

MEDICAL TRAVELERS, INC.

Personal Protective Equipment (PPE) Study Guide

THE EQUIPMENT

Personal protective equipment (PPE) is defined by the Occupational Safety and Health Administration (OSHA) as “specialized clothing or equipment, worn by an employee for protection against infectious materials.” OSHA is charged with regulating workplace health and safety. Its regulations require use of PPE to protect healthcare personnel from exposure to bloodborne pathogens and Mycobacterium tuberculosis. Under OSHA’s General Duty Clause, PPE is required for any potential infectious disease exposure. Employers must provide their employees with appropriate PPE and ensure that PPE is disposed or, if reusable, properly cleaned or laundered, repaired, and stored after use.

The Centers for Disease Control and Prevention (CDC) issues recommendations on use of PPEs to prevent exposure to infectious diseases. This course addresses those recommendations, beginning with the hierarchy of safety and health controls. The protection of healthcare personnel from infectious disease exposures in the workplace requires a combination of controls, one of which is the use of PPE. It is important to recognize that your protection as a healthcare worker also involves other prevention strategies.

There are four major components to healthcare worker-safety programs. First are training and administrative controls, including isolation policies and procedures, and procedures for recognizing patients with a communicable disease before they expose workers. Second are engineering controls, such as negative pressure rooms for patients with airborne diseases including TB; third are work practice controls, such as not recapping needles. Finally, there is personal protective equipment. While PPE is mentioned last in the hierarchy of prevention, it is essential to protecting healthcare workers from disease transmission.

All of the PPE discussed in this course prevent contact with the infectious agent, or body fluid that may contain the infectious agent, by creating a barrier between the worker and the infectious material. Gloves protect the hands, gowns or aprons protect the skin and/or clothing, masks and respirators protect the mouth and nose, goggles protect the eyes, and face shields protect the entire face. The respirator has been designed to also protect the respiratory tract from airborne transmission of infectious agents.

When you are selecting PPE, consider three key points:

1. Anticipated exposure
2. Durability and appropriateness of PPE
3. Fit

First, anticipated exposure can include personal touch, splashes or sprays, or large volumes of blood or body fluids that could penetrate the clothing. Selection of personal protection, or a combination of PPE, also depends upon the patient's category of isolation precautions.

Second, and very much linked to the first, is the durability and appropriateness of the PPE for the task. Is a gown or apron selected? If so, does it need to be fluid resistant, fluid proof, or neither?

Third, you must be concerned with proper fit. Have you ever seen someone trying to work in PPE that is too small or large? PPE must fit the individual user, and it is up to the employer to ensure that all PPE are available in sizes appropriate for the workforce that must be protected.

Gloves

Gloves are the most common type of PPE used in healthcare settings. There are several things to consider when selecting the right glove:

- * Purpose: patient care, environmental services, other
- * Glove material: vinyl, latex, nitrile, other
- * Sterile or nonsterile
- * One or two pairs
- * Single-use or reusable

Most patient-care activities require the use of a single pair of nonsterile gloves made of latex, nitrile, or vinyl. Because of allergy concerns, some facilities have eliminated or limited latex products, including gloves, and now use gloves made of nitrile or other material. Vinyl gloves are frequently available and work well if there is limited patient contact.

Some gloves do not fit the hand snugly, especially around the wrist, and should not be used if extensive contact is likely. Gloves should fit comfortably, neither too loose nor too tight. They should not tear or damage easily. Gloves are sometimes worn for several hours, and they need to stand up to the task.

Sterile surgical gloves are worn by surgeons and other healthcare personnel who perform invasive patient procedures. During some surgical procedures, two pairs of gloves may be worn. Environmental services personnel often wear reusable heavy-duty gloves made of latex or nitrile to work with caustic disinfectants when cleaning environmental surfaces.

Gloves protect you against contact with infectious materials. However, once contaminated, gloves can become a means for spreading infectious materials to yourself, to other patients, or to environmental surfaces. The way you use gloves can influence the risk of disease transmission in your healthcare setting. The following guidelines are the most important do's and don'ts of glove use.

