm, including exposure to infection. Unsafe injection practices put patients at increased risk of infection and other hazards. Additionally, inappropriate handling of syringes and needles puts HCWs, patients, visitors, and the community at increased risk of exposure to bloodborne pathogens. Safe injection practices, which are a component of Standard Precautions, include using a new, single-use disposable syringe and needle for each patient, using single-use vials for only one patient, and managing multi-dose vials correctly.

**Risk to Patients**

Unsafe injections can result in transmission of a wide variety of pathogens, including viruses, bacteria, fungi, and parasites. The World Health Organization (WHO) estimates that in low- and middle-income countries, 16 billion health care injections are administered each year, translating to approximately three injections per person per year, many of which are unnecessary. Reuse of syringes or needles, which is common in many settings, exposes patients to pathogens either directly (via contaminated equipment) or indirectly (via contaminated medication vials). The risks of unsafe injection practices have been well-documented for the three primary bloodborne pathogens: HIV, HBV, and HCV. Worldwide, each year, the overuse of injections and unsafe injection practices combine to cause an estimated:

- 8–16 million HBV infections
- 2.3–4.7 million HCV infections
- 80,000–160,000 HIV infections

(Hutin et al. 2003; Wilburn and Eijkemans 2007; WHO 2015)

**Risk to Health Care Workers**

Globally, in the course of their duties, HCWs are at an increased risk from bloodborne pathogens because they handle sharps, including needles and syringes. It is estimated that 39% of HCV, 37% of HBV, and 4.4% of HIV infection among HCWs worldwide are attributable to occupational exposure to sharps injuries. (Prüss-Üstün et al. 2005)

Both patients and HCWs are at risk of bloodborne disease from unsafe injection practices. Eliminating unnecessary injections and using safe injection practices are the best ways to protect patients and staff from the risks.

**Multi-Dose Vials**

Multi-dose vials are vials of liquid medication intended for parenteral administration (injection or infusion) that contain more than one dose of a medication. Multi-dose vials are labeled as such by the manufacturer and typically contain an antimicrobial preservative to help prevent the growth of bacteria. The preservative has no effect on viruses and does not protect against contamination when HCWs do not follow safe injection practices. Thimerosal, a mercury-containing compound, has been used as a
preservative in multi-dose vials including vaccines since 1930. It has antiseptic and antifungal properties. Thimerosal does not have antiviral activity.

There are many documented incidences of contamination of injection vials due to improper practices in settings with all levels of resources. In a study at a Brazilian teaching hospital, the overall microbial contamination rate was 5.36%; the highest rate—14.28%—was found in vials used in the interventional bronchoscopy unit. (Baniasadi et al. 2013)

In a study on isolation of HIV-1 from experimentally contaminated multi-dose local anesthetic vials, it was observed that needles and syringes retained small volumes of fluid after use (mean, 25 microL; in syringe alone, mean 16 microL), which could be transferred to multi-dose vials of local anesthetic. A 10-mL vial of anesthetic solution contaminated with 8 microL of HIV-infected solution (equivalent to 1% infected lymphocytes in vivo) contained active virus 1 hour later and, in some settings, HIV could be isolated 4 hours after exposure. The authors demonstrated that multi-dose vials could be a potential source of transmissible virus and cause inadvertent contamination with HIV. (Druce et al. 1995)

**Single-Use Vials**

Single-use vials are vials of liquid medication intended for parenteral administration (injection or infusion) that are meant for use in a single patient for a single procedure or injection. They are labeled as “single-use” or “single-dose” or “preservative-free” by the manufacturer and lack an antimicrobial preservative. Using vials designed for single patient doses for more than one patient increases the risk of infection. The risk for contamination of the vial is the same as described above for multi-dose vials, with the added risk of the lack antimicrobial preservatives, which increases the vial’s chances of contamination and becoming a source of infection. (See Table 1-1.)

**Table 1-1. Recommendations for Medication Containers**

<table>
<thead>
<tr>
<th>Type of Container</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-dose vial</td>
<td>Preferred</td>
<td>Low likelihood of contamination</td>
</tr>
<tr>
<td>Multi-dose vial</td>
<td>Only if unavoidable</td>
<td>High likelihood of contamination if aseptic technique and/or injection practices are poor</td>
</tr>
<tr>
<td>Ampoules</td>
<td>Pop-open preferred</td>
<td>Breaking a glass ampoule may result in particulate matter escaping into the vial, it may also injure the HCW opening the ampoule</td>
</tr>
<tr>
<td>Fluid or solution bags (100–1,000 mL) for reconstitution</td>
<td>Not recommended as a source for drawing off small volumes for routine injections (e.g., normal saline flushes)</td>
<td></td>
</tr>
</tbody>
</table>

*Source: WHO 2010.*

**Needles and Syringes**

An adequate supply of single-use disposable syringes and needles for injections is needed at all health care facilities. Reuse of needles or syringes has been established as a source of transmission of bloodborne pathogens. Reusing even needles or syringes that have been reprocessed carries a risk since
they are difficult to clean and sterilize adequately (tiny lumens of the needles cannot be adequately cleaned and syringes are prone to melt at high temperatures). Pathogens may remain after reprocessing. It is no longer acceptable to reprocess needles and syringes for injection.

Needles, syringes, and single-use and multi-dose vials can become transmission routes for infection if infection prevention and control (IPC) practices are not followed.

Unsafe Injection Practices: Transmission Pathways

Double dipping is the reuse of a syringe that has been used to inject medication into a patient to withdraw medication from a multi-dose vial using a new needle and injecting another patient with the medication. This results in contamination of the medication in the vial and the syringe.

Even if a new needle is attached, when this syringe is used on subsequent patients, patients can become infected with bloodborne pathogens from contamination within the syringe. Even if a new needle and new syringe are used for subsequent patients, they can become infected with bloodborne pathogens from the contaminated liquid in the vial. Figure 1-1 shows the pathway of transmission of bloodborne pathogens, in this case HCV, via unsafe injection practices.

Figure 1-1. Unsafe Injection Practices and Disease Transmission

Source: CDC 2008.

Safe Injection Practices

The reduction of accidental exposure to potentially infected blood and body fluids for patients and HCWs requires 100% compliance with safe injection practices. A safe injection is one that does not harm the recipient, does not expose the provider to any avoidable risks, and does not result in waste that is dangerous for the community (WHO 2015). The components of safe injection practices include the following:

- Adequate supply of single-use disposable injection devices (needles and syringes)
- Safe handling of vials containing medication (single-use and multi-dose vials)
- Safe preparation of parenteral medication
- Appropriate administration of injections
- Safe disposal of used needles and syringes
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**Adequate Supply of Safe Injection Devices (Single-Use Disposable Needles and Syringes)**

Re-processing of needles and/or syringes is no longer acceptable. This practice should be halted immediately. Providing sufficient single-use disposable injection devices should be a priority and facility resources should be prioritized accordingly.

**Safe Handling of Vials Containing Medication (Single-Use and Multi-Dose Vials)**

**Practical guidance on use of safe injection devices**

When using a sterile, single-use device (i.e., a syringe and hypodermic needle that are not separated or manipulated unless necessary):

- Use a new device for every patient, including for withdrawing medication. This practice is considered a very basic IPC precaution and is promoted by WHO (Safe Injection Global Network [SIGN]) and the US Centers for Disease Control and Prevention (CDC), among others. Figure 1-2 shows the “ONE and ONLY Campaign,” which advocates for one needle, one syringe, and only one use.
- Inspect the packaging of the device to ensure that the protective barrier has not been breached.
- Discard the device if the package has been punctured, torn, or damaged by exposure to moisture, or if the expiry date has passed. (WHO 2010)

**Practical guidance on handling parenteral medication**

- When giving medication:
  - ALWAYS follow the one needle, one syringe, one injection rule.
  - DO NOT use a single-loaded syringe to administer medication to several patients even if you change the needle every time between patients. See Figure 1-1, Unsafe Injection Practices and Disease Transmission in this chapter. (Always follow the one needle, one syringe, one injection rule.)
  - DO NOT use the same mixing syringe and needle to reconstitute several vials. See Figure 1-1, Unsafe Injection Practices and Disease Transmission, in this chapter.
  - DO NOT combine leftover medications for later use.
  - DO NOT use single-use vials for multiple patients, if at all possible.
- When using single-use vials:
  - Vials labeled by the manufacturer as “single-dose,” “single-use,” or “preservative-free” should be used only for a single patient.
    - There may be circumstances when the contents of single-use vials must be used for multiple patients. In this situation, contents from an unopened single-use vial can be repackaged one time into multiple single-use syringes for multiple patients. However, this should be performed only by a trained HCW in an area away from patient care and in accordance with strict IPC standards. Label as described below. Store for only 24 hours.
  - Check that you have the right medication vial for the patient’s prescription.
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- Double-check the expiration date and if the vial has previously been opened, the current date is within 24 hours of opening (unless a shorter or longer time frame is otherwise specified by the manufacturer).
- Follow the principle of one syringe, one needle, one time.
- Discard the single-use vial after use.
- Discard a single-use vial:
  - If sterility or content is compromised
  - If the expiry date or time has passed
  - If found to be undated, improperly stored, inadvertently contaminated, perceived to be contaminated, or already punctured, regardless of expiration date

When using multi-dose vials:

- If a multi-dose vial is assigned to a single patient (e.g., insulin pen), check that you have the right vial for the patient.
- Double-check the expiration date and if previously opened, check that the vial is labeled by the manufacturer as a multi-dose vial and the current date is within 28 days of opening, unless a shorter or longer time frame is otherwise specified by the manufacturer.
- Follow the principle of one syringe, one needle, one time.
- When withdrawing medication from a multi-dose vial, avoid double dipping, which may contaminate the contents of the vial and transmit infection to subsequent patients. See the Needles and Syringes section in this chapter.
- If newly opened, label the multi-dose vial. See the Labeling section in this chapter.
- DO NOT store multi-dose vials in patient care areas, where they could be inadvertently contaminated.

Discard a multi-dose vial:

- If sterility or content is compromised
- If the expiry date or time has passed (even if the vial contains antimicrobial preservatives)
- If it is not properly stored after opening, or within 28 days of opening, unless a shorter or longer time frame is otherwise specified by the manufacturer, or follow the manufacturer’s instructions for the time the vial can be used once opened
- If found to be undated, improperly stored, inadvertently contaminated, perceived to be contaminated, or has a visible hole in the rubber septum, regardless of expiration date, if thought to be a single-use rather than multi-dose vial

Safe Preparation of Parenteral Medication

Injections should be prepared in a designated clean area, away from patient care, where contamination by blood and body fluids is unlikely.
Practical guidance on setting up for preparing injections

Three steps must be followed when preparing injections:

1. Keep the injection preparation area free of clutter so all surfaces can be easily cleaned.
2. Before starting the injection session, and whenever there is contamination with blood or body fluids, clean the preparation surfaces with a surface antiseptic such as 0.5% sodium hypochlorite solution, 70% alcohol (isopropyl alcohol or ethanol), or other suitable surface disinfectant and allow the preparation to dry.
3. Perform hand hygiene and assemble all equipment needed for the injection: sterile, single-use needles and syringes; reconstitution solution, such as sterile water or a specific diluent; alcohol swab or cotton wool; and a sharps container.

(WHO 2010)

Procedure for vials with a rubber septum

Many vials have a rubber septum (stopper).

- Wipe the access rubber septum with 70% alcohol (isopropyl alcohol or ethanol) with a swab or cotton-wool ball and allow it to dry before piercing the vial or inserting a device into the bottle.
- Use a new, single-use, disposable, sterile syringe and needle for each insertion into a vial.
- Never leave a needle in a multi-dose vial.
- Once the loaded syringe and needle have been withdrawn from a multi-dose vial, administer the injection as soon as possible.

Reconstitution

- Always use a sterile syringe and a sterile needle to withdraw the reconstitution solution from an ampoule or a vial, insert the needle into the rubber septum in the single- or multi-dose vial, and inject the necessary amount of reconstitution fluid.
- Remove the needle and syringe and discard them immediately as a single unit into a sharps container.
- Mix the contents of the vial thoroughly until all visible particles have dissolved.

Delay in administration

- If a dose has been withdrawn into a syringe and cannot be administered immediately for any reason, cover the needle with the cap using a one-handed scoop technique. Do not keep the medication longer than 24 hours unless a shorter or longer time frame is otherwise specified by the manufacturer. Inject the medication as soon as possible after withdrawing from the vial. See the section on labeling in this chapter.

(WHO 2010)

Labeling

After reconstitution of a vaccine or medication in a multi-dose vial (e.g., BCG vaccine), label the vial and the final medication container with:

- Date and time of preparation
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- Type and volume of diluent (if applicable)
- Final concentration
- Expiry date and time after reconstitution
- Name and signature of the person reconstituting the drug

For multi-dose medications that DO NOT require reconstitution (e.g., lignocaine), label the container with:

- Date and time of first piercing of the vial
- Expiry date and time after reconstitution
- Name and signature of the person first piercing the vial

Procedure for Pop-Open Ampoules

- Whenever possible, use vials with a rubber septum. If not available, use pop-open ampoules rather than ampoules that require use of a metal file to open. When opening glass ampoules, always protect fingers with a clean barrier, such as a small gauze pad (see Figure 1.3).
- Pop-open vials cannot be stored for later use.
  (Hutin et al. 2003)

Figure 1-3. Breaking Open an Ampoule

Safe Administration of Injections

Aseptic techniques should be followed for all injections.

Practical guidance on administering injections

General

- When administering an injection:
  - Ensure that the patient is adequately prepared for and informed about the procedure.
  - Check the drug chart or prescription for the medication and the five “rights”: right patient, right drug, right dose, right route, right time.
  - Perform hand hygiene.
• Wipe the top of the vial with 70% alcohol (isopropyl alcohol or ethanol) using a swab or cotton-wool ball. Allow it to dry.
• Open the package in front of the patient to reassure the person that the syringe and needle have not been used previously.
• Use a sterile syringe and needle to withdraw the medication from the ampoule or vial.

Important points
• DO NOT allow the needle to touch any contaminated surface.
• DO NOT reuse a syringe, even if the needle has been changed.
• DO NOT touch the rubber septum after disinfection with the 70% alcohol (isopropyl alcohol or ethanol).
• DO NOT re-enter a multi-dose vial with the same needle used for mixing or reconstituting medications.
• DO NOT re-enter a vial with a needle or syringe used on a patient if that vial will be used to withdraw medication again (whether it is for the same patient or for another patient).
• DO NOT use bags or bottles of intravenous solution as a common source of supply for injections (e.g., normal saline flushes) for multiple patients. These are not manufactured as multi-dose and do not have any preservative (see Table 1-1).

Safe Disposal of Used Needles and Syringes
Use of best practices can help to prevent sharps injuries to HCWs.

