

An infection control program when used appropriately restricts the spread of infection. A breach in infection control practices facilitates transmission of infection from patients to health care workers, other patients and attendants. It is therefore important for all health care workers, patients, their family members, friends and close contacts to adhere to the infection control policies and procedures strictly.

Standard precautions (universal precautions) require that health care workers assume that any materials that could be potentially contaminated with blood or other human body fluids as infectious and to consider all materials, instruments, environmental surfaces, etc. that could possibly be contaminated with blood or body fluids as infectious regardless of the diagnosis, or presumed infectious status. Additional precautions are needed for diseases transmitted by air, droplets and contact. Standard precautions involving work practices that are essential to provide a high level of protection to patients, health care workers and visitors include the following:

- Hand hygiene
- Use of personal protective equipment when handling blood, body substances, excretions and secretions
- Respiratory hygiene and cough etiquette
- Prevention of needlestick/sharp injuries
- Appropriate handling of waste
- Appropriate handling of patient care equipment

STANDARD PRECAUTIONS

A. Hand Hygiene

Good hand hygiene is critical to reduce the risk of spreading health care-associated infection including multi-drug resistant organisms. Evidence showed that use of alcohol-based handrubs at the point of care (e.g. blood taking trolleys or station, consultation desks, triage station, at bedside) facilitates hand hygiene, increases compliance and irritates hands less.

Hand Hygiene Technique

Hand hygiene can be achieved by rubbing hands with 70-80% alcohol-based formulation or washing hands with soap and water.

Handrubbing with 70-80% Alcohol-based Handrub (ABHR):-

- Apply a palmful of ABHR (~3-5ml) and cover all surfaces of the hands including palms, back of hands, between fingers, back of fingers, thumbs, finger tips and wrists.
- Rub all hand surfaces for at least 20 seconds until hands are dry.

Handwashing with Soap and Water:

- Wet hands with water and apply enough amount of liquid soap necessary to cover all hand surfaces.
- Rub all surfaces of the hands for at least 20 seconds before rinsing under running water.
- Dry hands thoroughly with paper towel or a hand dryer.
- The whole procedure usually takes about 40-60 seconds.
- Avoid using hot water for handwashing because repeated exposure to hot water may increase the risk of dermatitis.

Indications for Hand Hygiene

- Before and after any direct patient contact and between patients, whether or not gloves are worn.
- Immediately after gloves are removed.
- Before handling an invasive device.
- After touching blood, body fluids, secretions, excretions, non-intact skin, and contaminated items, even if gloves are worn.
- During patient care, when moving from a contaminated to a clean body site on the patient.
- After contact with inanimate objects in the immediate vicinity of the patient.
- Preferably use ABHR for routine hand-antisepsis if hands are not visibly soiled.
- Wash hands with soap and water when visibly dirty or visibly soiled with blood or other body fluids or after using the toilet.
- If exposure to potential spore-forming pathogens is strongly suspected or proven, including outbreaks *Clostridium difficile*, or after contacting patients with hand-foot-mouth disease or diarrheal diseases (e.g. norovirus infection), hand washing with soap and water is the preferred means.
- Soap and ABHR should not be used concomitantly.

Other aspects of Hand Hygiene

- Do not wear artificial fingernails or extenders, rings or other jewelry when having direct contact with patients.
- Do not add soap to a partially empty soap dispenser. This practice can lead to bacterial contamination of soap. If reusable soap container is used, it should be washed and dried thoroughly before refilling.
- Ensure availability of hand-washing facilities with clean running water.
- Ensure availability of hand hygiene products (clean water, soap single use clean towels, ABHR). ABHRs should ideally be available at the point of care.

B. Personal Protective Equipment (PPE)

The use of PPE provides a physical barrier between micro-organisms and the user. It reduces exposure risk but does not eliminate the infectious hazard. Besides, it does not replace basic infection control measures such as hand hygiene. Selection of PPE should be based on risk assessment. PPE should be stored in appropriate area free from dampness, sunlight and dirt. They need to be examined for the expiry date and checked regularly to ensure integrity.

Use of PPE

Gloves

Should be worn when there is an anticipated risk that hands would be contacted with (i) blood or body fluids, secretions, excretions, non-intact skin, mucus membrane and potentially infectious material; (ii) patients who are colonized or infected with pathogens transmitted by contact route; (iii) handling or touching visibly or potentially contaminated patient care equipment and environmental surfaces.

- Use of gloves does not replace the need for hand hygiene

- Remove gloves after caring for a patient. Do not wear the same pair of gloves for the care of more than one patient.
- Change gloves between tasks and procedures on the same patient after contact with material that may contain a high concentration of microorganisms.
- Remove gloves promptly after the procedure, before touching non-contaminated items and surface, e.g. handling telephones or performing office work.
- Perform hand hygiene immediately after removal of gloves.
- Selection of **powder free** gloves is recommended since this avoids interactions with the ABHR and also the gritty feeling on hands.
- Do not reuse disposable gloves.
- Sterile gloves should be used for surgical/aseptic procedures.
- Appropriate gloves sizes and types should be readily available.

