Occupational Health for Health Care Professionals

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Chapter 20

PERSONAL PROTECTIVE EQUIPMENT FOR HEALTH CARE PROFESSIONALS

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“See no hazards, hear no hazards, breathe no hazards, touch no hazard; once you lose it, you lose it forever” – unknown author

Introduction

There are several definitions provided by different sources on personal protective equipment worn by health care professionals who are especially exposed to biological hazards at the work setting. The Department of Labor in the United States of America has been a pioneer in Occupational Safety and Health issues. It has defined Personal Protective equipment (PPE) for health care professionals as: “specialized clothing or equipment worn by an employee for protection against infectious materials”.¹

Every PPE must create an effective barrier between the exposed worker and any blood, other body fluids or hazards. The genuine attempt to coax health care professionals to understand the importance and exercise the usage of PPE is to improve personnel safety and health in the healthcare environment through prudent and appropriate use of it.

PPE is the last choice among the hierarchy of control measures in place. In the case of health care professionals, the use of personal protective equipment (PPE) is strongly recommended to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing this exposure to acceptable levels. Thus, employers are required to determine if PPE should be used to protect their workers. To bring this message home, they need to inculcate awareness among health care professionals (HCPs) to enable them to firstly understand the reasons for doing so. Thus a strong commitment and responsibility of every employer is inevitable to ensure the practice of donning PPE is well instituted in any health care facility.

The traditional PPE available in any healthcare facility are gloves, caps, shoe-covers, aprons, surgical masks, rubber or plastic boots and disposable shoe covers. Many more specific PPE may be added to this list based on the type of procedure or examination carried out which may require more appropriate PPE like laser goggles, an N95 respirator, heat resistant gloves or chemical resistant gloves depending on whether the hazard is physical, chemical, biological, ergonomic or psychosocial against which protection is needed. These hazards may exist in the process of daily work or environment.

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The health care professional encounters numerous hazards at the workplace everyday. Although broadly five (5) different types of hazards are enumerated in healthcare facilities, in today's world, the most common risks posed to health care professionals are blood and blood fluids due to the increasing burden of emerging diseases of AIDS, HIV, Hepatitis B and Hepatitis C. These risks become multifold as most times the source of the blood or body sample is not known or the infective nature is not established. Such situations increase the risk of health care professionals to serious infections and death. In such situations, personal protective equipment act as barriers between infectious materials and the skin, mouth, nose, or eyes (mucous membranes).

The deliberation of PPE use by HCPs in this chapter describing the different types of PPE will be based on the prevention of the spread of infection by:

i. protecting wearers from infection or contamination from blood, body fluids, or respiratory secretions.
ii. reducing the chance that health care professionals will infect or contaminate others and
iii. reducing the chance of transmitting infections from one person to another.¹

The World Health Organisation (WHO) has put forth the following basic tenets in the use of personal protective equipments in infection control as follows:

i. personal protective equipment reduces but does not completely eliminate the risk of acquiring an infection.
ii. it is important that it is used effectively, correctly, and at all times where contact with blood and body fluids of all patients may occur.
iii. continuous availability of personal protective equipment and adequate training for its proper use are essential.
iv. staff must also be aware that use of personal protective equipment does not replace the need to follow basic infection control measures such as hand hygiene.

WHO has further highlighted that health care professionals should adhere to the following principles that guide the use of personal protective equipment in infection control in health care facilities:

i. personal protective equipment should be chosen according to the risk of exposure.
ii. avoid any contact between contaminated (used) personal protective equipment and surface, clothing or people outside the patient care area.
iii. discard used personal protective equipment in appropriate disposal bags, and dispose of according to the health care facility protocol.
iv. do not share personal protective equipment.
v. change personal protective equipment completely and thoroughly wash hands each time you leave a patient to attend to another patient or another duty.

Effective and correct use of personal protective equipment should be ensured at all times where contact with patient's blood, body fluids, excretions and secretions may occur, failure of which would defeat the intended purpose.²
The choice and use of PPE is based on specific situations at work settings that warrant different types of PPE use alone or together, adhering to certain guidelines that protect the health of health care professionals, as stated below.

i. Wear gloves, when handling chemicals and/or body fluids.

ii. Wear safety shoes/boots/covers if hazardous substance is likely to splash.

iii. Wear apron/gown/coveralls if hazardous substance is likely to splash.

iv. Use a respirator when hazardous substance is airborne such as tuberculosis.

v. Wear hearing protection in noisy environment.

vi. Wear PPE correctly to benefit optimally.

vii. Remove PPE carefully to avoid contaminating yourself.

viii. Dispose of PPE in designated containers before leaving the area.