Practical guidance on prevention of sharps injuries
• Do not bend, break, manipulate, or manually remove needles before disposal.
• Avoid recapping needles, but if a needle must be recapped, use a single-handed scoop technique (see Figure 1-4).

Figure 1-4. Single-Handed Scoop Technique for Recapping Needles

1. Place the cap on a flat surface, then remove your hand from the cap. With one hand, hold the syringe and use the needle to scoop up the cap.

2. When the cap covers the needle completely, use your other hand to secure the cap on the needle hub. Handle the cap at the bottom, near the hub.

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- Discard used sharps and glass ampoules into a leak- and puncture-resistant sharps container immediately after use in the location where they were used.

- Place the sharps container within arm’s reach to allow for easy disposal of sharps.

- Seal and replace the sharps container when it is three-quarters full. Be sure that no sharp items are sticking out of the container.

Practical guidance on sharps disposal

Used syringes and needles should be disposed of following recommended guidelines. (See Module 5, Chapter 5, Waste Management in Health Care Facilities.) If used syringes and needles are not properly disposed of, they can injure patients, HCWs, or members of the community.

To ensure that sharps are dealt with safely:

- Place needles and syringes into containers specifically designed for sharps disposal. The four main criteria for secure and safe sharps disposal containers are: functionality, accessibility, visibility, and accommodation (i.e., easy to store and assemble, minimal training required, easy to operate, flexible in design). (CDC 2010)

- After closing and sealing sharps containers (when three-quarters full), never open, empty, or reuse them.

Summary

Injections present risks to patients, HCWs, and the community and should be limited where alternative administration routes are available. Safe injection practices are one of the components of Standard Precautions. A safe injection is one that does not harm the recipient, does not expose the HCW to any avoidable risks, and does not result in waste that is dangerous for the community (Rapiti et al. 2005). Safe injection practices include the proper use of single-use and multi-dose vials. It is the responsibility of each HCW to ensure safe injection practices for every patient.
References


Injection Safety


Chapter 2. Infection Prevention and Control Aspects of Occupational Health in Health Care Settings

Key Topics
- Health care workers’ (HCWs’) occupational risks of infection
- Occupational health activities for the prevention and management of infections in HCWs
- Occupational health activities for specific groups of HCWs
- Monitoring of occupational health activities
- Risks and work restrictions for HCWs exposed to or infected with infectious diseases

Key Terms
- Health care worker (HCW), in this manual, is someone who works in a health care facility and provides health care and services to people, either directly or indirectly as a clinician, nurse, midwife, aide, helper, laboratory or x-ray technician, cleaner, or waste handler.
- Occupational exposure is an exposure of an HCW to an infection while providing care and treatment services to patients in a health care facility.
- Occupational health is the discipline that deals with all aspects of work-related health and safety and has a strong focus on prevention; it is known also as employee health.
- Occupational health activities include all aspects of work-related health and safety activities, including prevention. In this chapter, the term refers in particular to activities that address infectious hazards at health care facilities.
- Occupational health surveillance is the collection, analysis, and dissemination of data on hazards that have endangered or may endanger HCWs.
- Occupational infection is an infection contracted as a result of an exposure to risk factors arising from work activity.
- Sharps injuries are injuries from a “sharp” penetrating the skin. “Sharps” include syringe needles, scalpels, broken glass, and other objects that may be contaminated with blood or body fluids. These injuries potentially expose HCWs to infections from bloodborne pathogens.
- Vaccine-preventable diseases are infectious diseases for which effective vaccines are available. They include but are not limited to hepatitis A and B, influenza, measles, mumps, rubella, tetanus, diphtheria, pertussis, and varicella (chicken pox).

Background
Health care facilities around the world employ over 59 million workers who are routinely exposed to a variety of health and safety risks (WHO 2016a). These risks include exposure to infectious agents such as bloodborne pathogens, tuberculosis (TB), viral respiratory infections, vaccine-preventable diseases, bacterial infections, and gastrointestinal infections, among others. If an infection is contracted as a result of an exposure to risk factors arising from work activity, it is known as an occupational infection. In general, HCWs who have contact with patients, body fluids, or specimens have a higher risk of
acquiring or transmitting infections than those who have casual contact with patients and the health care environment.

Occupational exposures to sharps injuries are an example of the substantial impact of occupational infections among HCWs. It is estimated that 39% of hepatitis C virus (HCV), 37% of hepatitis B virus (HBV), and 4.4% of HIV infections among HCWs worldwide are attributable to occupational exposure due to sharps injuries. This amounts to an estimate of 16,000 HCV, 66,000 HBV, and 1,000 HIV occupational infections annually (Prüss-Üstün et al. 2005). It is thought that more than 90% of these are in limited-resource countries. (IFIC 2003)

It is notable that infection with HBV is 95% preventable with immunization, and the HBV vaccine has contributed to a significant reduction of HBV in HCWs. However, less than 20% of HCWs in some regions of the world have received all three doses of vaccine needed for immunity from HBV infection. (APIC 2014a; IFIC 2003)

In general, occupational health deals with all aspects of work-related health and safety and has a strong focus on prevention, especially for infectious (such as disease exposures) and non-infectious risks (such as injury). The goals of infection prevention and control (IPC) intersect with those of occupational health in preventing and addressing infectious hazards at health care facilities. Therefore, a large portion of occupational health activities at a health care facility are also IPC activities. (APIC 2014a)

Although the actual risk of infectious exposure for HCWs depends somewhat upon the job description and the setting, attention to IPC helps protect staff and patients in all settings. Emerging infectious disease outbreaks, such as severe acute respiratory syndrome (SARS) in 2003, Middle Eastern respiratory syndrome coronavirus (MERS-CoV) in 2012, and Ebola Virus Disease (EVD) in 2014, have highlighted the importance of IPC in protecting HCWs, as transmission of these viruses to HCWs occurred when they cared for infected patients. These outbreaks have demonstrated that strategies to protect HCWs from exposure to infectious risks in the workplace are critically important and that facilities must have the infrastructure in place to be able to adapt to changes in emerging infectious threats. Health care facilities need staff knowledgeable in IPC to conduct and support sound occupational health activities to minimize the risk of occupational infection in HCWs and provide a safe environment for patients and staff. (APIC 2014a; WHO 2016a; WHO 2016c)

**Occupational Health Activities for Preventing Infections among Health Care Workers**

The goal of occupational health activities is to protect HCWs—and thereby their patients—from acquiring an infection while working in a health care facility. This goal is achieved by:

- Identifying work-related infection risks and preventing them
- Ensuring prompt and appropriate management of any occupational exposures to infections
- Training all HCWs on IPC practices and how to protect themselves against the risks of occupational exposures to infections
- Monitoring and investigating potentially harmful exposures and outbreaks among HCWs
- Preventing infections by carrying out occupational health activities

(APIC 2014a; CDC 1998; WHO 2016c)
Protection from acquiring infections through occupational exposure is critical to maintaining and retaining an adequate workforce of trained and healthy HCWs. Protecting HCWs also helps to contain costs associated with absenteeism, illness, and attrition as a result of incapacity, death, and fear. In addition, occupational health activities protect patients through prevention, early identification, and control of infections among staff. Therefore, protecting HCWs is integral to maintaining a safe environment for both patients and staff.

Aspects of occupational health should be included in any IPC program; the World Health Organization’s (WHO’s) (2016c) Core Components of IPC emphasize the importance of collaboration between occupational health/employee safety activities and the IPC program (CDC 1998; WHO 2016a; WHO 2016c).

It is ideal to have an occupational health department and program in a larger health care facility, depending on the size of the facility and available staffing. In smaller health care facilities, the IPC team or other appropriate staff may carry out occupational health activities. All occupational health programs should be coordinated and overseen by a trained health care professional or team who hold the responsibility for ensuring that all of the program activities, including IPC aspects are conducted.

A responsible person from various departments, which could include human resources, IPC, outpatient clinics, administration, and the laboratory, should work in a coordinated manner to implement occupational health activities such as efficient and prompt screening, immunization, and follow-up of exposures and outbreaks among HCWs.

**Major Occupational Health Activities**

The priorities of occupational health activities at any facility will vary depending on factors such as the type of facility, organizational structure and services provided, geographical location, characteristics of the patients and HCWs, and diseases that are endemic in the community (APIC 2014a). This section provides a practical description of the implementation and integration of occupational health activities.

Activities that should be implemented by staff responsible for occupational health can be divided into the following categories:

- For newly employed HCWs (see Table 2-1)
- For all HCWs on an ongoing basis (see Table 2-2)
- Facility-wide activities (see Table 2-3)
### Table 2-1. Occupational Health Activities for Newly Employed HCWs

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key Occupational Health Activities: Newly Employed HCWs</th>
</tr>
</thead>
</table>
| **Pre-employment evaluation** | • Though not recommended in many settings, a baseline medical history and physical examination, if done, can serve as a screening tool and establish a baseline to determine if any future diseases are work-related.  
• Review history of vaccination for hepatitis B in particular and other vaccinations recommended as per the national guidelines for vaccination of HCWs.  
• Assess for immunity: In low-resource settings, documentation of routine immunization might be the only source to verify immunity if the records are available. Follow the national vaccination schedule for HCWs when vaccination status is not known. In some settings blood titers to determine current immunity to vaccine preventable diseases may be available.  
• Assess for presence of chronic and acute infections, including screening for TB. |
| **Education/training on IPC** | • Tailor training to the needs of specific job functions.  
• Conduct IPC training for newly employed HCWs following the national training curriculum. At a minimum, all new employee should receive training in:  
  − Standard Precautions and Transmission-Based Precautions  
  − Management of occupational exposure to bloodborne pathogens  
• Include topics such as risk and prevention of occupational infections, risk of infection after exposures, and management of exposures, including availability and effectiveness of post-exposure prophylaxis (PEP) and potential consequences to family members of exposed HCWs. Also include updates on occupational health and pregnant HCWs. |
| **Counseling for occupational exposure to infections** | • Counsel for:  
  − The risk and prevention of occupational infection  
  − Risk of various infections following exposure  
  − Management of exposures, including testing and PEP (where indicated)  
  − Risks and benefits of PEP  
  − Long-term consequences of infections  
  − Potential risks for family members, colleagues, and other patients  
  − The need to be away from the job  
• Female HCWs of childbearing age and those who are pregnant should be counseled on the risks of infections and provided with information on appropriate Transmission-Based Precautions needed for infections of concern during pregnancy.  
• Answer any other questions that the HCW might have. |
Table 2-2. Occupational Health Activities for all HCWs

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key Occupational Health Activities: All HCWs</th>
</tr>
</thead>
</table>
| **Monitoring employee health status** | • Screen for TB using the WHO TB screening tool.  
• Ensure that the vaccination status of all HCWs is up to date.  
• Update employee health records.  
• Perform routine monitoring of HCWs with HBV, HCV, and HIV infection with the goal of assisting infected HCWs to continue to provide safe health care to patients. |
| **Education/training on IPC** | • Organize periodic refresher training for all HCWs in key IPC practices.  
• Provide updates on guidelines for monitoring and managing occupational exposures to bloodborne pathogens and other infections. |
| **Determining work restrictions for employee illness and exposure** | • Make decisions about work restrictions (the need to be away from the job) for ill HCWs (see Appendix 2-A for disease-specific work restrictions). |
| **Post-exposure follow-up** | • Follow up immediately those HCWs with job-related exposures and make decisions about work restrictions and post-exposure care (see Appendix 2-A for disease-specific work restrictions). See the Occupational Health Activities for Management of Job-Related Illnesses and Occupational Exposures section in this chapter. |
| **Vaccination** | • Organize vaccination sessions for those staff who need to complete vaccinations according to national/facility recommendations. |

Table 2-3. Facility-Wide Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key Occupational Health Activities: Facility-Wide</th>
</tr>
</thead>
</table>
| **Exposure reporting** | • Conduct a regular review of occupational exposure reporting in the facility.  
• Ensure that round-the-clock services are available for post-exposure management as recommended in Chapter 3, Sharps Injuries and Management of Exposure to Bloodborne Pathogens, in this module.  
• Prepare and transmit documentation of occupational exposures to the authorities as needed. |
| **Occupational health program review** | • Evaluate effectiveness of occupational health activities for preventing occupational exposure to bloodborne pathogens and other risks.  
• Make changes in the selection and implementation of occupational health program activities as needed. |

National guidelines, if available, should be followed to vaccinate HCWs against vaccine-preventable diseases. WHO has provided information on immunization for the general population and HCWs (see Table 2-4) to help countries develop national policies for vaccination of HCWs.
Table 2-4. WHO-Recommended Immunizations for HCWs

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| Hepatitis B     | • Routine childhood immunization. No booster needed.  
• Incompletely vaccinated HCWs should receive additional doses to complete the vaccine series. The vaccine series does not need to be restarted; however, minimum dosing intervals should be followed: 4 weeks between the first and second dose, 8 weeks between the second and third dose, and 16 weeks between the first and third dose. (CDC 2013)  
• Hepatitis B vaccine is affordable and available in many settings and is an appropriate place to begin when starting a staff immunization program. (CDC 1998)                                                                                 |
| Polio           | Routine childhood immunization.  
All HCWs should have completed a full course of primary vaccination against polio.                                                                                                                                                                                                                                                                   |
| Diphtheria      | Routine childhood immunization.  
Booster for HCWs every 10 years.                                                                                                                                                                                                                                                                                                                                 |
| Measles         | Routine childhood immunization.  
If required by the national policy, all HCWs should produce proof of immunity or documentation of immunization at the time of employment.                                                                                                                                                                                                                  |
| Rubella         | If rubella vaccine has been introduced into the national program, all HCWs should be immunized for rubella and produce proof of immunity or documentation of immunization at the time of employment.                                                                                                                                                                                   |
| Meningococcal   | One booster dose 3–5 years after the primary dose may be given to persons considered to be at continued risk of exposure, including HCWs.                                                                                                                                                                                                                           |
| Influenza       | Influenza virus changes regularly so annual immunization with a single dose is recommended if the vaccine is available for HCWs under the national immunization program.                                                                                                                                                                                                 |
| Varicella (Chicken pox) | Countries should consider vaccination of potentially susceptible HCWs (i.e., unvaccinated and with no history of varicella) with two doses of varicella vaccine.                                                                                                                                                                      |

Immunizations with NO Current WHO Recommendation for HCWs

There are no specific recommendations for vaccination specifically for HCWs for TB, pertussis, tetanus, mumps, hepatitis A (HAV), typhoid, or cholera. These vaccines should be offered as a part of routine vaccination programs and as overall strategies for preventing outbreaks (typhoid and cholera).