WORK FROM CLEAN TO DIRTY

This is a basic principle of infection control. In this instance it refers to touching clean body sites or surfaces before you touch dirty or heavily contaminated areas. Limit opportunities for “touch contamination”—protect yourself, others, and environmental surfaces. How many times have you seen someone adjust their glasses, rub their nose, or touch their face with gloves that have been in contact with a patient? This is one example of “touch contamination” that can potentially expose you to infectious agents. Be aware of environmental surfaces, too, and avoid touching them unnecessarily with contaminated gloves. Surfaces such as light switches, door handles, and cabinet knobs can become contaminated if touched by soiled gloves.

CHANGE GLOVES AS NEEDED

If gloves become torn or heavily soiled and additional patient care tasks must be performed, change gloves before starting the next task. Always change gloves after each patient, discarding them in the nearest appropriate receptacle. Patient-care gloves should never be washed and used again. Washing gloves does not necessarily make them safe for reuse; first, it may not be possible to eliminate all microorganisms and, second, washing can make the gloves more prone to tearing or leaking.

Gowns

There are three factors that influence the selection of a gown or apron as PPE. First is the intended use. Isolation gowns are generally the preferred PPE to protect clothing, but aprons occasionally are used where limited contamination is anticipated. If contamination of the arms can be anticipated, a gown should be selected. Gowns should fully cover the torso, fit comfortably over the body, and have long sleeves that fit snugly at the wrist.

Second is the material properties of the gown. Isolation gowns are made either of cotton or a spun-synthetic material, which dictates whether they can be laundered and reused or must be discarded. Cotton and spun-synthetic isolation gowns vary in their degree of fluid resistance, another factor that must be considered in the selection of this garb. If fluid penetration is likely, a fluid-resistant gown should be used.

The last factor concerns patient risks and whether a clean, rather than sterile, gown can be used. Clean gowns are generally used for isolation. Sterile gowns are only necessary for performing invasive procedures, such as inserting a central line. In this case, a sterile gown would serve for both patient and healthcare worker protection.

Face Protection

Several PPE types are available to protect all or parts of the face from contact with potentially infectious material. The selection of facial PPE is determined by the isolation precautions required for the patient and the nature of the patient contact.

Masks should fully cover the nose and mouth and prevent fluid penetration. Masks should fit snugly over the nose and mouth. For this reason, masks that have a flexible nose piece and can be secured to the head with string ties or elastic are preferable.

Goggles provide barrier protection for the eyes; personal prescription lenses do not provide optimal eye protection and should not be used as a substitute for goggles. Goggles should fit snugly over and around the eyes or prescription lenses. Goggles with anti-fog features help maintain clarity of vision.

When skin protection is needed or desired in addition to mouth, nose, and eye protection—for example, when irrigating a wound or suctioning copious secretions—a face shield can substitute for a mask or goggles. The face shield should cover the forehead, extend below the chin, and wrap around the side of the face.

Respiratory Protection

Personal protective equipment is also used to protect healthcare workers from hazardous or infectious aerosols, such as *Mycobacterium tuberculosis*. Respirators that filter the air before it is inhaled should be used for respiratory protection. The most commonly used respirators in healthcare settings are the N95, N99, and N100 particulate respirators. These devices has a sub-micron filter capable of excluding particles that are less than 5 microns in diameter. Respirators are approved by the CDC's National Institute for Occupational Safety and Health.

Like other PPE, the selection of a respirator type depends on the nature of the exposure and the risk involved. For example, N95 particulate respirators might be worn by personnel entering the room of a patient with infectious tuberculosis. However, if a bronchoscopy is performed on the patient, the healthcare worker might wear a higher level of respiratory protection, such as a powered air-purifying respirator (PAPR).

Before you can use a respirator, your employer is required to have you medically evaluated to determine that it is safe for you to wear one. Your employer is also responsible for fitting you with the appropriate respirator size and type and for training you on how and when to use a respirator. You are responsible for fit checking your respirator before use to make sure it has a proper seal.

SAFETY ISSUES

There are four key points to remember about using PPE. First, always don PPE before you have any contact with the patient, generally before entering the room. Once you are wearing PPE, work carefully to prevent spreading contamination. When you have completed your task, remove the PPE carefully and discard it in the receptacles provided. Immediately perform hand hygiene before going on to the next patient.