Gowns

- Should be worn to protect skin and clothing during procedures or activities that are likely to generate splashes or sprays of blood, body fluids, excretions and secretions.
- Remove soiled gown as soon as possible, and perform hand hygiene.
- Face protection: masks, goggles, face shields
- Use of mouth, nose and eye protection during procedures that are likely to generate splashes or sprays of blood or other body fluids.

Surgical Masks

- Should be worn to protect from contact with infectious material from patients, e.g. respiratory secretions and sprays of blood or body fluids.
- Should be worn when engaged in procedures requiring sterile technique to protect patients from exposure to infectious agents carried in a health care worker's mouth or nose.
- Should be worn when working within three feet of patients with respiratory symptoms.
- Placed on coughing patients to limit potential dissemination of infectious respiratory secretions from the patient to others (i.e., Respiratory Hygiene/Cough Etiquette).

N95 respirator

- Should be worn by staff for potential exposure to infectious agents transmitted via airborne route.
- Should be worn by staff when performing aerosol generating procedures e.g. nasopharyngeal aspiration, endotracheal intubation.
- Staff should have **fit test** to ensure appropriate respirator selection and use.
- Education on respirator use, especially on how to don and doff the specific brand and model of respirator that staff is using.
- A **seal check** (formerly called a fit check) should be performed by the staff **each time** when a N95 respirator is donned to minimize air leakage around the facepiece.

Goggles and Face Shields

- Should be worn by staff to protect the mucus membrane of the eye, nose and mouth during procedure that may generate splashes or sprays of blood, body fluids, excretions and secretions.
- Personal eyeglasses and contact lenses are NOT considered adequate eye protection.

Principles of PPE Removal

- Doffing of used PPE is a high-risk procedure and requires strict adherence to PPE doffing procedure to protect healthcare worker from contamination.
- PPE should be removed before leaving patient care room except respirators which should be removed after exiting the room. (*Used PPE should be treated as contaminated and should not be worn out of the workplace into non-clinical areas.*)
- Remove PPE in designated doffing area that prevents other persons from getting contaminated.
- Do not doff together in close proximity to another person. PPE should be doffed slowly and deliberately in the correct sequence.
- Perform hand hygiene according to steps of PPE doffing, or when hands get contaminated during doffing of PPE.
- Change PPE and wash skin thoroughly with soap and water without delay whenever having substantial splashing or contamination by blood or body fluids.
- Disposable PPE should be discarded in lidded waste receptacles properly after use.
- Reusable PPE should be properly decontaminated after use and maintained.

Suggested Sequence of PPE Removal

In order to keep mucosal protection intact throughout, the suggested sequence of PPE removal in designated room or after performing high risk nursing procedure is as follows:

1. Remove gloves
2. Perform hand hygiene
3. Remove gown
4. Perform hand hygiene
5. Remove disposable cap
6. Perform hand hygiene
7. Remove eye protection
8. Perform hand hygiene
9. Remove mask/N95 respirator
10. Perform hand hygiene

C. Respiratory Hygiene and Cough Etiquette

- Cover mouth and nose when coughing or sneezing.
- Use tissue paper to contain respiratory secretions and dispose of them in lidded receptacles.
- Perform hand hygiene after hands have been in contact with respiratory secretions.
- Offer surgical masks to persons with respiratory symptoms, especially during epidemic periods.
- Place acute febrile respiratory symptomatic patients at least three feet away from others in common waiting areas, if possible.

- Post visual alerts at the entrance the health-care facility instructing persons with respiratory symptoms to practice respiratory hygiene and cough etiquette.
- Make hand hygiene resources, tissues and masks available in common areas and areas used for the evaluation of patients with respiratory illnesses.

D. Prevention of Needlestick/Sharp Injuries

- Staff should adhere to basic principles of aseptic technique for the preparation and administration of parenteral medications.
- Use of a sterile, single-use, disposable needle and syringe for each injection.
- Use of single-dose vials is preferred over multiple-dose vials, especially when medication will be administered to multiple patients.
- Implement engineering controls that include puncture-resistant disposable sharps container and needles and other sharp devices with an integrated sharps injury prevention feature.
- Contaminated needles and other contaminated sharps should not be bent, recapped, manipulated or removed prior to disposal.
- If needles need to be recapped, use recapping devices or one-handed scoop technique. Used needles and sharps shall be discarded into sharps container.
- Sharps container is recommended to be placed in a convenient place near to where the sharps are used.
- Do not overfill sharps container. Dispose sharps container when the disposable sharps reach the warning line (70-80%) for maximum volume.
- Secure sharps container in an upright position or placed in the rack for sharps container.
- Seal up sharps container and discard into red plastic waste bag with international biohazard sign for proper disposal.