Occupational Health Activities for Management of Job-Related Illnesses and Occupational Exposures

The occupational health team should respond to all potential and confirmed exposures to bloodborne pathogens and other infectious diseases immediately and collaborate with IPC staff for follow-up as necessary. Health care facilities should have systems in place for HCWs to report sharps injuries and bloodborne pathogen exposures with prompt evaluation and follow-up (see Table 2-5). See Chapter 3, Sharps Injuries and Management of Exposure to Bloodborne Pathogens, in this module.
### Table 2-5. Occupational Health Activities for Management of Job-Related Illnesses and Exposures

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key Occupational Health Activities: Job-Related Illnesses and Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infectious disease in HCWs</strong></td>
<td>- Identify infections in HCWs (whether community-acquired or job-related).</td>
</tr>
<tr>
<td></td>
<td>- Make decisions about the length and type of work restrictions (related to patient care or food handling) and assignment to other duties (see Appendix 2-A).</td>
</tr>
<tr>
<td></td>
<td>- Report to public health authorities if it is a notifiable disease of public health interest.</td>
</tr>
<tr>
<td><strong>Sentinel infections in HCWs</strong></td>
<td>- Suspect a job-related infection in an HCW with an infectious disease known to spread in health care facilities. Certain occupational infections may be the result of caring for patients with an unidentified infection (such as meningococcal meningitis or novel influenza) or may indicate IPC lapses at the facility. (See Appendix 2-A for disease-specific risk of transmission to and from HCWs.)</td>
</tr>
<tr>
<td></td>
<td>- Ensure infections are managed following clinical guidelines and make decisions about the length and type of work restrictions (as above).</td>
</tr>
<tr>
<td></td>
<td>- Take necessary measures to prevent further spread of the infection through investigation of possible routes of transmission in the facility and correct any lapses in IPC.</td>
</tr>
<tr>
<td></td>
<td>- Identify and facilitate clinical management and work restrictions of those exposed.</td>
</tr>
<tr>
<td></td>
<td>- Monitor closely for additional cases (indicating a hospital or community outbreak).</td>
</tr>
<tr>
<td><strong>Post-exposure follow-up</strong></td>
<td>- Determine what is considered an exposure (exposure definition).</td>
</tr>
<tr>
<td></td>
<td>- Obtain a list of those who have been exposed.</td>
</tr>
<tr>
<td></td>
<td>- Counsel those exposed.</td>
</tr>
<tr>
<td></td>
<td>- Offer PEP promptly when appropriate and available.</td>
</tr>
<tr>
<td></td>
<td>- Determine any work restrictions.</td>
</tr>
<tr>
<td></td>
<td>- Conduct medical surveillance for development of disease.</td>
</tr>
<tr>
<td></td>
<td>- Determine when the HCW can return to work.</td>
</tr>
<tr>
<td></td>
<td>- Maintain adequate and confidential documentation on the event.</td>
</tr>
<tr>
<td></td>
<td>- Coordinate all of the above and any other activities such as ongoing monitoring or follow-up lab testing. (See Chapter 3, Sharps Injuries and Management of Exposure to Bloodborne Pathogens, in this module for more information on post-exposure management for HBV, HCV, and HIV and Appendix 2-A for disease-specific guidance for management of exposed HCWs.)</td>
</tr>
</tbody>
</table>

### Summary of Key Elements of Occupational Health Activities

The following are the key elements for occupational health programs in health care facilities:

- Oversight by a qualified health care professional or team
- Coordination among multiple hospital departments
- Medical evaluation at the start of employment
- Health and safety education and training of all staff
- Immunization programs
- Management of work restrictions and post-exposure treatment for occupational illnesses and exposures
Occupational Health

- Counseling on protection from and management of accidental exposure to bloodborne and other infectious pathogens
- Maintenance of personnel health records

(APIC 2014a; CDC 1998; WHO 2002)

Prevention Strategies for Infections Relevant to Occupational Health in Health Care Facilities

- Prevent occupational exposure of HCWs by the application of Standard Precautions for all patients, at all times, as well as disease- or syndrome-specific Transmission-Based Precautions, to prevent exposures to infectious agents. (See Module 1, Chapter 2, Standard and Transmission-Based Precautions.)

- Protect against vaccine-preventable diseases: Having a mandatory program that requires all HCWs to receive vaccines to protect themselves against vaccine-preventable diseases has been found to be more effective than a voluntary program in ensuring that all susceptible staff are vaccinated. In settings with limited resources, priority should be given to staff who are at high risk of exposure and those without any existing immunity. Select the vaccines that may provide the most protective effects, such as hepatitis B or influenza.

- Manage occupational exposures following the national guidelines (e.g., national guidelines for management of occupational exposure to blood and body fluids) (Refer to Chapter 3, Sharps Injuries and Management of Exposure to Bloodborne Pathogens, in this module for post-exposure management of HBV, HCV, and HIV and Appendix 2-A for disease-specific guidance for management of exposed HCWs.)

- Keep up to date by seeking additional information on specific diseases and local epidemiology: Details on specific, key infections relevant to limited-resource settings can be found in Appendix 2-A.

Occupational Health Activities for Specific Groups of Health Care Workers

Certain groups of workers at a health care facility may require special attention related to occupational health activities. They include pregnant staff, laboratory staff, emergency response staff, and HCWs infected with HIV, HBV, or HCV.

Pregnant Health Care Workers

- Pregnancy does not increase the risk of acquisition of infection for most occupationally acquired infections, and clinical manifestations are no more severe in pregnant women than in others (APIC 2014b). However, pregnant HCWs may be anxious about potential infection and possible harm to their babies. The staff supporting occupational health activities should address any questions that pregnant HCWs may have about occupational exposures, how to avoid them, and the management of exposures, as well as any implications for the baby. Full compliance with Standard Precautions, such as hand hygiene and appropriate personal protective equipment (PPE), as well as adherence to Transmission-Based Precautions, should be adequate for pregnant HCWs in preventing most infectious diseases (see Table 2-6). (APIC 2014b) (See Module 1, Chapter 2, Standard and Transmission-Based Precautions.)
Table 2-6. Infectious Agents of Concern for Pregnant HCWs According to the Risk of Transmission Associated with Providing Health Care Services and Available Preventive Measures

<table>
<thead>
<tr>
<th>Health Care-Associated Acquisition Possible and Prevented by Vaccine</th>
<th>Health Care-Associated Acquisition Is Unlikely</th>
<th>Health Care-Associated Infections for Which Standard and Transmission-Based Precautions Are the Only Preventive Measures</th>
<th>Health Care-Associated Infections for Which PEP Is Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax, hepatitis A virus (HAV), HBV, influenza, <em>Neisseria meningitis</em>, pertussis, rubella, measles, varicella, tetanus, diphtheria</td>
<td>Herpes simplex virus, toxoplasmosis</td>
<td>Cytomegalovirus (CMV), viral hemorrhagic fever, HCV, parvovirus B19, TB</td>
<td>HIV, <em>N. meningitis</em>, syphilis</td>
</tr>
</tbody>
</table>

*Source:* APIC 2014b.

However, as in the case of non-pregnant HCWs, non-immune pregnant HCWs should not care for patients with measles, rubella, and varicella (APIC 2014b). Table 2-7 provides information on occupational exposure to infection among pregnant HCWs, risks to their babies, and prevention strategies. The information provided in the table will guide the occupational health team members in making appropriate decisions. Table 2-7 describes additional pertinent facts to assist with management of relevant occupational exposures in pregnant HCWs.

In settings where adequate infection control precautions (including PPE) are available and immunizations for vaccine-preventable diseases are maintained, there are few instances in which pregnant HCWs cannot provide the same care as their non-pregnant colleagues; they should not routinely be restricted from duties on the basis of pregnancy status. However, pregnant HCWs should not care for patients with parvovirus B16 and certain vaccine-preventable diseases if they are non-immune. At times of PPE and vaccine shortage, assign pregnant HCWs to other tasks with no risk for exposure to infectious agents. (APIC 2014b; CDC 2013)
Table 2-7. Management of Occupational Exposure to Common Infections for Pregnant Staff Members

<table>
<thead>
<tr>
<th>Agent</th>
<th>In-Hospital Source</th>
<th>Potential Effect on the Fetus</th>
<th>Rate of Perinatal Transmission</th>
<th>Maternal Screening</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cytomegalovirus (CMV)</td>
<td>Urine, blood, semen, vaginal secretion, immunosuppressed transplant, dialysis, day care</td>
<td>Classic cytomegalic inclusion disease (5–10%)&lt;sup&gt;*&lt;/sup&gt; Hearing loss (10–15%)</td>
<td>Primary infection (25–50%) Recurrent infants (52%) Symptomatic (&lt;5–15%)</td>
<td>Routine screening not recommended; antibody is incompletely protective</td>
<td>Efficacy of CMV immune globulin not established. No vaccine available Standard Precautions</td>
</tr>
<tr>
<td>Hepatitis A virus (HAV)</td>
<td>Feces (most common), blood (rare)</td>
<td>No fetal transmission described; transmission can occur at the time of delivery if the mother is still in the infectious phase and can cause hepatitis</td>
<td>None</td>
<td>Routine screening not recommended</td>
<td>Vaccine is a killed viral vaccine and can safely be used in pregnancy. Contact Precautions during acute phase. The safety of HAV vaccination during pregnancy has not been determined; however, because the vaccine is produced from inactivated HAV, the theoretical risk to the developing fetus is expected to be low. The risk associated with vaccination, however, should be weighed against the risk for HAV in women who might be at high risk of exposure to HAV.</td>
</tr>
<tr>
<td>Hepatitis B virus (HBV)</td>
<td>Blood, body fluids, vaginal secretions, semen</td>
<td>Hepatitis, early onset hepatocellular carcinoma</td>
<td>HbsAg + 10% HbeAg + 90%</td>
<td>Routine HBsAg testing advised</td>
<td>HBV vaccine during pregnancy Neonate: HBIG plus vaccine at birth Standard Precautions</td>
</tr>
<tr>
<td>Hepatitis C virus (HCV)</td>
<td>Blood, sexual</td>
<td>Hepatitis</td>
<td>5% (0–25%)</td>
<td>Routine screening not recommended</td>
<td>No vaccine or immunoglobulin available; post-exposure treatment with antiviral agents being investigated. Standard Precautions</td>
</tr>
<tr>
<td>Herpes simplex virus</td>
<td>Vesicular fluid, oropharyngeal, and vaginal secretions</td>
<td>Sepsis, encephalitis, meningitis, mucocutaneous lesions, congenital malformation (rare)</td>
<td>Primary genital (33–50%) Recurrent genital (1–2%)</td>
<td>Antibody testing minimally useful, genital inspection for lesions if in labor</td>
<td>Chemoprophylaxis at 36 weeks decreases shedding. Standard Precautions</td>
</tr>
<tr>
<td>Agent</td>
<td>In-Hospital Source</td>
<td>Potential Effect on the Fetus</td>
<td>Rate of Perinatal Transmission</td>
<td>Maternal Screening</td>
<td>Prevention</td>
</tr>
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<td>------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>HIV</td>
<td>Blood, body fluids</td>
<td>No congenital syndrome; if fetus infected, AIDS in 2–4 years</td>
<td>Depends on HIV viral titer and use of ART</td>
<td>Routine maternal screening advised</td>
<td>Antiretroviral chemophrophylaxis available for exposures, postnatal/breastfeeding chemophrophylaxis for HIV+ mothers and their infants. Standard Precautions</td>
</tr>
<tr>
<td>HIV</td>
<td>Blood, body fluids</td>
<td>No congenital syndrome; influenza in mother could cause hypoxia in fetus</td>
<td>Rare</td>
<td>None</td>
<td>Non-live vaccine (such as trivalent inactivated) for all pregnant HCW during influenza season. Droplet Precautions</td>
</tr>
<tr>
<td>Measles</td>
<td>Respiratory secretion, coughing</td>
<td>Prematurity, spontaneous abortion, no congenital syndrome</td>
<td>Rare</td>
<td>Antibody test</td>
<td>Vaccine contraindicated during pregnancy. Vaccination recommended prior to conception. Airborne Precautions</td>
</tr>
<tr>
<td>Neisseria</td>
<td>Respiratory secretion of untreated patients or those patients who have received antimicrobials for &lt; 24 hours</td>
<td>Sepsis No congenital syndrome</td>
<td>Unknown</td>
<td>None</td>
<td>Chemoprophylaxis with ceftriaxone or azithromycin</td>
</tr>
<tr>
<td>Neisseria</td>
<td>Respiratory secretion of untreated patients or those patients who have received antimicrobials for &lt; 24 hours</td>
<td>Sepsis No congenital syndrome</td>
<td>Unknown</td>
<td>None</td>
<td>Vaccine if indicated for outbreak control Droplet Precautions, based on syndrome and for confirmed cases. Standard Precautions, especially mask, face protection for all intubations</td>
</tr>
<tr>
<td>Rubella</td>
<td>Respiratory secretions</td>
<td>Congenital syndrome</td>
<td>90% in first trimester 40–50% overall</td>
<td>Routine rubella IgG testing in pregnancy Preconception screening recommended</td>
<td>Vaccine contraindicated during pregnancy. Vaccine prior to conception No congenital rubella syndrome described for vaccine Droplet Precautions; Contact Precautions for contact with congenital rubella patients.</td>
</tr>
<tr>
<td>Syphilis</td>
<td>Blood, lesion, fluid, amniotic fluid</td>
<td>Congenital syndrome</td>
<td>Variable 10–90%, depends on stage of maternal disease and trimester of the infection</td>
<td>VDRL RPR FTA-ABS</td>
<td>Post-exposure prophylaxis with penicillin Standard Precautions, gloves until 24 hours of effective therapy completed for infants with congenital syphilis and all patients with skin and mucous membrane lesions</td>
</tr>
<tr>
<td>Agent</td>
<td>In-Hospital Source</td>
<td>Potential Effect on the Fetus</td>
<td>Rate of Perinatal Transmission</td>
<td>Maternal Screening</td>
<td>Prevention</td>
</tr>
<tr>
<td>---------------</td>
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<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tuberculosis (TB)</td>
<td>Sputum, skin lesions</td>
<td>Neonatal TB; liver most frequently infected</td>
<td>Rare</td>
<td>TB skin test Interferon gamma-release assay (IGRA) blood test; if available. Chest radiograph</td>
<td>Post-exposure prevention recommendations vary with tuberculin skin test reaction size and chest radiograph result. Airborne Precautions</td>
</tr>
<tr>
<td>Varicella-zoster</td>
<td>Droplet or airborne spread of vesicle fluid or secretions of the respiratory tract (scabs are not infective)</td>
<td>Malformations (skin, limb, central nervous system, eye); chicken pox</td>
<td>Total 25%: congenital syndrome (0–4%)</td>
<td>Antibody</td>
<td>Vaccine contraindicated during pregnancy. Vaccine prior to conception Varicella-zoster immune globulin within 96 hours’ exposure if susceptible Airborne and Contact Precautions</td>
</tr>
</tbody>
</table>

*Congenital syndrome: varying combinations of jaundice, hepatosplenomegaly, microcephaly, thrombocytopenia, anemia, retinopathy, and skin and bone lesions.