Like any other protective gear PPE would be considered ‘appropriate’ only if it does not allow blood or other potentially infectious material to seep through or contaminate the health care professionals clothes, street clothes, undergarments, skin and all other mucous membrane surfaces like the mouth, eye and nose throughout the period of use in normal work conditions.

**Personal Protective Equipment used in health care facilities:**

**Caps**

Caps have to be used to cover the hair and scalp so that flakes of skin and hair do not fall into the surgical wound during dressing and surgical procedures. The cap should cover all of the hair. The primary aim of such caps, provide considerable protection to the patients, and prevent body fluid and blood splashes and sprays on to the HCP. Such caps are also called bonnets. Caps made from paper should never be reused as they cannot be properly washed or sterilized.

**Eyewear**

Eyewear come in the form of safety glasses, clear plastic goggles, visors and face shields. They are used to prevent inadvertent splashes or sprays of blood or body fluids, secretions or excretions onto the mucous membrane of the eye, nose and mouth. Masks with eyewear or face shields are recommended when performing caesarean sections, vaginal deliveries or cleaning wounds. In the absence of a face shield, a mask with goggles or prescriptive glasses can be used. Face shield should cover the forehead, extend below the chin and wrap around the side of the face.
Gowns and Aprons

**Gowns** are used mainly while performing surgical procedures or deliveries. These materials usually come in lightweight cloth texture but should ideally be fluid resistant. Though these gowns are supposed to protect the patient from microorganisms present on the abdomen or hands of HCPs, the most important protection is from unknown splashes of blood and body fluids from patients undergoing such procedures. In case of large spills or splashes, HCPs should immediately shower or bath. The sleeves of surgical gowns should taper towards the wrist or end with elastic or ties around the wrist. The cuffs of surgical gloves should cover the end of the gown sleeves.

**Aprons** made of plastic or rubber provide a water proof barrier for surgeons and obstetricians. Aprons are recommended over scrub suits to prevent splashes and spills from potentially dangerous blood and body fluids of patients.

Footwear

**Wellington boots** made from rubber or its synthetic equivalent is used in places where there are wet floors like, kitchens, laboratories, laundry units, clinical waste disposal units. This is also used by staff and surgeons in operating theatres due to its waterproof nature. Protective footwear such as Wellington boots or clogs in theatre are intended to prevent contamination of the feet specifically in theatre or when splashing of the feet with blood and body fluids is anticipated.

Certain hospitals use surgical shoe covers which protect HCPs from exposure to contaminants or pathogens. Disposable Shoe Covers are often used in medical, laboratory, and clean room settings when you need protection for HCPs or objects from contamination. Medical Shoe Covers are recommended to stifle pathogen transference while Waterproof Shoe Covers are used in laboratory. Spun bond polypropylene makes an excellent medical shoe cover that is strong, skid-resistant, and disposable. This synthetic weave can take punishment and stay in place. A variant, poly-coated polypropylene is excellent to protect you against spills and biohazards, while protecting you against slippage on a wet floor.

The two most commonly used PPE in hospitals by HCPs are gloves, masks or respirators. The use of disposable gloves has dramatically increased over the past decade, due mainly to the emergence of HIV and awareness of the risks posed by blood borne viruses. It is also widely recognised that the hands of health care professionals are the most likely cause of the spread of infection in hospitals, as well as being the major area of blood contamination. These risks can be minimised by thorough hand washing and the use of gloves.

The hand is the most frequently used part of the body during daily work and thus the part that can be easily contaminated by infectious blood or body fluids. Thus, gloves are the first line of defence that health care professionals need, to prevent contact with infectious substances and reduce the risk of cross-contamination.
Gloves are worn as protective barrier to reduce or prevent gross contamination of the hands when providing patient care and to reduce the transmission of microorganisms present on the hands of the health care personnel to patients during normal or invasive procedures that may cause touching patient’s mucous membrane and or non intact skin.

All health care personnel must use gloves when contact is anticipated with a patient’s mucous membranes (such as nose, mouth, rectum, vagina), non-intact skin (such as rashes, abrasions, wounds, pustules), and moist body substances (blood, body fluids, secretions, excretions, or discharges). Disposable single-use gloves that are appropriate for the task should be worn. The environment must not be soiled with gloved hands. Gloves should be changed and hand hygiene performed as needed during care of the same patient. Used gloves should be discarded into a trash receptacle upon removal.