The gown should be donned first. The mask or respirator should be put on next and properly adjusted to fit; remember to fit check the respirator. The goggles or face shield should be donned next, and the gloves last. Keep in mind, the combination of PPE used, and therefore the sequence for donning, will be determined by the precautions that need to be taken.

Donning PPE

To don a gown, first select the appropriate type for the task and the right size for you. The

gown should open in the back; secure the gown at the neck and waist. If the gown is too small to fully cover your torso, use two gowns. Put on the first gown with the opening in front and the second gown over the first with the opening in the back (Figure 1).

A picture showing the proper sequence for donning a gown.

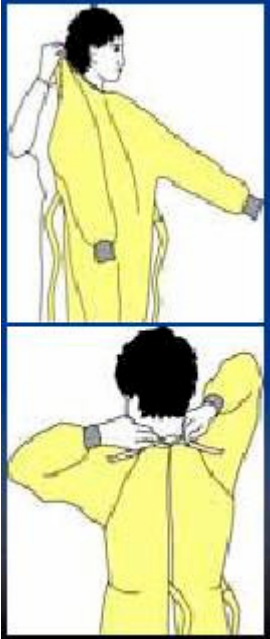


Figure 1 The proper sequence for donning a gown. Courtesy CDC.

Some masks are fastened with ties, others with elastic. If the mask has ties, place the mask over your mouth, nose, and chin. Fit the flexible nosepiece to the bridge of your nose; tie the upper set at the back of your head and the lower set at the base of your neck (Figure 2).



Figure 2 The proper fit for a face mask with ties. Courtesy CDC.

If a mask has elastic head bands, separate the two bands and hold the mask in one hand and the bands in the other. Place and hold the mask over your nose, mouth, and chin, then stretch the bands over your head and secure them comfortably as shown; one band on the upper back of your head, the other below the ears at the base of the neck. Adjust the mask to fit. Remember, you don't want to be touching it during use, so take the few seconds needed to make sure it is secure on your head and fits snugly around your face so there are no gaps.

The technique for donning a particulate respirator, such as an N95, N99, or N100, is similar to putting on a pre-formed mask with elastic head bands (Figure 3). Key differences are:

The need to first select a respirator for which you have been fit tested

Fit checking the device, as you have been instructed, before entering an area where there may be airborne infectious disease

Select a Fit Tested Respirator

- * Place over nose, mouth and chin
- * Fit flexible nosepiece over bridge of nose
- * Secure on head with elastic
- * Adjust to fit
- * Perform fit check
 - Inhale: respirator should collapse
 - Exhale: check for leakage around face



Figure 3 The correct technique for fitting a particulate respirator. Courtesy CDC.

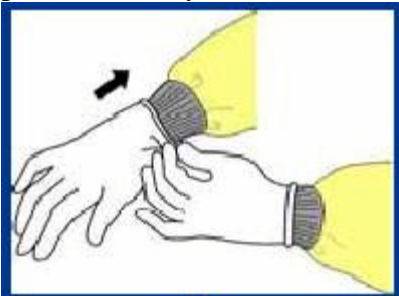
Be sure to follow the manufacturer's instructions for donning the device. In some instances, the manufacturer's instructions may differ slightly from those presented here. You may be asked to wear an elastomeric or powered air-purifying respirator (PAPR). Your agency is responsible for instructing you in proper use of these devices. If eye protection is needed, either goggles or a face shield should be worn. Position either device over the face and/or eyes and secure to head using the attached earpieces or headband. Adjust to fit comfortably. Goggles should feel snug but not tight (Figure 4).



Position goggles over eyes and secure to the head using the earpieces or headband. Position face shield over face and secure on brow with headband; adjust to fit comfortably.

Figure 4 The proper placement of goggles and a face shield. Courtesy CDC.

The last item of PPE to be donned is a pair of gloves. Be sure to select the type of glove needed for the task in the size that best fits you. Insert each hand into the appropriate glove and adjust as needed for comfort and dexterity. If you are wearing an isolation gown, tuck the gown cuffs securely under each glove. This provides a continuous barrier protection for your skin.



In addition to wearing PPE, you should also use safe work practices. Avoid contaminating yourself by keeping your hands away from your face and not touching or adjusting PPE. Remove your gloves if they become torn and perform hand hygiene before putting on a new pair of gloves. Avoid spreading contamination by limiting surfaces and items touched with contaminated gloves.