FTA-ABS = fluorescent treponemal absorption test; HbsAg = hepatitis B surface antigen; HbeAg = hepatitis B e-antigen; HBIG = hepatitis B immune globulin; IgG = immunoglobulin G; RPR = rapid plasma reagin test; VDRL = Venereal Disease Research Laboratory test

Adapted from: APIC 2014b
Laboratory Staff

HCWs in laboratories may be at increased risk of occupational exposure to the pathogens with which they work. Laboratory staff should receive specific training on the risks and how to avoid them (such as working under a biocontainment hood, using a closed centrifuge, avoiding mouth pipetting) and have access to PPE, as required, according to the procedures they perform and the pathogens with which they have contact. (Module 8, Chapter 1, Clinical Laboratory Biosafety, provides details on preventing infection among laboratory staff.) In addition to the vaccines routinely recommended for all HCWs, further vaccinations may be appropriate for HCWs working in a clinical or research laboratory (CDC 1998). National recommendations should be consulted and followed if available.

The following vaccines may be relevant for staff working with specific pathogens:

- BCG (*Mycobacterium tuberculosis*)
- Hepatitis A
- Meningococcal (*N. meningitidis*)
- Polio
- Rabies
- Typhoid

(CDC 1998)

Emergency Response Staff

HCWs who respond to emergencies and transport patients should not be overlooked during occupational health activities. These HCWs are at a high risk of exposure to bloodborne pathogens and should have access to HBV vaccination, have adequate PPE and thorough instruction on proper PPE use, and be taught to apply Standard Precautions for all patients at all times. Furthermore, they may transport patients before the infection status of the patient is known (e.g., meningococcal meningitis, influenza, novel respiratory viruses, viral hemorrhagic fever) and thus should be aware of how to apply Isolation Precautions based on disease syndromes, be informed about patients who later develop infections of occupational health concern, and be included in exposure follow-up and relevant PEP and work restrictions. (CDC 1998) (Information on syndromic Isolation Precautions can be found in Module 1, Chapter 2, Standard and Transmission-Based Precautions.)

Health Care Workers Infected with HIV and/or Hepatitis B or C

HCWs infected with HIV and/or HBV or HCV should inform the facility manager of their status. The facility IPC team should strive to prevent transmission of infections to patients and at the same time maintain the livelihood and privacy of the infected staff members. These HCWs should not be prohibited from providing patient care if they are not performing invasive procedures, the infection is well-controlled, they fully comply with recommended IPC practices, and there are no other factors that would prevent them from safely carrying out the patient care activities.

HCWs with these conditions should be closely followed up by a team of clinicians for periodical clinical monitoring, to assess treatment response and viral suppression, when appropriate, and to revise recommendations about duty restrictions accordingly. They should avoid performing procedures that may result in increased risk of contact with large amounts of blood and body fluids. There are no restrictions for those staff with viral loads less than designated levels. (Henderson et al. 2010)
The Society of Healthcare Epidemiology of America (SHEA) has classified patient care and clinical procedures into three different categories based on the risk of transmission of bloodborne pathogens:

- **Category I: Procedures with minimum risk of bloodborne virus transmission.** Clinical procedures and patient care activities that either do not involve touching patients (e.g., history taking, counseling) or are limited to touching patients’ intact skin (e.g., performing physical examinations) and mucous membranes (e.g., performing vaginal examinations, performing some dental procedures, phlebotomy). It also includes minor surgical procedures with very minimal exposure to patients’ blood and body fluids (e.g., surface stitches, gastrointestinal endoscopy procedures).

- **Category II: Procedures for which bloodborne virus transmission is theoretically possible but unlikely.** Several surgical procedures are examples of such procedures, including ophthalmic surgery, dental surgery that requires local anesthesia, minor oral surgical procedures, endoscopic and arthroscopic procedures, provision of contraceptive methods, minor gynecological procedures, starting of central lines, and medical male circumcisions.

- **Category III: Procedures for which there is definite risk of bloodborne transmission of** viruses or that have previously been classified as “exposure-prone.” All major surgical procedures that involve a high volume of blood and body fluids are Category III procedures with definite risk of exposure. Examples of Category III procedures are: general surgery; oral surgery with difficult access for suturing; emergency surgical procedures involving bleeding and exposure to a high volume of blood; obstetric procedures, including cesarean section; and orthopedic surgeries. Any major surgical procedure that goes beyond 3 hours and requires changing gloves should not include staff members infected with bloodborne pathogens.

**Managing HCWs infected with HIV and/or hepatitis B or C**

HCWs infected with bloodborne pathogens whose viral load is below the minimum designated level should follow a six-point plan described below to safely provide patient care and be productive.

The HCWs should:

1. **Not have transmitted infection to any patient.**
2. **Obtain advice from a team of clinicians about continuing to care for patients.**
3. **Undergo testing twice a year to demonstrate the maintenance of a viral burden below designated levels.**
4. **Receive follow-up by a clinician with expertise in managing bloodborne pathogen infections and consent to share their results with the IPC/occupational health team at the facility.**
5. **Consult closely with experts on the use of optimal IPC procedures:**
   a. This may include guidance on double gloving, changing gloves during procedures, avoiding digital palpation of needle tips, and performing all procedures under direct view. It also includes promptly withdrawing from a procedure if they have any injury that bleeds and informing the IPC/occupational health team about any injuries.
   b. Adhere strictly to recommended procedures, including the routine use of double gloving for Category II (such as minor surgery) and Category III (such as major surgery) procedures and frequent glove changes during procedures, particularly if performing technical tasks that have a potential to compromise glove integrity.
6. Agree in writing to comply with recommendations and guidance of the expert clinicians as well as the facility IPC/occupational health and management team.

*Adapted from:* Henderson et al. 2010.

### Monitoring Prevention of Occupational Exposures and Injuries

Health care facilities should evaluate the effectiveness of occupational health interventions and practices on a routine basis. They should conduct surveillance to collect, analyze, and disseminate data on risks to HCWs. There should be a system to report any occupational exposure and injury, which should be supported by prompt management and PEP. The rates of injuries or exposures among HCWs should be routinely reviewed and reported back to the staff, and strategies and action plans to prevent future injuries should be developed and updated. (The principles of surveillance are discussed in Module 9, Chapter 2, Introduction to Surveillance of Health Care-Associated Infections.)

Surveillance activities can be conducted by the staff organizing occupational health activities at the facility and/or with the assistance of IPC staff. Table 2-8 outlines three examples of how to calculate rates of reported sharps injuries that can be used to measure performance improvement.

**Table 2-8. Calculation of Rates to Measure and Compare Reported Sharps Injuries**

<table>
<thead>
<tr>
<th>Metric</th>
<th>How to Calculate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of sharps injuries reported per year</td>
<td>(Number of sharps injuries reported in 1 year/average daily occupied beds during that year) x 100</td>
</tr>
</tbody>
</table>

Application:

**Calculate Rates:**

1. **2015**
   
   (20 sharps injuries reported in 2015/average daily occupied beds during 2015 was 80 per day) x 100
   
   = (20/80) x 100 = Rate of 25 sharps injuries per 100 occupied beds in 2015

2. **2016**
   
   (10 sharps injuries reported in 2016/average daily occupied beds during 2016 was 100 occupied beds) x 100
   
   = (10/100) x 100 = Rate of 10 sharps injuries per 100 occupied beds in 2016

Such calculations allow comparisons of yearly rates. The rates for 2016 were much lower than the rates in 2015.

**Rate of sharps injuries per occupational category per year**

(Number of sharps injuries reported in an occupational category in 1 year/Number of full-time equivalents (FTEs) of the same occupational category employed in that year)

*Note: The category of HCW must be identified when each sharps injury is reported.*
### Application:

**Occupational breakdown of sharps injuries:** In 2015: surgeons 5; nurses 10; rubbish collectors 5

### Calculate Rates for Each:

<table>
<thead>
<tr>
<th>Metric</th>
<th>How to Calculate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. <strong>Surgeons</strong></td>
<td>(5 sharps injuries reported by surgeons in 2015/7 FTE surgeons employed in 2015) = 5/7 = Rate of 0.7 sharps injury per FTE surgeon in 2015</td>
</tr>
<tr>
<td>4. <strong>Nurses</strong></td>
<td>(10 sharps injuries reported by nurses in 2015/100 FTE nurses employed in 2015) = 10/100 = Rate of 0.1 sharps injury per FTE nurse in 2015</td>
</tr>
<tr>
<td>5. <strong>Rubbish collectors</strong> (5 sharps injuries reported by rubbish collectors in 2015/5 FTE rubbish collectors employed in 2015)</td>
<td>= 5/5 = Rate of 1 sharps injury per FTE rubbish collectors in 2015</td>
</tr>
</tbody>
</table>

In a comparison of sharps injuries by occupational categories, it is evident that the rubbish collectors had the highest rate of 1 per FTE rubbish collectors in 2015. The health care facility should prioritize interventions to reduce sharps injuries among the rubbish collectors.

### Rate of sharps injury per device type per year

(Number of sharps injuries from a device type in 1 year/number of the devices of that type used in that year) x 100

*Note: The type of device must be identified when each sharps injury is reported.*

### Application:

**Breakdown of devices causing sharps injuries:** In 2015: removable-blade scalpel 3; disposable fixed-blade scalpel 1

### Calculate Rates for Each:

<table>
<thead>
<tr>
<th>Metric</th>
<th>How to Calculate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Removable-blade scalpel</strong></td>
<td>(3 sharps injuries from removable-blade scalpel in 2015/100 removable-blade scalpels used in 2015) x 100 = (3/100) x 100 = Rate of 3 sharps injuries per 100 removable-blade scalpels in 2015</td>
</tr>
<tr>
<td><strong>Disposable scalpel</strong></td>
<td>(1 sharps injury from disposable scalpel in 2015/500 disposable scalpels used in 2015) x 100 = (1/500) x 100 = Rate of 0.2 sharps injuries per 100 disposable scalpels in 2015</td>
</tr>
</tbody>
</table>

### Compare rates between occupational categories:

Comparison of the rates indicates that removable-blade scalpels are 15 times riskier than disposable scalpels. This will help the health care facility make a strong case for replacing removable blade scalpels with disposable scalpels.

*Sources: APIC 2014a; Jagger 1992.*
Summary

In the course of their duties, millions of HCWs around the world are routinely exposed to a variety of health and safety hazards, including infectious agents. Infections can be transmitted to HCWs, who can in turn transmit the infections to patients and others. The goals of IPC intersect with those of occupational health activities in preventing and addressing infectious hazards at health care facilities. Therefore, IPC staff should be involved in occupational health activities at the facility, and occupational health staff should be knowledgeable about IPC.

IPC elements of an occupational health program include surveillance, education, immunization, and exposure prevention and response. Protection of staff by the application of Standard Precautions to every patient, every time, and use of disease- or syndrome-specific Transmission-Based Precautions to prevent exposures to infectious agents are essential to prevent occupational exposures. Recommendations for managing specific occupational exposures and infections in staff members are based on the epidemiology of infectious disease transmission in health care facilities and they should target HCWs as potential sources or hosts. Special attention may be needed for specific groups of employees with potential increased risk of exposure (laboratory, pregnant, and emergency response personnel, and HCWs infected with HBV, HCV, and HIV). Finally, the effectiveness of interventions to protect HCWs from occupational infection should be evaluated. Monitoring progress and identifying causes, with feedback to key persons, can enhance prevention activities.
### Appendix 2-A. Risk and Work Restriction for Health Care Workers Exposed to or Infected with Infectious Diseases of Importance in Health Care Settings

This information is to be used in the absence of local regulations.

<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cholera</strong></td>
<td>Fecal-oral contaminated water</td>
<td>Rare</td>
<td>Rare</td>
<td>Hours to 5 days, shedding up to 10 days after cessation</td>
<td>Stool contact, unwashed hands</td>
<td>Hand hygiene, Contact Precautions, clean environment</td>
<td>Yes; No recommendation for HCWs</td>
</tr>
<tr>
<td><strong>Conjunctivitis due to adenovirus</strong></td>
<td>Contact with eye secretions and contaminated surfaces and equipment</td>
<td>High</td>
<td>High</td>
<td>5–12 days, shedding from incubation period until 14 days after onset</td>
<td>Surfaces, equipment, unwashed hands</td>
<td>Hand hygiene, Contact Precautions, clean instruments and equipment</td>
<td>No</td>
</tr>
<tr>
<td><strong>Cytomegalovirus (CMV)</strong></td>
<td>Contact with urine, saliva, breast milk, cervical secretions, and semen from infected person who is actively shedding virus</td>
<td>Rare</td>
<td>Rare</td>
<td>Unknown</td>
<td>Contact with body fluids, especially saliva, blood, and urine, possibly unwashed hands</td>
<td>Hand hygiene, Standard Precautions</td>
<td>No</td>
</tr>
</tbody>
</table>

**Work restrictions:** No duty. Restrict from food handling.

**Duration of restrictions:** Until 48 hours after last episode of diarrhea except for food handlers: 2 consecutive negative fecal specimens at least 48 hours apart and at least 48 hours after stopping antibiotics are required.*

**Work restrictions:** No contact with patient or patient environment.

**Duration of restrictions:** Until discharge from eye ceases.

**Work restrictions:** No restriction.

**Duration of restrictions:** None.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrheal diseases</td>
<td>Contact with infected person’s stool, consumption of contaminated food or water, contact with objects or environment contaminated with stool</td>
<td>Varies</td>
<td>Varies</td>
<td>Stool contact, unwashed hands, contaminated environmental surfaces, contaminated food or water</td>
<td>Hand hygiene, Contact Precautions, clean environment</td>
<td>See specific disease</td>
<td>No</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Diphtheria</td>
<td>By respiratory droplets, contact with skin lesions</td>
<td>No data</td>
<td>Rare</td>
<td>2–5 days, infectious for 2 weeks</td>
<td>Close contact, face-to-face exposure, cough</td>
<td>Hand hygiene, Droplet Precautions for pharyngeal lesions, Contact Precautions for skin lesions</td>
<td>Yes, and booster every 10 years†</td>
</tr>
<tr>
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</tr>
<tr>
<td>Hemorrhagic fever (e.g., Ebola, Marburg, Lassa virus)</td>
<td>Bloodborne; possible contact transmission</td>
<td>Negligible</td>
<td>Moderate to high</td>
<td>Exposure of mucous membranes or respiratory tract, through broken skin or sharps injury</td>
<td>Hand hygiene, Barrier Precautions to achieve full skin coverage to be used with training and trainer observer to monitor</td>
<td>No</td>
<td>Antivirals should be discussed</td>
</tr>
</tbody>
</table>

Work restrictions: Active disease: No duty; Asymptomatic carriers: No duty.
Duration of restrictions: Until antibiotic therapy completed and 2 negative cultures more than 24 hours apart.