Gloves may have small, inapparent defects, or, may be torn during use. In addition, hands can become contaminated during removal of gloves. Therefore, hand hygiene must be performed after glove removal. The use of gloves does not eliminate the need for hand hygiene. Likewise, the use of hand hygiene does not eliminate the need for gloves. Gloves reduce hand contamination by 70 percent to 80 percent, prevent cross-contamination and protect patients and health care personnel from infection. Hand rubs should be used before and after each patient just as gloves should be changed before and after each patient. Health care providers should provide appropriate bins or containers for discarding gloves.

Important factors to consider in hand and glove care

i. Change gloves between each patient contact and between each activity on same patient.
ii. Wash hands before and after any procedure even if gloves are worn.
iii. Develop good practice when washing hands. Dry hands carefully.
iv. Protect your skin by keeping it well moisturised.
v. Keep nails short to prevent glove puncture.
vi. Should you develop dry or cracked skin, contact your Occupational Health Department.
vii. Keep any cuts or abrasions covered at work.
viii. Gloves should not be worn outside the area where the task involving their use is being performed.
ix. Contact with personal or shared equipment such as computer, keyboard, telephone and other surfaces while wearing contaminated gloves (through environment or patient contact) should be avoided.
x. Check gloves for obvious tears before and after use and discard such gloves.
xi. Avoid wearing jewellery that can tear gloves.
xii. Ensure the glove is the right size.
xiii. Remove gloves carefully to avoid hand contamination and dispose into clinical waste or trash receptacle.
xiv. Wash hands and dry hands thoroughly.
xv. Do not wash gloves to re-use. This can stress gloves causing invisible punctures and will not remove microorganisms thoroughly.

xvi. Double gloving should be considered for activities associated with high risk of skin puncture e.g. orthopaedic or dental surgery.

The choice of a glove will depend on whether it complies to: 1. consistent fit over time 2. barrier protection 3. comfort to the wearer 4. ease of donning 5. integrity (e.g. resistance to tearing and leaking and durability of the glove) 6. tactile sensitivity 7. grip and friction—ability to grasp and hold slippery objects 8. ability to perform tasks 9. non-irritation to the skin.

There are a variety of gloves available for use in the market and below is a list of the major types of gloves applicable to the health industry.

**Natural Rubber Latex**
Latex gloves still remain the best material of choice in glove selection and gold standard in barrier protection particularly due to its high tensile strength and good comfort whilst providing good protection against blood borne pathogens. Latex gloves cannot be used with acids and solvents.

**Nitrile**
Gloves manufactured with synthetic material extend an excellent barrier to microorganisms over long duration use. These are used as a good alternative for those allergic to Natural Rubber Latex (NRL). These are mainly recommended for use with chemicals like formaldehyde, glutaraldehyde, and quaternary ammonium cleaners.

**Neoprene**
This is a synthetic elastomeric surgical glove similar to the Nitrile gloves, used as a substitute for those allergic to NRL. It also provides an excellent barrier to microorganisms.

**Polyisoprene**
This is manufactured from synthetic polyisoprene latex and is more recent in the market and used as a substitute for NRL by/for those who have a known or suspected allergy to NRL.

**Vinyl**
These gloves are more often used for short term procedures posing a low risk of contamination from microorganisms and also for non-invasive procedures. They are an alternative for NRL gloves.
In the case of possible worker exposure to blood borne pathogens, Occupational Safety and Health Administration, (OSHA), U.S. recommends the use of "appropriate gloves" without specifically requiring the gloves to be U.S. Food and Drug Administration (FDA) approved surgical or medical exam gloves. Based on this, the type of gloves used in a health care facility can be:

- **Non-sterile gloves** *(latex/vinyl/polythene- powder/powder free)*
  These are usually used:
  1. when in contact with blood, body fluids, mucous membrane or non intact skin.
  2. for a close fit and when a sense of touch and dexterity is important.
  3. in situations where large volumes of blood or body fluids are anticipated. Ensure the gloves selected fits firmly at the wrist with gown cuffs secured under the glove cuff.

- **Sterile gloves** *(latex/polythene – powder/powder free)*
  These are indicated:
  1. for all surgical procedures where asepsis is to be maintained.
  2. when double gloves may be used while working with extremely hazardous materials including carcinogens and unbound radioiodine.