Removing PPE

To remove PPE safely, you must first be able to identify what sites are considered “clean” and what are “contaminated.” In general, the outside front and sleeves of the isolation gown and outside front of the goggles, mask, respirator, and face shield are considered “contaminated,” regardless of whether there is visible soil. The outside of the gloves are contaminated. The areas that are considered “clean” are the parts that will be touched when removing PPE. These include the insides of the gloves; the gown ties and the inside and back of the gown; and the ties, elastics, or earpieces of the mask, goggles ,

and face shield.

The sequence for removing PPE is intended to limit opportunities for self-contamination. The gloves are considered the most contaminated pieces of PPE and are therefore removed first. The face shield or goggles are removed next because they are cumbersome and would interfere with removal of other PPE. The gown is third in the sequence, followed by the mask or respirator.

The location for removing PPE depends on the amount and type of PPE worn and the isolation category of the patient, if applicable. If only gloves are worn as PPE, it is safe to remove and discard them in the patient room. When a gown or full PPE is worn, PPE should be removed at the doorway or in an anteroom. Respirators should always be removed outside the patient room, after the door is closed. Hand hygiene should be performed after all PPE is removed.

To remove gloves, using one gloved hand, grasp the outside of the opposite glove near the wrist. Pull and peel the glove away from the hand. The glove should now be turned inside-out, with the contaminated side now on the inside. Hold the removed glove in the opposite gloved hand. Slide one or two fingers of the ungloved hand under the wrist of the remaining glove. Peel glove off from the inside, creating a bag for both gloves. Discard in waste container.

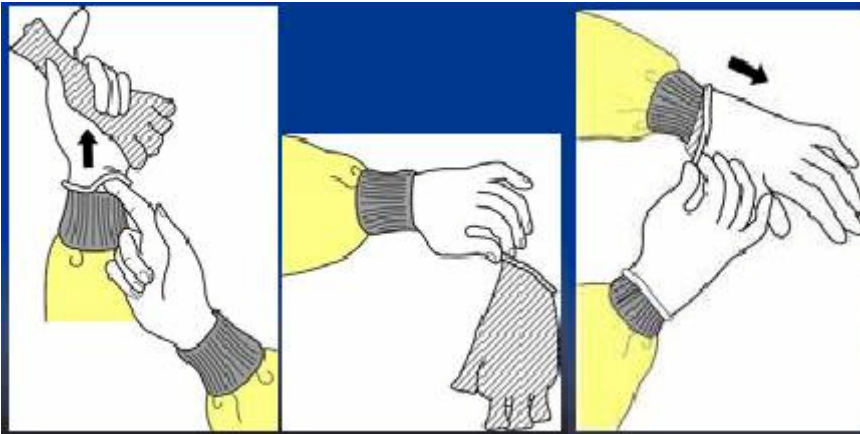


Figure 6 Removing gloves. Courtesy CDC.

To remove goggles, using ungloved hands, grasp the “clean” ear- or headpieces and lift away from face. If goggle or face shield are reusable, place them in a designated receptacle for reprocessing. Otherwise, discard them in the waste receptacle.



Figure 7 Removing goggles and shields. Courtesy CDC.

To remove your gown, unfasten the gown ties with the ungloved hands. Slip your hands underneath the gown at the neck and shoulder, and peel it away from the shoulders. Slip the fingers of one hand under the cuff of the opposite arm. Pull the hand into the sleeve, grasping the gown from inside. Reach across your body and push the sleeve off the opposite arm. Fold the gown toward the inside and roll into a bundle. (Only the “clean” part of the gown should be visible.) Discard into a waste or linen container, as appropriate.



Figure 8 Removing gowns. Courtesy CDC.

The front of the mask is considered contaminated and should not be touched. Remove your mask by handling only the ties or elastic bands, starting with the bottom following with the top tie or band. Lift the mask or respirator away from the face and discard it into the designated waste receptacle.