Caring for EVD patients with adequate PPE and no known exposure: Active monitoring for fever and symptoms twice per day. Off duty if any symptoms. Work restrictions: Active suspected or confirmed: Off duty. Post-exposure: Off duty. With active monitoring for fever and symptoms twice per day.
Duration of restrictions: Active: Until cleared by medical staff. Post-exposure: Until 21 days after last exposure.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hepatitis A</strong></td>
<td>Person-to-person by fecal-oral route; infected food handlers with poor personal hygiene can contaminate food</td>
<td>Rare</td>
<td>Rare</td>
<td>15–50 days</td>
<td>Hand hygiene, Contact Precautions, especially with babies and incontinent patients</td>
<td>Yes; HCWs are not considered at increased risk</td>
<td>Immune globulin</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Hepatitis B (HBV)</strong></td>
<td>Via sharps, mucosal, and non-intact skin, contact with blood, semen, vaginal secretions, and bloody fluids</td>
<td>Low</td>
<td>Moderate, 2–40% after percutaneous injury from infected patient</td>
<td>45–180 days (average 60–90 days)</td>
<td>Sharps injury, blood and serum-derived body fluid splashes to mucous membranes</td>
<td>Hand hygiene, Standard Precautions, including prevention of sharps injury, vaccination</td>
<td>Yes; Recommended for all HCWs†</td>
</tr>
</tbody>
</table>

Work restrictions: No contact with patient or the patient environment, or food handling. Duration of restrictions: Until 7 days after the onset of jaundice.

Work restrictions: Acute or chronic HBV: Do not exclude from duty but restrictions apply depending on circulating viral levels and procedures performed by HCW. Requires review by occupational health/IPC personnel and possibly an expert review panel.
Duration of restrictions: Different recommendations if HepB antigen is positive or negative and if HBV is \( \leq 10^4 \text{ GE/mL} \) (genome equivalents/milliliter plasma) or \( \geq 10^5 \text{ GE/mL} \).
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis C⁰</td>
<td>Via sharps, mucosal, and non-intact skin contact with blood, semen, vaginal secretions, and bloody fluids</td>
<td>Low</td>
<td>Moderate, 0–10% (average 1.8%) after percutaneous injury from infected patient</td>
<td>6–7 weeks</td>
<td>Sharps injury, splash on mucous membranes or non-intact skin</td>
<td>Hand hygiene, Standard Precautions, including prevention of sharps injury</td>
<td>No</td>
</tr>
<tr>
<td>Hepatitis E</td>
<td>Person to person by fecal-oral route, contaminated water, contaminate food</td>
<td>—</td>
<td>2–9 weeks</td>
<td>Contaminated food or water, unwashed hands</td>
<td>Hand hygiene, Standard Precautions</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Herpes simplex⁰</td>
<td>Contact with virus in saliva of carriers, contact with vesicle fluid</td>
<td>Rare</td>
<td>Low</td>
<td>2–14 days</td>
<td>Contact with infected site or saliva, vaginal secretions, or amniotic fluid</td>
<td>Hand hygiene, Standard Precautions⁰ (Contact Precautions in disseminated infection)</td>
<td>No</td>
</tr>
</tbody>
</table>

Work restrictions: Acute or chronic HCV: Do not exclude from duty but restrictions apply depending on circulating viral levels and procedures performed by HCW. Requires review by occupational health/IPC personnel and possibly an expert review panel.# Post-exposure:§ Duration of restrictions: Different recommendations if HCV is < 10⁴ GE/mL or > 1⁰⁴ GE/mL.# Work restrictions: Off duty. Duration of restrictions: Duration of illness, viral shedding in stool occurs 7–30 days after onset of jaundice. Work restrictions: Genital: No restriction. Hands (herpetic whitlow): No contact with patient or the patient environment. Orofacial: No contact with high-risk patients.⁰ Duration of restrictions: Genital: None. Hands (herpetic whitlow): Until lesions heal.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human immunodeficiency virus (HIV)⁰</td>
<td>Primarily via sharps contact with blood; mucosal or non-intact skin contact with blood; semen, vaginal secretions, and bloody body fluids less likely to transmit</td>
<td>Rare</td>
<td>Low, 0.2–0.4% after sharps exposure to infected person</td>
<td>Within 6 months</td>
<td>Sharps injury, splash on mucous membranes or non-intact skin</td>
<td>Hand hygiene, Standard Precautions including prevention of sharps injury</td>
<td>No</td>
</tr>
<tr>
<td>Influenza⁰</td>
<td>Droplet spread; direct droplet transmission or droplet-to-contact transmission of respiratory secretions of infected patients</td>
<td>Moderate</td>
<td>Moderate</td>
<td>1–5 days</td>
<td>Close contact with patient (within 1–2 meters from coughing/sneezing)</td>
<td>Hand hygiene, Droplet Precautions, annual vaccine</td>
<td>Yes; annual immunization with a single dose recommended yearly for HCW*</td>
</tr>
</tbody>
</table>

Work restrictions: Acute or chronic HIV: Do not exclude from duty but restrictions apply depending on circulating viral levels and procedures performed by HCW. Requires review by occupational health/IPC personnel and possibly an expert review panel.§ Post-exposure:§ Duration of restrictions: Different recommendations if circulating HIV viral burden is < $5 \times 10^2$ GE/mL or ≥ $5 \times 10^2$ GE/mL.

Work restrictions: No contact with high-risk patients§ during community outbreaks. Duration of restrictions: Until acute symptoms resolve.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measles</strong>&lt;sup&gt;0&lt;/sup&gt;</td>
<td>Airborne; direct airborne transmission or airborne-to-contact transmission of respiratory secretions of infected person</td>
<td>High</td>
<td>High</td>
<td>5–21 days</td>
<td>Inhaling droplets and airborne virus or contact with the patient’s respiratory secretions</td>
<td>Hand hygiene, Airborne and Contact Precautions, vaccine</td>
<td>Yes; all HCWs should be immune to measles, proof of immunity or immunization required pre-patient contact†</td>
</tr>
<tr>
<td><strong>Meningococcal infectious</strong> N. meningitides</td>
<td>Droplet spread; direct droplet transmission or droplet-to-contact transmission of respiratory secretions of infected patients</td>
<td>—</td>
<td>Rare</td>
<td>2–10 days</td>
<td>Close contact (face to face) with respiratory secretions of patients with meningococcemia or meningococcal meningitis</td>
<td>Hand hygiene, Droplet Precautions</td>
<td>Yes; recommended for HCWs at risk of exposure‡ (tetravalent A, C, W135, and Y)</td>
</tr>
</tbody>
</table>

Duration of restrictions: Active: 7 days after rash appears. Post-exposure: From 5th day after first exposure through 21st day after last exposure and/or 4 days after rash appears.

Work restrictions: Active: No duty. Post-exposure: No restrictions. Recommended prophylaxis includes: rifampin (600 mg twice a day for 2 days), a single dose of ciprofloxacin (500 mg), or a single dose of ceftriaxone (250 mg) IM.
Duration of restrictions: Active: Until 24 hours after start of effective antibiotic therapy. Post-exposure: No restrictions.
<table>
<thead>
<tr>
<th>Disease/ Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumps</td>
<td>Droplet spread; direct droplet transmission or droplet-to-contact transmission of respiratory secretions and saliva of infected patients</td>
<td>Moderate</td>
<td>Moderate</td>
<td>12–25 days</td>
<td>Close contact with patient (within 1–2 meters from coughing/sneezing)</td>
<td>Hand hygiene, Droplet Precautions</td>
<td>Yes; HCWs are not indicated as a group at increased risk†</td>
</tr>
<tr>
<td>Methicillin-resistant S. aureus (MRSA) infection</td>
<td>Direct and indirect contact</td>
<td>Rare</td>
<td>Rare</td>
<td>Depends on the type of infection</td>
<td>Unwashed hands, contaminated surfaces, contaminated equipment</td>
<td>Hand hygiene, Contact Precautions</td>
<td>No</td>
</tr>
<tr>
<td>Norovirus</td>
<td>Fecal-oral (direct or indirect contact with patient’s stool or vomit), contaminated surfaces, contaminated food or water</td>
<td>High</td>
<td>High</td>
<td>12–48 hour</td>
<td>Stool or vomit contact, possibly aerosol transmission during vomiting</td>
<td>Hand hygiene, Contact Precautions, clean equipment, clean environment</td>
<td>No</td>
</tr>
</tbody>
</table>

Duration of restrictions: Active: 9 days after onset of parotitis. Post-exposure: From 12th day after first exposure through 26th day after last exposure or 9 days after onset of parotitis.

Work restrictions: Active, draining skin lesions: No contact with patient or the patient environment, or food handling. Carrier: No restriction unless epidemiologically linked with transmission of the organism.
Duration of restrictions: Until lesions have resolved.

Work restrictions: Acute: No contact with patient or the patient environment, or food handling.
Duration of restrictions: Until symptoms resolve, viral shedding in stool may occur.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parvovirus B19 (erythema infectiosum or fifth disease)</td>
<td>Contact with infected persons, fomites, or respiratory secretions</td>
<td>—</td>
<td>Rare</td>
<td>6–10 days</td>
<td>Respiratory secretions</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Work restrictions: Acute: Off duty. Exposed: no restriction. Duration of restrictions: 7 days after onset of illness.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Pertussis (whooping cough)</td>
<td>Droplet spread; direct droplet transmission or droplet-to-contact transmission of respiratory secretions of infected patients</td>
<td>Moderate</td>
<td>Moderate</td>
<td>7–10 days</td>
<td>Respiratory secretions and respiratory droplets</td>
<td>Hand hygiene, Droplet Precautions</td>
<td>Yes; recommendation for HCWs currently under review†</td>
</tr>
<tr>
<td></td>
<td>Work restrictions: Active: Off duty. Post-exposure asymptomatic: No restriction if PEP received. Post-exposure symptomatic: Off duty. Duration of restrictions: Active: from beginning of catarrhal stage through 3rd week after onset of paroxysms. Post-exposure: Until 5 days of effective antibiotic therapy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Poliomyelitis</td>
<td>Contact with feces or urine of infected person, respiratory secretions and fomites</td>
<td>Rare</td>
<td>Rare</td>
<td>3–21 days, vaccine-associated polio (oral vaccine): 7–21 days after vaccination</td>
<td>Feces, respiratory secretions, lab specimens</td>
<td>Hand hygiene, Contact Precautions</td>
<td>Yes; all HCWs should have completed a full course of primary vaccination against polio†</td>
</tr>
<tr>
<td></td>
<td>Work restrictions: Active: Off duty. Post-exposure: Vaccination series or booster. Duration of restrictions: Duration of illness.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Disease/Infection/Syndrome</td>
<td>Mode of Transmission</td>
<td>Transmission Risk</td>
<td>Incubation Period</td>
<td>Main Risk in Health Care Facility</td>
<td>Prevention</td>
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<td>Post-Exposure Prophylaxis (PEP) Available</td>
</tr>
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</tr>
<tr>
<td>Rabies</td>
<td>Animal bite, saliva, tissue and organ transplants</td>
<td>Rare</td>
<td>Rare</td>
<td>1–3 months</td>
<td>Lab samples, saliva of infected patients (theoretical)</td>
<td>Hand hygiene, Standard Precautions</td>
<td>Yes; HCWs are not at increased risk</td>
</tr>
<tr>
<td>Respiratory syncytial virus (RSV)</td>
<td>Droplet contact or direct contact with respiratory secretions</td>
<td>Moderate</td>
<td>Moderate</td>
<td>2–8 days</td>
<td>Respiratory secretions, hands, and fomites</td>
<td>Hand hygiene, Contact Precautions</td>
<td>No</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Person-to-person via fecal-oral route; food handlers may contaminate food</td>
<td>Moderate</td>
<td>Moderate</td>
<td>2–3 days</td>
<td>Stool contact, unwashed hands, environmental surfaces, fomites</td>
<td>Hand hygiene, Contact Precautions, clean environment, clean equipment</td>
<td>Yes; adults including HCWs are not at increased risk of severe disease†</td>
</tr>
</tbody>
</table>


Work restrictions: No contact with high-risk patients during community outbreaks. Duration of restrictions: Until acute symptoms resolve.

Work restrictions: Acute: No contact with patient or the patient environment, or food handling. Duration of restrictions: Until symptoms resolve.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubella</td>
<td>Droplet contact or direct contact with respiratory secretions; airborne transmission not demonstrated</td>
<td>Moderate</td>
<td>Moderate</td>
<td>12–23 days</td>
<td>Respiratory droplets and secretions</td>
<td>Droplet Precautions (acute infection), Contact Precautions (congenital rubella)</td>
<td>Yes; all HCWs should be immune to rubella and proof of immunity or immunization required pre-patient contact†</td>
</tr>
<tr>
<td>Salmonella or shigella</td>
<td>Person-to-person via fecal-oral route, via contaminated food or water; food handlers with poor personal hygiene can contaminate food</td>
<td>Low</td>
<td>Low</td>
<td>1–3 days</td>
<td>Stool contact, unwashed hands</td>
<td>Hand hygiene, Contact Precautions for incontinent patients and babies</td>
<td>Yes (typhoid), currently no recommendation regarding HCWs†</td>
</tr>
<tr>
<td>Novel respiratory viruses (SARS, bird flu, MERS-CoV, etc.)</td>
<td>Droplets, contact (possibly airborne)</td>
<td>Medium</td>
<td>Medium</td>
<td>Varies</td>
<td>Small droplets from respiratory secretions, possibility of airborne transmission</td>
<td>Hand hygiene, Droplet and Contact Precautions, use Airborne Precautions if possible</td>
<td>No</td>
</tr>
</tbody>
</table>

Duration of restrictions: Active: Until 5 days after rash appears. Post-exposure: From 7th day after first exposure through 21st day after last exposure.

Work restrictions: Acute: No contact with patient or the patient environment, or food handling. Carrier: No restriction from patient care unless staff member handles food* or is epidemiologically linked with transmission of the organism.
Duration of restrictions: Until symptoms resolve unless food handler,* in which case a specific number of negative cultures is required.

Work restrictions: Acute: No duty.
Duration of restrictions: Until acute symptoms resolve.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Staff to Patient</th>
<th>Patient to Staff</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em> infection (see also MRSA)</td>
<td>Direct and indirect contact</td>
<td>Rare</td>
<td>Rare</td>
<td>Foodborne: 30 minutes–6 days Impetigo: 1–10 days Toxic shock syndrome: 2 days</td>
<td>Unwashed hands, contaminated surfaces, contaminated equipment</td>
<td>Hand hygiene, Contact Precautions</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Scabies</td>
<td>Direct skin-to-skin contact with infested person</td>
<td>Low (typical scabies) to moderate (crusted scabies)</td>
<td>Low (typical scabies), moderate (crusted scabies)</td>
<td>2–6 weeks</td>
<td>Prolonged skin-to-skin contact (typical scabies), skin-to-skin contact during daily care (crusted scabies), infrequently fomites</td>
<td>Hand hygiene, Contact Precautions, clean environment, clean equipment</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Work restrictions: Active, draining skin lesions: No contact with patient or the patient environment, or food handling. Carrier: No restriction unless epidemiologically linked with transmission of the organism. Duration of restrictions: Until lesions have resolved.