**Surgical masks and respirators**

**Surgical masks**

Surgical masks and respirators are recommended to protect the respiratory tract from viruses, bacteria, and fungi transmitted through direct contamination of the mucous membranes of the nose and mouth (and sometimes the eyes) or through inhalation of organisms in the air.

A face mask donned by a health care professional provides protection against the transmission of infectious, large-particle droplets that are spread by close contact and travel short distances, up to 3 feet from infected patients coughing or sneezing and vice versa. It also helps to prevent accidental splashes, sprays or splatter of blood and other contaminated body fluids from entering the health care professional's nose or mouth. In addition, it protects patients from exposure to infectious agents carried in a health care professional's mouth or nose.

Procedures that generate splashes or sprays of blood, body fluids, secretions, or excretions (e.g., endotracheal suctioning, bronchoscopy, invasive vascular procedures) in addition, require either a face shield (disposable or reusable) or mask and goggles.

Health care facilities may find that different types of masks are needed to meet individual health care personnel needs. These masks are also called as procedure, isolation, or laser masks. Surgical masks are designed to cover the mouth and noses loosely, strapped behind the head and made of soft materials and are comfortable to wear. However, these provide minimal protection from respirable particles. Surgical masks
come in different types but all masks have some degree of fluid resistance. Approved surgical masks must meet specified standards preventing penetration of blood and body fluids.

It is important to remember that improper use will defeat the purpose of the use of masks. To ensure effective use of the mask, the following recommendations should be strictly adhered to.

i. Masks must be worn properly and be comfortable.
ii. Masks should cover both the nose and mouth completely.
iii. There should be no tenting at the sides of the mouth to allow dispersion or entry of microbes. A small pliable strip at the nose area should ensure a close fit.
iv. A face shield or protective eyewear should be worn while working in the sterile field.
v. Masks should be changed frequently and every time they become wet.
vi. Never allow a mask to hang or dangle around the neck, nor be folded and placed in a pocket for later use; masks should either be on or off.

Respirators

A respirator is a personal protective device that is worn on the face, covers at least the nose and mouth, and is used to reduce the wearer’s risk of inhaling hazardous airborne particles (including dust particles and infectious agents), gases, or vapours. The types of respirators available include:

1. particulate respirators, which filter out airborne particles.
2. "gas masks," which filter out chemicals and gases.
3. airline respirators, which use compressed air from a remote source and
4. self-contained breathing apparatus, which include their own air supply.10

N95 type respirators are the respirators recommended for use by health care professionals in contact with patients with infections that are transmitted from inhaling airborne droplets (e.g. tuberculosis, measles and varicella).

Respiratory filtering devices that provide protection against inhalation of small and large airborne particles are called particulate respirators or air-purifying respirators. A particulate respirator is worn on the face and fits tightly to cover the nose and mouth.

Particulate respirators include the following types.

- Disposable or filtering facepiece respirators which filter airborne particles. These are discarded once soiled, contaminated, or undergo physical damage.
- Reusable or elastomeric respirators. These respirator facepieces can be cleaned, disinfected, and fitted with new filters for reuse. They have an exhalation valve and do not prevent transmission of virus to others when worn by infected patient.
- **Powered air-purifying respirators** (PAPRs). This comes with a battery-powered blower to provide filtered breathing air. PAPRs can be cleaned, disinfected, and fitted with new filters for re-use.

**Choice of respirators** used in health care facilities should be based on the type of procedure carried out and the aerosol filtering efficiency. The respirators most commonly used in hospitals are of two (2) types.

- The **N95 filtering facepiece respirator** [Fig. 20.1(a)].
- The powered air purifying respirator (PAPR).

An N95 respirator is a particulate respirator certified by NIOSH. It is rated ‘N’ because it is not resistant to oil and ‘95’ for its ability to filter out 95% of the small inhalable particles. NIOSH certified N95 respirators fit closely to form a tight seal over the mouth and nose. It needs to be fit-tested and adjusted to one’s face and must be safely removed and discarded. Surgical N95 respirators are N95 respirators that are FDA-cleared as surgical masks, as well as NIOSH-certified as respirators. These have been evaluated for fluid resistance, flammability, and biocompatibility.

A particulate respirator must be at least as protective as the U.S. NIOSH-certified N95, European Union CE-Certified: Full Facepiece Class 2 (EU FFP2), or an equivalent. Examples of acceptable disposable particulate respirators in various parts of the world include:

- U.S. NIOSH-certified N95 (95%), N99 (99%), N100 (99.7%).
- Australia/New Zealand: P2 (94%), P3 (99.95%).
- China: II (95%), I (99%).
- Japan: 2nd class (95%), 3rd class (99.9%).
- Korea: 1st class (94%), Special (99.95%).
- EU: FFP2, (filter face piece – medium protection) and FFP3 (filter facepiece – high protection).

