

## VIDEOS IN CLINICAL MEDICINE

## SUMMARY POINTS

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# Personal Protective Equipment and Covid-19

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and Robert Canelli, M.D.*The following text summarizes information provided in the video.***OVERVIEW**

**G**IVEN THE THREAT OF CORONAVIRUS DISEASE 2019, OR COVID-19, IT IS important to emphasize the use of proper precautions for infection control in health care settings. Severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2, is the virus that causes Covid-19.<sup>1</sup> The routes of SARS-CoV-2 transmission include direct contact — that is, contact with the respiratory droplets and aerosols from an affected person — and indirect contact, such as contact with contaminated surfaces or supplies.<sup>2</sup>

The best way for health care workers to prevent infection with SARS-CoV-2 is through training and demonstrated competency in putting on and removing, also known as donning and doffing, personal protective equipment (PPE). Various methods of putting on and removing PPE may be acceptable; you should follow the guidelines of the Centers for Disease Control and Prevention (or CDC) and your institution.

This video demonstrates a procedure for putting on and removing one type of PPE that has been recommended by the CDC for use in U.S. hospitals to minimize the risk of exposure to infectious material during the care of patients with Covid-19.<sup>3</sup>

**EQUIPMENT**

Protection against exposure to SARS-CoV-2 includes both standard and transmission-based precautions. The PPE used to prevent exposure includes gloves, a gown, a respirator with a rating of N95 or higher, and a full face shield or goggles. When respirators are not available, face masks are an acceptable alternative. These recommendations may be updated during the Covid-19 pandemic as decisions about best practices change.

You will need a fluid-resistant gown or coveralls that should cover the body at least from the neck to the mid-calf and medical gloves that extend to cover the wrists of the gown. Gowns with integrated thumb hooks may help to secure the sleeves under the gloves.

If disposable N95 respirators are worn, they must be certified by the National Institute for Occupational Safety and Health (NIOSH) and fit-tested by occupational health officials. The respirator should be used along with a full face shield that protects the face and neck. Alternatively, a NIOSH-certified, powered air-purifying respirator (PAPR) can be used.

**PROCEDURE FOR PUTTING ON PPE**

Because you may be wearing PPE for an extended period of time, make sure that you are well hydrated and use the restroom before putting on PPE. If you wear

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prescription eyeglasses, make sure that they are positioned securely on your face. Prescription eyeglasses alone do not suffice as eye protection.

Put on the PPE when you are near the patient's room. Before donning PPE, it is advisable to change into scrubs, secure long hair, and remove personal items such as jewelry.

Before handling any PPE, wash your hands with soap and water or clean your hands with an alcohol-based hand sanitizer. Visually check the integrity of the equipment. If possible, have an observer watch you as you put on the PPE to make sure there are no breaches in technique.

If the gown has an opening for your head, pull the gown over your head through the opening. If the gown does not have such an opening, fasten it behind your neck. When using a respirator, cup the outside of the respirator in your dominant hand, holding the pliable nasal strip with your fingertips and letting the two straps hang freely around your hand. Bring the respirator to your face. Secure the lower strap around the back of your neck, and then secure the upper strap behind your head. Mold the pliable nasal strip around the bridge of your nose with both hands, without tenting it. Do not pinch the nosepiece with one hand.

Check the seal of the respirator. Begin by covering the respirator with your hands and inhaling deeply and quickly several times. The respirator should collapse slightly against your face when you inhale. Next, place your hands around the edges of the respirator and exhale to determine whether there are any air leaks (Fig. 1). If the respirator fails to collapse or if air leaks from the sides, remold the nasal strip and adjust the positioning of the respirator on your face. If you are still unable to obtain a complete seal, consider using a PAPR.

Put on the face shield, letting it rest on your forehead and securing the strap on the back of your head. If your hair is tied in a bun, make sure the strap is positioned in a manner that ensures that the strap will not slide up or down. Adjust the elastic strap if necessary, to ensure a snug fit. If you are wearing eyeglasses, make sure they are secure to minimize the need to readjust them during patient care.

Disinfect your hands with an alcohol-based hand sanitizer. Put on the gloves and extend the cuffs over the sleeves of the gown. You are now ready to enter the patient's room.

#### PROCEDURE FOR REMOVING PPE

Proper removal and disposal of contaminated PPE is the most difficult challenge in preventing exposure to pathogens. Careful attention is required. Whenever possible, have an observer watch you as you take off the PPE to make sure there are no breaches in technique. Removal of PPE should begin in the patient's room.

There is more than one technique for removing gloves. We describe the glove-in-glove technique (Fig. 2). First, remove your gloves by grasping the glove on one hand with the other hand. Grasping the exterior of the glove at the wrist, pull the glove off your hand, with the contaminated exterior folded inside. Hold the removed glove in your gloved hand. Slide a finger under the wristband of the remaining glove. Gently pull off the glove so that it is now inside-out, forming a bag for the other glove, and discard. Disinfect your hands.

Remove your gown by first undoing the fastening at the waist. Someone may assist you in undoing the fastenings at the neck and the back of the gown. Grasp the shoulder area and peel the gown away from your body, turning the gown inside-out and wrapping it into a bundle. Only the interior of the gown should remain visible. Discard the gown and disinfect your hands.

You are now ready to leave the patient's room. Disinfect your hands again.



Figure 1. Testing for Air Leaks.



Figure 2. Removal of Second Glove.

Once you have left the patient's room, remove the face shield (Fig. 3). It is particularly important to avoid contamination of the eyes and mucous membranes when removing facial PPE. Tilt your head forward and lift the shield by the strap. Lift it above and away from your head without touching the shield itself. If you wear prescription eyeglasses, make sure the glasses are not contaminated when you remove the PPE.

If you have used a nondisposable face shield, place it in the appropriate container for decontamination, following the guidelines at your institution. If you have used a disposable face shield, a waste receptacle should be available to discard such equipment.

Remove the N95 respirator (Fig. 4). To minimize the possibility of contamination, avoid contact with the respirator itself, touching only the straps. Tilt your head forward, grab the strap that is around your neck, and lift it over your head, allowing it to hang freely. Then bring the top strap over your head and use it to remove the respirator from your face. Discard the respirator or return it to a designated location for recycling, following the guidelines at your institution. Disinfect your hands.

#### SUMMARY

When PPE is properly worn, removed, and discarded, it is effective in protecting both the person who wears it and those with whom that person comes into contact.

No potential conflict of interest relevant to this video was reported.

Disclosure forms provided by the authors are available with this video at NEJM.org.

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Figure 3. Removal of Face Shield.



Figure 4. Removal of Respirator.