<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Streptococcus, Group A (GAS)</strong></td>
<td>Droplet contact or direct contact with oral secretions or drainage from infected wounds</td>
<td>Rare</td>
<td>No data</td>
<td>Pharyngitis 2–5 days, impetigo 7–10 days, other infections variable</td>
<td>Contact with infected secretions; HCWs are rarely carriers</td>
<td>Hand hygiene; precautions depend on type of infection – Minor skin and endometritis: Standard Precautions, Major skin: Contact Precautions, Respiratory tract, scarlet fever and invasive disease: Droplet Precautions</td>
<td>No</td>
</tr>
<tr>
<td><strong>Tuberculosis (TB)</strong></td>
<td>Airborne transmission from sources with active pulmonary or laryngeal tuberculosis; susceptible person must inhale airborne droplet nuclei to become infected</td>
<td>Low to high</td>
<td>Low to high</td>
<td>Weeks to years</td>
<td>Incomplete implementation of recommend control measures, including patient placement, facility ventilation, and personal respiratory protection</td>
<td>Airborne Precautions</td>
<td>Yes, BCG; There is no recommendation for HCWs in routine circumstances</td>
</tr>
</tbody>
</table>

Work restrictions: Active: No contact with patient or the patient environment, or food handling. Carrier: No restriction unless linked with transmission. Duration of restrictions: Until 24 hours after effective treatment is started.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Healthcare Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicella, chicken pox, disseminated zoster&lt;sup&gt;0&lt;/sup&gt;</td>
<td>Contact with vesicles; droplet or airborne spread from respiratory tract</td>
<td>High</td>
<td>High</td>
<td>10–21 days (up to 28 days in person who receives varicella-zoster immune globulin [VZIG])</td>
<td>Contact with lesions and aerosols even without direct contact with the infected patient</td>
<td>Airborne and Contact Precautions</td>
<td>Yes; consider vaccination of potentially susceptible HCWs (i.e., unvaccinated and with no history of varicella)</td>
</tr>
</tbody>
</table>

Duration of restrictions: Active: Until all lesions are dry and crusted. Post-exposure: From 10<sup>th</sup> day after first exposure through 21<sup>st</sup> day (28<sup>th</sup> if VZIG is given) after last exposure.

| Localized varicella-zoster (shingles) | Contact with vesicles; perhaps droplet or airborne spread from respiratory tract from disseminated zoster | Moderate | Moderate | Years after acute infection | Contact with lesions and perhaps aerosols from respiratory tract from disseminated zoster | Contact Precautions and Airborne Precautions for disseminated zoster | Yes; see above; shingles vaccine not recommended specifically for HCWs | VZIG |

Work restrictions: Localized in healthy person: Cover lesions, no contact with high-risk patients.<sup>6</sup> Generalized or localized in immunosuppressed person: No patient contact.
Post-exposure in non-immune people: No patient contact.
Duration of restrictions: Active and generalized: Until all lesions are dry and crusted. Post-exposure: From 10<sup>th</sup> day after first exposure through 21<sup>st</sup> day (28<sup>th</sup> if VZIG is given) after last exposure or if varicella occurs, until all lesions dry and crusted.
<table>
<thead>
<tr>
<th>Disease/Infection/Syndrome</th>
<th>Mode of Transmission</th>
<th>Transmission Risk</th>
<th>Incubation Period</th>
<th>Main Risk in Health Care Facility</th>
<th>Prevention</th>
<th>Vaccine Available</th>
<th>Post-Exposure Prophylaxis (PEP) Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral respiratory infections, acute febrile</td>
<td>Respiratory secretions</td>
<td>Moderate</td>
<td>Moderate</td>
<td>1–7 days</td>
<td>Droplet contact or direct contact with respiratory secretions, close contact (1–2 meters) with patient</td>
<td>Respiratory etiquette, hand hygiene, Droplet Precautions, annual vaccine</td>
<td>Yes (influenza only)</td>
</tr>
</tbody>
</table>

Work restrictions: No contact with high-risk patients\(^\circ\) during community outbreaks.
Duration of restrictions: Until acute symptoms resolve.

\(^\sharp\) PPE—Post-exposure prophylaxis; see Chapter 3, Sharps Injuries and Management of Exposure to Bloodborne Pathogens, in this module for details about PEP for bloodborne pathogens.
\(^\circ\) See section above on Health Care Workers Infected with HIV and/or Hepatitis B or C.
\(^\circ\) For information relevant to exposure of pregnant personnel, see Table 2-7 in this chapter.
\(^\circ\) Definition of high-risk patient: neonates and immunocompromised persons of any age. For influenza, also those > 65 years, residents of nursing homes, persons with chronic pulmonary or cardiac conditions, diabetes. (CDC 1998)
\(^\|\) Definition of close contact: Direct, mouth-to-mouth contact as in resuscitation attempts, endotracheal intubation, endotracheal tube management, or close examination of oropharynx of patients. (CDC 1998; WHO 2002)
\(^\|\) For vaccine recommendations for HCWs (WHO 2016b), see Table 2-4.
\(^*\) For management of illness in food handlers, see Module 5, Chapter 3, Managing Food and Water Services for the Prevention of Health Care-Associated Infections.
References


Chapter 3. Sharps Injuries and Management of Exposure to Bloodborne Pathogens

Key Topics
- Safe and unsafe sharps tasks
- The risk of exposure to bloodborne pathogens
- Prevention of exposure to bloodborne pathogens
- Strategies to reduce sharps injuries
- Management of exposure to bloodborne pathogens

Key Terms
- **Bloodborne pathogens** are infectious microorganisms (bacteria, viruses, and other microorganisms) contained in blood and other potentially infectious body fluids (including urine, respiratory secretions, cerebrospinal, peritoneal, pleural, pericardial, and synovial amniotic fluids, semen, vaginal secretions, breast milk, and saliva). The pathogens of primary concern are hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV.
- **Hands-free technique** is the technique for transferring sharp instruments to reduce the risk of injuries. It consists of the indirect transfer of instruments between health care workers (HCWs) performing a procedure so that only one person touches the same sharp item at any time. Items are usually placed in a designated neutral or safe zone, which can be a section of the surgical field or a container, from where they can be picked up.
- **Neutral (safe) zone** is a designated area on the sterile field during procedures where sharps can be placed by an HCW and then picked up by another HCW.
- **Occupational exposure to blood and body fluid** is the exposure of an HCW to blood or other potentially infectious materials during the performance of an employee's duties. Exposure to bloodborne pathogens involves skin, eye, mucous membrane, or parenteral contact (e.g., a needle stick).
- **Partial or limited hands-free technique** is used to hand a sharp instrument directly to the HCW performing a procedure (e.g., surgeon) and to return the instrument to the assistant HCW via a neutral zone.
- **Post-exposure prophylaxis (PEP)** is a preventive medical treatment that a person may take following exposure to potentially infectious bloodborne pathogens, such as HIV or HBV, to prevent becoming infected from the exposure. Post-exposure prophylaxis can also be taken following exposure to non-bloodborne pathogens such as invasive Group A streptococcal infections, invasive meningococcal infections, and pertussis.
- **Sharps** are instruments, needles, and any other objects that can easily penetrate through the skin.
- **Sharps injuries** are injuries from a “sharp” penetrating the skin. “Sharps” include syringe needles, scalpels, broken glass, and other objects that may be contaminated with blood or body fluids. These injuries potentially expose HCWs to infections from bloodborne pathogens.
Sharps Injuries and Exposure to Bloodborne Pathogens

- **Sharps injury prevention strategies** are measures taken to prevent injuries while handling sharps. These measures include elimination of hazards and the use of engineering controls, administrative controls, work space practices, and personal protective equipment.

- **Standard Precautions** are a set of infection control practices (IPC) used for every patient encounter to reduce the risk of transmission of bloodborne and other pathogens from both recognized and unrecognized sources. They are the basic level of infection control practices to be used, at a minimum, in preventing the spread of infectious agents to all individuals in the health care facility.

**Background**

Globally, HCWs are at an increased risk of exposure to bloodborne pathogens (HBV, HCV, and HIV) because they handle sharps during the course of their duties. It is estimated that 39% of HCV, 37% of HBV, and 4.4% of HIV infection among HCWs worldwide are attributable to occupational exposure to sharps injuries (Prüss-Üstün et al. 2005). According to estimates in the World Health Organization (WHO) sharps injuries report (2005), the Eastern Mediterranean region had the highest incidence of sharps injuries, with 4.86 injuries per HCW; the African regions had an estimated incidence of 2.1. The regions with the lowest incidence of sharps injuries were the United States, Northern Europe, and the Western Pacific, with 0.18, 0.64, and 0.74 per HCW respectively. (Rapiti et al. 2005)

Understanding the risk of exposure to blood and body fluids is important for all HCWs. Implementing recommended IPC practices, technological advances, and a greater emphasis on a culture of safety in health care facilities have reduced sharps injuries in many settings. While safer practices have been available for some time, effective implementation of these safety standards has been a challenge for many low- and middle-income countries. Table 3-1 provides examples of safe and unsafe practices in the use of sharps. (Also see Module 8, Chapter 1, Clinical Laboratory Biosafety.)

<table>
<thead>
<tr>
<th>Sharps Task</th>
<th>Unsafe</th>
<th>Safe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suture needle</td>
<td>Using fingers to load or reposition needle</td>
<td>Using an instrument to load or reposition needle</td>
</tr>
<tr>
<td>Tying suture</td>
<td>Exposed needle when tying suture (not loose)</td>
<td>Needle is off/on driver during tying (protected or loose)</td>
</tr>
<tr>
<td>Tissue retraction</td>
<td>Using hand/fingers to retract wound edges when using sharps</td>
<td>Using instrument to retract wound edge when using sharps</td>
</tr>
<tr>
<td>Injection needle</td>
<td>Injecting toward hand/fingers; 2-handed needle capping</td>
<td>Injecting away from hand/fingers, no 2-handed needle capping</td>
</tr>
<tr>
<td>Placement of sharps in sterile field</td>
<td>Sharps left in operative field unattended</td>
<td>Placing sharps back onto a neutral hands-free zone* while not in use</td>
</tr>
<tr>
<td>Passage of sharps</td>
<td>Passing sharps to another individual (i.e., hand to hand)</td>
<td>Using neutral zone or hands-free zone*</td>
</tr>
<tr>
<td>Verbal communication about sharps</td>
<td>Unclear/no verbal notification when passing sharps</td>
<td>Clear verbal notification when passing sharps</td>
</tr>
<tr>
<td>Disposing of sharps</td>
<td>Sharps container not positioned close to procedure</td>
<td>Sharps container positioned within easy reach of procedure</td>
</tr>
</tbody>
</table>

Source: Tso et al. 2012. (*See Appendix 3-B*, Neutral and Safe Zone Using Hands-Free Technique.)
Risk of Exposure to Bloodborne Pathogens

Certain practices in the health care facility increase the risk of exposure to blood and body fluids. For example, HCWs often use and pass sharp instruments without looking or letting other HCWs know what they are doing. The work area is often a confined space requiring HCWs to be aware of their surroundings at all times during the procedure. Waste disposal containers are often not positioned close to the areas where procedures are performed. HCWs often have time pressures to complete their duties. This is especially the case for surgical procedures and emergency medical care. In addition, the operating theater (OT) presents additional challenges: the ability to see what is going on in the operative field may be poor for some members of the team. Procedures involving a high volume of blood and greater length of time (e.g., cardiac, obstetric, and orthopedic surgeries), in general, are more likely to result in exposure to blood and body fluids. The type of environment in the OT may result in anxiety, fatigue, and frustration that can impact HCWs’ judgment.

Exposure to blood and body fluids may occur without the HCW’s knowledge and is noticed when the gloves are removed at the end of the procedure, which prolongs the duration of exposure. Intact skin is an adequate barrier against bloodborne pathogens such as HBV, HCV, and HIV, but fingers are frequently the site of minor scratches and cuts, increasing the risk of infection.

Objects That Cause Injuries

The vast majority of sharps injuries in health care facilities occur in the OT. The most common sources of sharps injuries are suture needles, followed by scalpels. There are many other items that can cause sharps injuries and glove tears, resulting in exposure to blood and body fluids (see Tables 3-2 and 3-3). These items include:

- Hypodermic needles
- Wire sutures
- Laparoscopy and surgical drain trocars
- Orthopedic drill bits, screws, pins, wires, and saws
- Needle-point cautery tips
- Skin hooks and towel clips
- Sharp-pointed scissors and sharp-tipped mosquito forceps
- Dissecting forceps
- Sharp-toothed tenacula

Table 3-2. Surgical Staff Injuries, by Instrument and Use

<table>
<thead>
<tr>
<th>Use</th>
<th>Suture Needles</th>
<th>Scalpel Blades</th>
<th>Disposable Syringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>During use and passing between steps</td>
<td>84%</td>
<td>70%</td>
<td>52%</td>
</tr>
<tr>
<td>Assembly/disassembly</td>
<td>5%</td>
<td>14%</td>
<td>8%</td>
</tr>
<tr>
<td>Recapping</td>
<td>0%</td>
<td>0%</td>
<td>11%</td>
</tr>
</tbody>
</table>
### Use of Sharp Instruments

<table>
<thead>
<tr>
<th>Use</th>
<th>Suture Needles</th>
<th>Scalpel Blades</th>
<th>Disposable Syringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>After use/before disposal/during and after disposal</td>
<td>11%</td>
<td>16%</td>
<td>29%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Adapted from: Jagger et al. 2010.

### Table 3-3. Surgical Staff Injuries, by Cadre and Sharps

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Surgeons</th>
<th>Surgical Residents</th>
<th>Nurses</th>
<th>Surgical Technicians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suture needles</td>
<td>51.5%</td>
<td>55.1%</td>
<td>35.2%</td>
<td>41.4%</td>
</tr>
<tr>
<td>Scalpel blades (reusable/disposable)</td>
<td>12.2%</td>
<td>12.5%</td>
<td>17.2%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Disposable syringes</td>
<td>10.8%</td>
<td>8.5%</td>
<td>16.5%</td>
<td>10.7%</td>
</tr>
<tr>
<td>Other (e.g., wire, retractors, IV catheters)</td>
<td>25.5%</td>
<td>23.9%</td>
<td>31.1%</td>
<td>26.8%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Jagger et al. 2010.