![Fig. 20.1 Respirators:](image)

(a) N95 particulate respirator  
(b) N95 3 panel particulate respirator without exhalation valve  
(c) N95 3 panel particulate respirator with exhalation valve

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Reuse of Filtering Facepiece Respirators

Disposable masks and respirators cannot be reused because they are made of a mesh of fibres that trap the harmful particles which cannot be cleaned out or disinfected without damaging the fibres, nose clip or straps. However, in serious outbreaks in situations of short supply, a disposable N95 respirator can be reused with the following precautions.

i. To prevent surface contamination, a protective covering such as a medical mask or a clear plastic face shield should be worn over the respirator.
ii. The respirator should be carefully stored between uses.
iii. Hand washing should be carried out before and after handling the respirator and the device used to shield it.
iv. These steps are intended for reuse of a respirator by a single person.

High risk procedures such as bronchoscopy and autopsy require additional protection where a full facepiece negative-pressure respirator, powered air-purifying respirators, and positive pressure airline respirators equipped with a half-mask or full facepiece may be recommended. A supplied-air respirator with a hood may be needed for staff who cannot be properly fitted with respirators with a facepiece. Goggles or face shields should also be used to prevent eye contamination in medical procedures that generate aerosol mists.\textsuperscript{14}

To ensure effective functioning of a respirator the following should be adhered to.

1. The fit and seal of disposable particulate respirators is critical.
2. Fit testing must be performed prior to the first use of a disposable particulate respirator to ensure if an acceptable fit and seal is achieved. A user seal check should be performed each time a disposable particulate respirator is worn. If there is no good fit and seal, the particulate respirator will not be effective. HCPs with facial hair and facial structure abnormalities should not use a disposable particulate respirator because a good seal cannot be obtained.
3. The emergence of Severe Acute Respiratory Syndrome (SARS) has opened the eyes of stakeholders to ensure health care professionals are adequately protected with the appropriate personal protective equipment. The lives of these professionals were at stake due to the infectious nature of the virus apart from the stress arising from the associated social factors.

Personal Protective Equipment in an infectious outbreak

The health care facility should have a clear set of guidelines for preventing staff exposure to SARS. Health care professionals in contact with suspected or probable
SARS patients should be monitored daily for signs and symptoms of SARS, particularly for changes in temperature. If staff members indicate any signs or symptoms of SARS, they should be assessed by the infection control practitioner or the infection control team as to the appropriateness of home isolation.\textsuperscript{15}

### Personal protective equipment used for SARS

- Gloves - non sterile.
- N95 respirator preferable.
- Long sleeved cuffed gown.
- Plastic apron if splashing or spattering of blood, body fluids, excretions and secretions is anticipated.
- Appropriate protective eyewear/goggles/visors/face shields.
- Caps to be used in high risk situations where there may be increased aerosols.

The health care professionals who should don PPE include anyone who enters the isolation room/area including:

- all health care professionals e.g. doctors, nurses, physiotherapists and radiographers, who provide direct patient care.
- all support staff including medical aides and cleaning staff.
- family members or visitors.
- all laboratory workers handling specimens or samples from a patient with SARS.
- all sterilising service workers handling equipment that requires decontamination and has come from a patient with SARS.\textsuperscript{15}

![Fig. 20.2 Personal Protective Equipment – Photo courtesy of: Department of Public Health, Ministry of Health. Malaysia](image)

(a) Health care professionals  
(b) Hospital support service staff handling contaminated waste

**Donning and Removing Personal Protective Equipment**

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If full personal protective equipment needs to be worn before entering the patient care area, the following order of donning should be considered to avoid contamination

i. Wash hands.
ii. Wear scrub suit or old set of thin clothes before entering the designated changing room or area.
iii. Wear boots /or shoe covers with trousers tucked inside.
iv. Wash hands.
v. Wear cap.
vi. Wear the gown.
vii. Wear the mask.
viii. Wear an impermeable apron if splashes of blood or body fluids are expected.
ix. Wear protective eye wear/ goggles.
x. Wash hands and dry them.
xii. Wear gloves with gown sleeve cuff tucked into glove.

While removing personal protective equipment when leaving the patient care area an important criteria to consider is that contact with blood, body fluids, secretions, excretions and other contaminants should be avoided. Contaminated hands should be washed or decontaminated with 70% alcohol solution.