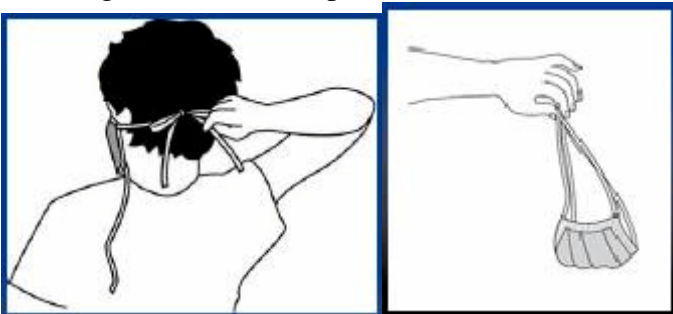


Figure 9 Removing masks with ties. Courtesy CDC.

If the mask has elastic bands, lift the bottom elastic over the head first, then remove the

top elastic. This must be done slowly to prevent the respirator from “snapping” off the face.



Figure 10 Removing a mask with elastic bands. Courtesy CDC.

Hand Hygiene

Hand hygiene is the cornerstone of preventing infection transmission. You should perform hand hygiene immediately after removing PPE. If your hands become visibly contaminated during PPE removal, wash the hands before continuing to remove PPE. Always wash your hands thoroughly with soap and warm water or, if hands are not visibly contaminated, use an alcohol-based hand rub.

WHEN TO USE PPE

Use the CDC’s recommendations for **Standard Precautions** and Expanded Isolation Precautions to decide which type of PPE should be worn. Standard Precautions is an outgrowth of Universal Precautions. Universal Precautions was first recommended in 1987 to prevent the transmission of bloodborne pathogens to healthcare personnel. In 1996, the application of the concept was expanded and renamed Standard Precautions. Standard Precautions are intended to prevent the transmission of common infectious agents to healthcare personnel, patients, and visitors in any healthcare setting.

During patient care, assume that an infectious agent could be present in the patient’s blood or body fluids, including all secretions and excretions except tears and sweat. Appropriate precautions, including use of PPE, must be taken. Whether PPE is needed and, if so, which type, is determined by the type of clinical interaction with the patient and the degree of blood and body fluid contact that can be reasonably anticipated, and by whether the patient has been placed on isolation precautions (eg, contact or droplet precautions or airborne infection isolation).

Under Standard Precautions, gloves should be used when touching blood, body fluids, secretions, excretions, or contaminated items, and for touching mucous membranes and nonintact skin. A gown should be used during procedures and patient-care activities when contact of clothing and/or exposed skin with blood, body fluids, secretions, or excretions is anticipated. Aprons are sometimes used as PPE over scrubs (eg, in hemodialysis centers when inserting a needle into a fistula). Mask and goggles or a face shield should be used during patient-care activities that are likely to generate splashes and sprays of

blood, body fluids, secretions, or excretions. The patient-care activities in Table 1 could indicate a need to wear PPE.

ACTIVITY	PPE
Giving a bed bath	Gloves
Suctioning oral secretions	Gloves and mask/goggles or a face shield (This may depend on whether open or closed suction is being used)
Transporting a patient in a wheelchair	Generally none
Responding to an emergency where blood is spurting	Gloves, fluid-resistant gown, mask/goggles or a face shield
Drawing blood from a vein	Gloves
Cleaning an incontinent patient who has diarrhea	Gloves, and generally a gown
Irrigating a wound	Gloves, gown, and mask/goggles or a face shield
Taking vital signs	Generally none

In some situations, healthcare personnel are required to wear PPE beyond that recommended for Standard Precautions. The three **Expanded Precautions** categories (formerly called transmission-based precautions) where this applies are:

Contact Precautions

Droplet Precautions

Airborne Infection Isolation

Contact Precautions requires gloves and gown for contact with the patient and/or the environment of care; in some instances, use of this PPE is recommended when entering the patient’s environment.

Droplet Precautions requires the use of a surgical mask within three feet of the patient.

Airborne

Infection Isolation requires that a particulate respirator be worn and use of a negative-pressure isolation room.

Hand hygiene is an essential infection control practice to protect patients, healthcare personnel, and visitors, and is required for both Standard and Expanded Precautions. Hand hygiene should be performed immediately after removing PPE, during PPE changes (with removal if necessary), and between patient contacts. Wash your hands thoroughly with soap and warm water or, if hands are not visibly soiled, use an alcohol-based hand rub.

Personal protective equipment is available to shield you from exposure to infectious agents during healthcare. It is important that you know what type of PPE is necessary for the procedures you perform **and** that you use it correctly.