### Injury Occurrences

**Suture needle injuries** occur most often when:
- Loading or repositioning the needle in the needle holder
- Passing the needle hand to hand between team members
- Suturing using fingers to hold tissue
- Tying knots with the needle still attached or in the operative field
- Leaving the suture needle in the operative field before and after use
- Accidentally dropping needles and injuring body parts
- Placing needles in an overfilled sharps container or a poorly located container

**Scalpel injuries** most often occur when:
- Putting on and taking off the disposable blade
- Passing the scalpel hand to hand between team members
- Cutting (e.g., using fingers to hold or spread tissue or cutting toward the fingers of the surgeon or assistant)
- Leaving the scalpel in the operative field before and after using it
- Accidentally dropping the scalpel and injuring body parts
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- Reaching for a scalpel sliding off a drape
- Placing the scalpel in an overfilled or poorly located sharps container

Surgeons and first assistants (i.e., HCWs assisting with the surgery) have the highest risk of injury during a surgical procedure. Hollow-bore vascular access needles are considered high-risk for transmission of infectious disease among surgeons and first assistants. However, HCWs do not always report their injuries and so they are not evaluated or given post-exposure prophylaxis (PEP), making it challenging to track their risk of infection as well as transmission of the infection to patients.

**Strategies to Prevent Needle Sticks and Other Sharps Injuries**

**General Strategies to Prevent Injuries**

General strategies to prevent injuries include using alternative instruments, devices, or methods for the task, whenever possible:

- **Elimination of hazard**—the complete removal of the hazard (e.g., substituting blunt-tipped needles for sharp needles) and use of Standard Precautions (See Module 1, Chapter 2, Standard and Transmission-Based Precautions, and Appendix 3-A, Engineering Controls for Preventing Sharps Injuries.)

- **Engineering controls**—the minimization or removal of bloodborne pathogen hazards from the workplace (e.g., placing sharp objects into sharps disposal containers, using self-sheathing needles and needleless systems rather than exposed needles, using blunt suture needles)

- **Administrative controls**—the plans and policies aimed at limiting exposure to a hazard (e.g., an exposure control plan, resources, policies, guidelines and protocols)

- **Work practice controls**—the reduction of the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles, using a two-handed technique or neutral zone) (See Appendix 3-B, Neutral and Safe Zone Using Hands-Free Technique.)

- **Visual Reminders**—e.g., color-coding sharps and waste containers, and placing biohazard symbols on contaminated items

- **Barriers**—use of personal protective equipment (PPE), which is designed to be used as a barrier between the worker and the hazard (e.g., gloves, gowns, masks, eye protection, closed-toe shoes)

The following are specific measures that can be used to prevent needle sticks and other sharps injuries (see Appendix 3-C for an Operating Theater Sharps Safety Checklist and Appendix 3-D for a Safe Assisting and Operating Checklist).

*Note:* Injuries are often self-inflicted. The most common body part injured is the non-dominant hand.

*Note:* Educating HCWs on the safe handling of sharps reduces the risk of injury.
Safe Injection Practices

Several studies have documented that unsafe injection practices are responsible for transmitting HIV, HBV, and HCV to HCWs (Gupta et al. 2013). Safe injection practices include the following guidelines:

- Use each needle and syringe only once.
- Do not disassemble the needle and syringe after use.
- Do not recap, bend, or break needles prior to disposal.
- Place sharps disposal containers as close as possible to the point of use (e.g., within an arm’s reach).
- Dispose of the needle and syringe in a puncture-resistant container. Use improvised sharps containers made from readily available “throw-away” items (e.g., empty metal containers, plastic bottles, heavy-duty cardboard boxes) if commercially produced sharps containers are not available.
- Place the universal biohazard symbol on any container used to dispose of sharps.
- See Chapter 1, Injection Safety, in this module for more details.

Double Gloving

The transmission of HBV and HCV from HCWs to patients and vice versa can occur even in the absence of breaks in proper surgical techniques with intact gloves. Even the best-quality latex rubber surgical and non-sterile gloves may leak. After testing gloves for defects, the US Food and Drug Administration (FDA) determined that the acceptable levels of leakage for surgical and non-sterile gloves are 1.5% and 2.5% respectively. Defects in new gloves would be expected to be higher in gloves from manufacturers with less stringent quality controls and where poor storage conditions exist. Latex gloves, especially when exposed to fat in wounds and some alcohol-based handrubs, gradually become weaker and can lose their integrity. (Davis 2001; FDA 2011; WHO 2009)

Double gloving cannot prevent needle sticks but may lower the risk of blood-hand contact, especially with procedures that involve large amounts of blood or other body fluids (e.g., vaginal deliveries and cesarean sections) and orthopedic procedures in which sharp bone fragments, wire sutures, and other sharps are likely to be encountered. (See Module 3, Chapter 1, Personal Protective Equipment, and Chapter 2, Infection Prevention and Control Aspects of Occupational Health in Health Care Settings, in this module.)

Safe Handling of Instruments and Sharps

The goal with any procedure should be to effectively accomplish the procedure using the least dangerous instruments or devices that will minimize risks to patients and HCWs. (Pyrek 2012)

Many sharps injuries can be easily avoided with little expense by using the following devices (see Appendix 3-A) and procedures (see Appendix 3-C):

- Use small Mayo forceps (not fingers) when holding a scalpel blade, when putting a blade on or taking it off, or for loading a suture needle.
- Use disposable scalpels with a permanent blade that cannot be removed.
- Use tissue forceps, not fingers, to hold tissue when using a scalpel or suturing or use blunt-tipped needles for suturing.
Use straight needles to help reduce sharps injuries during surgery. Other examples of instruments or devices that protect the surgical team without sacrificing patient safety or staff performance are shown in Table 3-4.

Use a hands-free technique to pass or transfer sharps (e.g., scalpels, needles, and sharp-tipped scissors) by establishing a safe or neutral zone in the sterile field. The hands-free technique for sharps handling is inexpensive, is simple to practice, and ensures that more than one HCW never touches the same instrument at the same time (see Appendix 3-B). (DeGirolamo et al. 2013; Fox 1992; Stringer et al. 2009)

### Table 3-4. Reducing the Risk of Exposure in the Operating Theater

<table>
<thead>
<tr>
<th>Function</th>
<th>Safer</th>
<th>Less Safe</th>
<th>Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin incision</td>
<td>Cautery</td>
<td>Disposable scalpel</td>
<td>Scalpel with removable blade</td>
</tr>
<tr>
<td>Cutting</td>
<td>Blunt-tipped scissors, or cautery probe</td>
<td>Sharp-tipped scissors</td>
<td>Scalpel</td>
</tr>
<tr>
<td>Hemostasis</td>
<td>Blunt-tipped needles, staples, or cautery</td>
<td>Sharp suture needles</td>
<td>Wire sutures</td>
</tr>
<tr>
<td>Sponging with gauze while using a scalpel</td>
<td>Surgeon does sponging; assistant only retracts</td>
<td>Assistant sponges but only by request</td>
<td>Assistant sponges spontaneously (no communication)</td>
</tr>
<tr>
<td>Retraction</td>
<td>Blunt retractor</td>
<td>Sharp retractor</td>
<td>Fingers or hands</td>
</tr>
<tr>
<td>Sharps transfer</td>
<td>Neutral zone</td>
<td>Hand to hand (communication)</td>
<td>Hand to hand (no communication)</td>
</tr>
<tr>
<td>Surgical gloves</td>
<td>Double gloving</td>
<td>Single pair of gloves</td>
<td>Single pair of reprocessed gloves</td>
</tr>
<tr>
<td>Closing peritoneum (small, 2- to 3-cm or 1-inch incision)</td>
<td>Do not close</td>
<td>Purse-string closure using tissue forceps to grasp needle</td>
<td>Purse-string closure using fingers to grasp needle</td>
</tr>
</tbody>
</table>


### Communication to Reduce Sharps Injuries

- A brief pre-procedure discussion (also known as a time-out or huddle) on how sharps will be handled by the team can be very helpful.

- The procedure team can review how to safely carry out each step during a procedure—e.g., from securing the surgical drapes with non-perforating drape clips around the proposed incision to using blunt-tipped needles for closure of all layers except the skin. (see Appendix 3-C for a list of safety items that should be reviewed.)

- The risk associated with assisting in a procedure/surgery may be reduced by anticipating the needs of the surgeon/doctor for each step in the procedure. When procedures are short (≤ 30 minutes) and/or the steps are straightforward (e.g., dilation and curettage, central line insertion, or cesarean section), this can be accomplished by developing a procedure checklist with each step or task listed in the sequence in which it will usually be performed.
Sharps Injuries and Exposure to Bloodborne Pathogens

- Reviewing the checklist with the surgical team just before starting the procedure and pointing out where changes may be necessary will make the planned surgery go more smoothly and with less risk of injury. This review can also help reduce the operation time and therefore protect patients from injury or increased blood loss. (CDC 1997; Dauleh et al. 1994; Nelson 2008)

Management of Bloodborne Pathogen Exposures

It is easier to prevent accidental exposure to blood and body fluids than to manage accidental exposures, however exposures still do occur. When an exposure occurs, it is important that HCWs are aware of the necessary steps, including prompt management and evaluation for PEP. Where indicated, PEP for HBV and HIV should be initiated as soon as possible, within 72 hours of exposure.

In many low- and middle-income countries, the proportion of HCWs offered PEP after a blood or body fluid exposure has been poorly documented. Health care facilities should have a non-punitive system to report occupational exposure. The rates of injuries or exposures among staff should be routinely reviewed and reported back to the staff, and strategies and action plans to prevent future injuries should be developed and regularly updated (see Chapter 2, Infection Prevention and Control Aspects of Occupational Health in Health Care Settings, in this module).

Hepatitis B

Chronic hepatitis B is a global public health problem; 240 million individuals worldwide live with the disease. Approximately 780,000 individuals (0.3% of infected individuals) die each year from HBV infection. Guidelines are available for the treatment of HBV infections. A high percentage of patients who survive become chronic carriers or are disabled and cannot work because of permanent liver damage (i.e., cirrhosis). HBV is estimated to be 50–100 times more infectious than HIV (WHO 2015). It is estimated that 37% of HBV infection among HCWs worldwide is attributable to occupational exposure to sharps injuries. (Prüss-Üstün et al. 2005)

While an effective vaccine for HBV has been available for more than 30 years, many HCWs have not been immunized against HBV. Health care facilities should prioritize hepatitis B vaccination for all HCWs. Being vaccinated against HBV protects not only the individual, but also other HCWs, patients, and family members. PEP is available for HBV exposure in the form of vaccination and immunoglobulin. (See Chapter 2, Infection Prevention and Control Aspects of Occupational Health in Health Care Settings, in this module for details on hepatitis B vaccination for HCWs.)

Hepatitis C

Hepatitis C has infected an estimated 130 to 150 million individuals worldwide, resulting in 350,000 to 500,000 deaths annually. Guidelines are available for the treatment of HCV infections. It is estimated that 39% of HCV infection among HCWs worldwide are attributable to occupational exposure to sharps injuries. (Prüss-Üstün et al. 2005)

Currently there is no vaccine or PEP available for HCV, and prevention of occupational exposure to blood and body fluids remains the best option.

HIV

In 2016, 36.7 million people globally were living with HIV; 1.8 million people became newly infected with HIV; and 1 million people died from AIDS-related illnesses. It is estimated that 4.4% of HIV infection
among HCWs worldwide are attributable to occupational exposure to sharps injuries. (Prüss-Üstün et al. 2005)

Currently there is no vaccine available for HIV. PEP is available for HIV exposure in the form of antiretroviral (ARV) drugs.

**Post-Exposure Management Steps (HBV, HCV, and HIV)**

The aim of post-exposure reporting and follow-up is to start PEP as soon as possible, within 72 hours of exposure, if indicated. The key components of managing occupational exposure to bloodborne pathogens are described below.

**STEP 1:** Time frame—immediately, within 30 minutes. Person responsible: Exposed HCW.

Provide immediate care to the exposure site:

- Wash the exposed skin and any wound with soap and water.
- Flush mucous membranes with water for 15 minutes.
- DO NOT use any antiseptic or caustic agents such as bleach.
- After washing, immediately report the event to the person in charge of PEP management. The information reported should include identification of the exposed person, date and time of exposure, type of fluid and nature of exposure, and details about the source person as recommended by national PEP guidelines.

**STEP 2:** Time frame—immediately after reporting. Person responsible: Physician, In-Charge of PEP management.

- Determine the risk associated with exposure (see Table 3-5) by:
  - Type of fluid (e.g., blood, visibly bloody fluid, other potentially infectious fluid or tissue)
  - Type of exposure (e.g., sharps injury, mucous membrane or non-intact skin exposure, bites resulting in direct contact with infected blood) (CDC 2001)
  - Infectious status of source (presence of HBSAg, HCV antibody, or HIV antibody)
  - Susceptibility of exposed person (hepatitis B vaccine and vaccine response status, HBV, HCV immune status)

**Table 3-5. HIV Exposure Risk and Type of Exposure**

<table>
<thead>
<tr>
<th>Risk</th>
<th>Type of Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-risk exposure</td>
<td>Exposure to a small volume of blood or blood-contaminated fluids from asymptomatic HIV-positive patients Following an injury with a solid needle Any superficial injury or mucocutaneous exposure</td>
</tr>
<tr>
<td>High-risk exposure</td>
<td>Exposure to a large volume of blood or potentially infectious fluids or blood-contaminated fluid Exposure to blood or body fluid from a patient with clinical AIDS or early seroconversion phase of HIV Injury with a hollow needle and/or deep and extensive injuries</td>
</tr>
</tbody>
</table>
Sharps Injuries and Exposure to Bloodborne Pathogens

STEP 3: Time frame—as soon as possible, preferably within 24 hours. Person responsible: Physician, In-Charge of PEP management, HCW.

- Evaluate the exposed HCW:
  - Check history of hepatitis B vaccination (currently there is no vaccine for hepatitis C or HIV).
  - Determine immune and infection status of the exposed HCW.
- For HBV, if not conducted previously, measure total hepatitis B core antibodies (anti-HBc)\(^1\) and hepatitis B surface antibodies (anti-HBs).\(^2\)
- For HCV, test for HCV antibodies (anti-HCV—a positive test means current or past infection) and ALT (alanine aminotransferase).
- If test is positive, test for viremia to confirm current infections.
- For HIV, check status and history of previous HIV testing:
  - Provide HIV pretest counseling.
  - Offer HIV testing if the exposed HCW provides informed consent.
  - Offer HIV post-test counseling per the national counseling and testing guidelines.
  - Refer to HIV care and treatment for those who test positive.

STEP 4: Time frame—as soon as possible, preferably within 24 hours, simultaneously with Step 3 above. Person responsible: In-Charge of PEP management, patient’s treating physician.