Sequence for removing PPE

I Using gloved hands, untie the gown string if tied in front and remove shoe covers.
i. Remove gloves.
ii. Wash hands.
iii. Remove gown and apron, without contaminating clothing underneath. Touch only inside of gown and apron while removing. Place in appropriate disposal bag.
iv. Remove goggles, mask, and cap and place in an appropriate container. Remove boots (if worn) and place in appropriate container.
v. Wash hands up to wrists thoroughly with soap and water: dry and decontaminate hands using 70% alcoholic hand-rub before leaving facility.
vi. All disposable PPE should be disposed according to the respective health care facility protocol.

Donning of Personal Protective Equipment

The basic principle to be followed in donning PPE would be to always:

- don the PPE before contact with patients.
- perform hand hygiene immediately before donning and after removing PPE.

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**Donning gown**

- Wash hands and dry.
- Ensure the opening is in the back.
- Hold gown at the neck on the inside permitting to unfold.
- Slide hands and arms down the sleeves.
- Ensure gown fully covers torso from neck to knees, arms to end of wrists, and wrap around the back.
- Secure at neck and waist.
- If gown is too small, use two gowns: the first ties in front, the second ties at the back.

**Donning surgical mask**

- Place over nose, mouth and chin.
- Fit flexible nose piece over nose bridge.
- Secure on head with ties or elastic.
- Adjust to fit.

**Donning N95 respirator**

- Select a fit tested respirator.
- Place over nose, mouth and chin.
- Fit flexible nose piece over nose bridge.
- Secure on head with elastic.
- Adjust to fit.
- Perform a fit check
  - inhale – respirator should collapse.
  - exhale – check for leakage around face.
Fig. 20.3 Donning of N95 respirator and Fit Check

**Donning eye protection**

- Position eyewear over eyes and secure to head using ear pieces or headband.
- Position face shield over face and secure on brow with the headband.
- Adjust to fit comfortably.

**Donning gloves**

- Don gloves last.
- Insert hands into gloves.
- Extend gloves over gown cuffs (if wearing gown).

Fig. 20.4. Donning of gloves - ensuring the gloves are extended over gown cuff

**Gloved hands**

- Keep gloved hands away from face.
- Avoid touching or adjusting other PPE.
- Remove gloves if they become torn; perform hand hygiene before donning new gloves.
- Limit surfaces and items touched.

**Removal of Personal Protective Equipment**

All items must be removed and discarded carefully. Perform hand hygiene after gloves/gown removal before your hands go near your face (for removal of masks and eye protection) and after completion of PPE removal, as well as when at any time you suspect your hands are contaminated during PPE removal.

**Glove removal**

- Outside of glove is ‘dirty’; use glove-to-glove/ skin-to-skin handling method.
- Grasp outside edge near wrist.
- Peel away from hand, turning glove inside out.
- Hold in opposite gloved hand.
- Slide ungloved finger under wrist of remaining glove.
- Peel off from inside, creating a bag for both gloves with contamination inside.
• Discard properly and safely.

![Image of glove removal process]

**Fig. 20.5.** Removing of gloves

**Gown removal**

- Gown front and sleeves are ‘dirty’; handle by inside/back of gown.
- Unfasten ties.
- Peel gown away from neck and shoulder.
- Turn contaminated outside surface toward the inside.
- Fold or roll into a bundle.
- Discard.

**Perform hand hygiene**

**Eyewear removal**

- Outside of eyepiece is ‘dirty’; handle by earpieces.
- Grasp earpieces with ungloved hands.
- Lift away from face.
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- Place in designated receptacle for reprocessing.

**Surgical mask removal**

- Untie the bottom, then the top.
- Remove from face.
- Discard.

**Respirator removal**

- Cup the respirator in your hand to maintain position on face.
- Pull bottom strap over head.
- Still holding respirator in position, pull top strap over head.
- Remove respirator from face and discard.

![Fig. 20.6. Removal of N95 respirator](image)

Perform hand hygiene immediately after removing PPE.\(^{18}\)

**Conclusion**

Personal Protective Equipment is widely used in health care facilities. The importance of this equipment is emphasised in great depth. Health care professionals would need to always bear in mind of the need to wear the correct type of PPE based on the different hazards existing at workplaces, instilling a maintenance culture, appropriate donning and removal techniques, as well as correct disposal methods. Training and retraining in this area cannot be underestimated as it ensures optimal benefit in the long run.

**References:**