- Evaluate the exposure source:
  - Obtain detailed information on clinical status of the source person.
  - Determine vaccination and immune status of the source person:
    > Test known source person for HBsAg.\(^3\)
    > Test known source person for anti-HCV antibodies.
    > Check known source person for HIV status and history of previous HIV testing.
    > Conduct clinical assessment of known source person for HIV/AIDS.
- Provide HIV pretest counseling.
- Conduct HIV testing if the source person provides informed consent.
- Offer HIV post-test counseling per the national counseling and testing guidelines.
- Refer to HIV care and treatment for those who test positive.

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\(^1\) Total hepatitis B core antibody (anti-HBc)—indicates previous or ongoing infection with HBV (CDC. Hepatitis).
\(^2\) Hepatitis B surface antibody (anti-HBs)—generally indicates recovery and immunity from HBV infection. Anti-HBs also develop in a person who has been successfully vaccinated against HBV (CDC. Hepatitis).
\(^3\) Hepatitis B surface antigen (HBsAg)—indicates that the person is infectious (CDC. Hepatitis).
Sharps Injuries and Exposure to Bloodborne Pathogens

Table 3-6. Determinant for Post-Exposure Prophylaxis for Occupational Exposure to HBV

<table>
<thead>
<tr>
<th>Vaccination and Antibody Response Status of Exposed Health Care Worker</th>
<th>Source HBsAg(^a) Positive</th>
<th>Source HBsAg Negative</th>
<th>Source Unknown or Not Available for Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previously vaccinated</td>
<td>No treatment</td>
<td>No treatment</td>
<td>No treatment</td>
</tr>
<tr>
<td>Unvaccinated</td>
<td>HBIG(^b) single dose and full HB vaccination</td>
<td>Full HB vaccination</td>
<td>Full HB vaccination</td>
</tr>
<tr>
<td>Known responder(^c)</td>
<td>No treatment</td>
<td>No treatment</td>
<td>No treatment</td>
</tr>
<tr>
<td>Known non-responder(^d)</td>
<td>HBIG single dose and revaccination or second dose of HBIG</td>
<td>No treatment</td>
<td>If known high-risk source, manage as if source were HBsAg positive</td>
</tr>
<tr>
<td>Antibody response unknown</td>
<td>Test exposed person for anti-HBs(^e): If adequate level, no treatment is necessary; if inadequate level, HBIG single dose and HB vaccine booster</td>
<td>No treatment</td>
<td>Test exposed person for anti-HBs: If adequate, no treatment is necessary; if inadequate, vaccine booster and check titer in 1–2 months</td>
</tr>
</tbody>
</table>

\(^a\) HBsAg: hepatitis B surface antigen  
\(^b\) HBIG: hepatitis B immunoglobulin  
\(^c\) Known responder: a person who has an adequate level of serum antibody (anti-HBs \(\geq 10\) mIU/mL)  
\(^d\) Known non-responder: a person with inadequate response to vaccination (anti-HBs < 10 mIU/mL)  
\(^e\) Anti-HBs: hepatitis B surface antibody  

STEP 5: Time frame—as soon as test results return (if any), must be within 72 hours from exposure. 
Person responsible: Physician, In-Charge of PEP management, HCW.

- Establish eligibility for PEP:  
  - Refer to Table 3-6 to determine the PEP required for HBV exposure.  
  - Parenteral or mucous membrane exposure (e.g., sexual exposure, splashes to the eye, nose, or oral cavity)  
  - Exposure to blood, blood-stained saliva, breast milk, genital secretions, or cerebrospinal, amniotic, peritoneal, synovial, pericardial, or pleural fluids
- PEP is not indicated if:  
  - The exposed HCW is known to be HIV-positive.  
  - The source person is HIV-negative.  
  - Exposure is limited to intact skin.
Sharps Injuries and Exposure to Bloodborne Pathogens

- Testing the source person and the exposed HCW is helpful but it is not mandatory to have either test results to initiate HIV PEP. The decision is sometimes based on an individual’s level of concern as well as background HIV prevalence.

**STEP 6**: Prescribe PEP: Time frame—initiate PEP as early as possible but within 72 hours.

- Continue ARVs for HIV for 28 days.
- Continue HBV vaccine schedule over 6 months.
- Provide adherence counseling and address any drug interactions.
- Follow national guidelines or WHO recommendations for PEP.

**STEP 7**: Time frame—72 hours—6 months after exposure. Person responsible: Physician, In Charge of PEP Management, HCW.

- Follow-up:
  - Provide follow-up for adherence and any side effects of ARVs and address questions that the individual may have.
  - Arrange for an HIV test at 3 months after the exposure.
  - Arrange for HBV vaccine at 1 and 6 months, if indicated.
  - Link HIV care and treatment, including prevention measure for protecting others, in case the HIV test results are positive.
  - Provide additional counseling and other preventive interventions, as needed, and if test results are negative.
- Document all PEP provided, following facility and national guidelines.
- Monitor PEP provision in the facility.

**Summary**

Globally, HCWs are at risk of exposure to bloodborne pathogens because they handle sharps and come into contact with blood and body fluids during the course of their duties. Certain practices and particular equipment and instruments used in health care increase the risk of exposure to blood and body fluids. Strategies to prevent injuries include, in general, eliminating hazards, using engineering controls, developing administrative controls, incorporating work practice controls, placing visual reminders, and utilizing barriers, whenever possible.

It is better to prevent accidental exposure to blood and body fluids than to manage exposed HCWs. However, when exposure occurs, it is important that HCWs are aware of the necessary steps, including prompt management and evaluation for PEP. HCWs often do not report exposures or take advantage of PEP after occupational exposures. For those who do, adherence can be an issue: the adherence to HIV PEP was found to be 56% in a systemic review of studies on PEP (WHO 2014a). Understanding the risk is important for all HCWs. Implementing recommended IPC practices, technological advances, and a greater emphasis on a culture of safety in health care facilities can reduced occupational exposure in many settings. Health care facilities should have a non-punitive system for HCWs to report occupational exposure and obtain access to PEP.
Appendix 3-A. Engineering Controls for Preventing Sharps Injuries

Table A-1. Examples of Good Engineering Controls for Preventing Sharps Injuries

1. **Blunt-tipped needle**

2. **Blunt retractor**

3. **Scalpel: disposable, retractable safety scalpel**

4. **Stapler for closing surgical skin incision**

5. **Safe butterfly needle that can be drawn in before discarding**

Blunt-Tipped Needles

More than half of all suture needle injuries occur during the suturing of muscles and fascia. Using blunt-tipped needles can substantially reduce needle sticks. When used appropriately, these needles are as
effective as sharp-tipped needles; therefore, it is recommended that, where possible, surgeons use blunt-tipped needles when closing fascia and muscles. (OSHA 2008)

The Technique for Using Blunt-Tipped Needles

**STEP 1:** Use a strong needle holder and lock it fully.

**STEP 2:** Position the needle in the holder in the mid-curve rather than three-quarters of the way back to prevent slippage or bending the needle. (This usually is not necessary when using minimally blunt-tipped needles.)

**STEP 3:** Grasp and hold the tissue to be sutured with tissue forceps to make it easier for the needle to go through the tissue being sutured. In general, the blunter the tip, the more important it is to follow these steps.

**STEP 4:** Dispose of sharps in an adequate, leak-proof sharps container (see Module 5, Chapter 5, Waste Management in Health Care Facilities).

**Sharps Containers**

Examples of the different types of sharps containers include:

- **Ready-made plastic sharps containers** are generally bright yellow in color with a biohazard symbol on the outside.

- **Thick cardboard sharps boxes** designed by WHO and UNICEF are water-resistant and can hold up to 150 needles and syringes in one container.

- **Improvised sharps containers** can be used for disposing of used needles (see below). Needles must be detached from the syringe before being dropped through the hole in the top of the lid.

**Improvised Sharps Containers**

Obtaining ready-made sharps containers on a regular basis may be challenging in low-resource settings. In facilities where they are not available, HCWs can make low-cost sharps containers from readily available leak-proof, puncture-resistant “throw-away” items (e.g., empty metal containers or plastic bottles).

Improvised containers should be labeled as hazardous, able to be completely closed, used only for needles (if syringes since may not fit into the opening of the container), and tightly sealed before disposal to prevent them from being opened.

**Recommendations for Using Sharps Containers**

- **DO put sharps containers as close to the point of use** as possible, ideally within an arm’s reach of the treatment area. Containers should be easy to see, recognize, and use.

- **DO attach containers to walls or other surfaces,** if at all possible, at a level at which the HCW can easily see the disposal opening.

- **DO mark them clearly** so that people will not use them as garbage containers or for discarding debris.

- **DO mark the fill line** at the three-quarters-full level.

- **DO replace the container** when it reaches the fill line (three-quarters full).
DO NOT overfill sharps containers.

DO NOT place non-sharps in the sharps container.

DO NOT shake a container to settle its contents and make room for more sharps.

DO NOT place containers in high-traffic areas (e.g., in corridors, thoroughfares, or waiting areas) where individuals could bump into them or accidently be stuck by someone carrying sharps to be disposed of.

DO NOT place containers on the floor or anywhere they could be knocked over or easily reached by a child.

DO NOT place containers near light switches, overhead fans, or thermostat controls where people might accidentally put their hand into them.
Appendix 3-B. Neutral and Safe Zone Using Hands-Free Technique

The designated neutral or safe zone is where sharps are placed before and immediately after use. For example, the surgical assistant or scrub nurse alerts the surgeon that a sharp instrument has been placed in or on the safe zone, with the handle pointing toward the surgeon, by saying “scalpel” or “sharp” while placing it in the safe zone. The surgeon then picks up the instrument and returns it to the safe-zone container after use, this time with the handle pointing away from the surgeon.

Instruments passed with the hands-free technique include anything sharp enough to puncture a glove (e.g., trocars, sharp-tipped mosquito forceps, loaded needle holders). The ideal container for a neutral or safe zone should be large enough to hold sharps, not easy to tip over, preferably mobile in the operative field, and easy to move between HCWs (e.g., Mayo stand or magnetic pad). Avoid using a kidney tray as the designated “pass container” because the surgical team member must reach into the narrow space, causing an increased risk of a sharps injury.

A “partial” hands-free technique may be used when the surgeon must not break eye contact with the operative field or when a microscope is used. This involves the surgical assistant or scrub nurse directly handing the sharp instrument to the surgeon. The surgeon later returns the sharp to the scrub nurse by placing it in a neutral zone.

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4 Various items (e.g., basins, mats or trays, parts of a sterile instrument stand) or a designated area in the operative field can be used as the safe zone.
Appendix 3-C. Operating Theater Sharps Safety Checklist

Requirements for Perioperative Health Care Workers

- Obtain hepatitis B vaccination and determination of anti-HBs after completion of the vaccination cycle.
- Report sharps injuries.
- Use Standard Precautions with all patients.

Personal Protective Equipment

- Protective eyewear (e.g., goggles, mask with face shield)
- Protective face masks (e.g., surgical masks, surgical N95 respirators)
- Gowns resistant to blood and body fluid penetration
- Impervious footwear/shoe covers
- Double gloves

Work Practice Controls

- Surgeon/Assistant: Right-handed ____ Left-handed ____
- Situational awareness (i.e., knowing and communicating the location of sharps)
- Neutral zone identified and in place
- No-touch or “partial” hands-free technique used when handling sharps
- Elimination of unnecessary sharp instrumentation (e.g., towel clips, retractors)
- Procedure plan for sharps management (e.g., unusual shaped and sized trocars and pins)
- Alternative cutting methods (e.g., blunt-tipped cautery) (when appropriate)
- Scalpels with safety features (e.g., disposable, retracting-blade, and shielded-blade scalpels)
- Syringes, needles, and IV catheters with safety engineered features
- Blunt-tipped needles (when appropriate)
- Appropriate retractors to avoid manual tissue retraction (e.g., mechanical retraction devices, blunt retractors)
- Alternative wound closure methods when appropriate (e.g., blunt-tipped needles, stapling devices, adhesive strips, tissue adhesives)

Sharps Management and Disposal Devices

- Sharps/needle counter to contain/isolate sharps on the sterile back table
- Needle-capping devices/no recapping of needles
- Scalpel blade removers or forceps to remove blade
Sharps Injuries and Exposure to Bloodborne Pathogens

- Sharps disposal container that is puncture-resistant, leak-proof, prevents over-filling, has a change indicator, and is readily accessible
- Separate contaminated, reusable sharps container with biohazard symbols for transport to the decontamination area

Source: AORN. Sharps Safety Tool Kit.
Appendix 3-D. Safe Assisting and Operating Checklist

During Preparation for Surgery or Invasive Procedure
- Inspect surgical field for adequate lighting and space.
- Point sharps away from team members.
- Use standardized sterile field setup.
- Include identification of the neutral zone in the pre-operation briefing.

During the Operative Procedure
- Monitor for glove punctures.
- Use blunt-tipped needles unless clinically contraindicated (e.g., scarred fascia).
- Use safety scalpels (when clinically feasible).
- Use alternative wound closure devices (when clinically indicated).
- Use syringes/needles with safety features.
- Take steps to track/account for location of sharps.
- Use forceps to attach or detach scalpel blade to/from handle.
- Avoid handling suture needles manually.
- Do not keep scalpel, loaded needle holder, or any other sharp in the same hand simultaneously with another instrument.
- Place sharps off the operative field unless in use.
- Employ a proper safe zone for the safe passing of sharps or a modified neutral zone (e.g., use limited hands-free technique).
- Use verbal warnings to announce transfer of sharps.
- Remove the needle from the suture before tying, park the needle safely, and protect the needle point with the needle holder or use “control release” sutures to allow the needle to be removed with a straight pull on the needle holder.
- Load the suture onto the needle holder using the suture packet to position the needle.
- Avoid finger contact with tissue being sutured or cut.
- Keep hands away from the surgical site when sharp items are being used (e.g., suturing or cutting).
- Use retractors rather than manually retracting (whenever possible).
- Avoid reflex sponging of tissue when a sharp is in use.
- Pass long laparoscopic instruments (e.g., sharp-pointed scissors) handle first and tip down.
- Replace the shield on the tip of a drain trocar with an instrument, not the fingers, before pulling the trocar out of the exit wound.
- Stick the needle in a rolled, sterile towel when not in use, when doing repeat injections with a hypodermic needle/syringe.
- Use sharps/needle counter devices to contain and isolate sharps on the sterile back table.
- Use gloves and an instrument to pick up sharps that have fallen on the floor.

During Post-Procedure Cleanup
- Inspect the surgical setup used during the procedure for sharps.
- Separate contaminated, reusable sharps (e.g., skin hooks, trocars) from non-sharp instruments after use for transport to the designated decontamination area in a puncture-resistant, contaminated-waste container that has a biohazard symbol on it.

Adapted from: Tietjen et al. 2003.
References