E. Appropriate Handling of Waste

Waste which arises from outpatient settings should be segregated at the source of generation into medical and non-medical waste in dedicated containers. Lidded waste receptacles, preferable with foot-pedal and lined with red plastic bags should be used for medical waste in clinical areas. Medical waste includes contaminated sharps, unused, discarded hypodermic needles, suture needles, scalpel blades and syringes, used intravenous equipment, cultures and stocks of infectious agents, human blood and blood products, dressings, paper tissues and other disposable items saturated or dripping with blood or items caked with dried blood.

- All medical waste must be collected and transported to the collection bin in leak-proof, impervious bags marked with the biohazard symbol.
- Store waste in specified areas with restricted access.
- Mark the storage areas with a biohazard symbol.
- Appropriate PPE should be used when handling medical waste.

F. Appropriate Handling of Patient Care Equipment

Decontamination of reusable patient care equipment is necessary to prevent transmission of organisms between patients. The risk of transmission is classified according to the site where the instrument is to be used. Contact site for instruments may be classified as critical, semi-

critical or non-critical. The level of reprocessing required is based on the classification and level of risk. Any instrument or equipment entering into a sterile part of the body must be sterilized. Where the instrument or equipment will be in contact with mucous membranes or non-intact skin, it must have undergone disinfection, and where there will be contact with intact skin, disinfection or cleaning should be used.

Cleaning

Cleaning is the removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products. It is an essential and important step before processing to disinfection and sterilization.

Instrument should be rinsed off gently under running water; or soaked in a solution of lukewarm water (not more than 45 °C) or any presoaking solutions including enzymatic, disinfectants, or detergents (in accordance with the instructions from the device manufactures) to prevent coagulation of proteinaceous substances and remove gross soil. Appropriate PPE should be worn when cleaning instruments to minimize occupational exposure. Care should be taken not to produce splashes.

Sterilization

Bench-top steam sterilizers (Autoclaves)

- Critical instruments which are not heat sensitive can be sterilized reliably by steam under pressure using sterilizers (also called autoclaves).
- Sterilizers should be located in treatment room/specific room away from traffic and they should not discharge steam/vapor into waiting area.
- Sterilizers must be operated only by staff who has been adequately instructed in their use. The operating persons should record the details of each load and the mechanical indicators in a log book specifically kept for this purpose.
- Recognized minimum exposure periods for sterilization of wrapped healthcare supplies are 30 minutes at 121 °C in a gravity displacement sterilizer or 4 minutes at 132 °C in a dynamic air removal sterilizers (pre-vacuum) sterilizer.
- It is important to refer to the manufacturer's instructions for operation, since exposure times can vary according to the design of the particular sterilizer.
- A standard operation chart for the correct exposure periods of all supplies should be prepared and posted for easy daily reference
- The ability of the sterilizer to reach physical parameters necessary to achieve sterilization should be monitored by mechanical, chemical, and biological indicators.
- All the results should be documented and recorded.
- Mechanical indicators record cycle time, temperature, and pressure as displayed on the sterilizer gauges for each instrument load.
- External chemical indicators such as autoclave tape are affixed on the outside of each instrument pack to show that the package has been processed through a sterilization cycle. An internal chemical indicator should be placed inside the packs to verify sterilant penetration.

- Biological indicators should be tested at least weekly with spore vials placed on the bottom shelf in the area above the chamber drain. The results of spore test should be entered into a record.
- Sterilizer should be serviced regularly at yearly intervals and as necessary.

Chemical disinfection

Chemical disinfection could be an alternative for heat labile semi-critical and non-critical instruments. However, they have many drawbacks such as materials compatibility, variability in the bactericidal effect, inactivation and different exposure times of respective disinfectants.

- When using chemical disinfection, the containers used for disinfection should be kept covered during use to avoid contamination and also the occupational hazard such as release of irritant chemical vapor.
- Do not top up the prepared solution with fresh solution.
- The container should be washed, rinsed and dried when the solution is changed.
- The containers should be clearly labelled with contents, recommended concentration for soaking and exposure time required and expiry date.
- Follow manufacturer's instructions, which include contact time, concentration/dilution, water requirement and rinsing method of the selected disinfectant.
- Different disinfectants should not be mixed or used in combination.
- Health and safety precautions such as adequate ventilation to evacuate the released chemical vapor and use of appropriate PPE should be followed.

TRANSMISSION-BASED PRECAUTIONS

These precautions are designed for patients who are documented or suspected to be infected with highly transmissible pathogens. These precautions are to be implemented in addition to Standard Precautions. Additional precautions include:

- Airborne precautions
- Droplet precautions
- Contact precautions

Airborne Precautions

Airborne precautions are designed to reduce the transmission of diseases spread by the airborne route. Airborne transmission occurs when droplet nuclei (evaporated droplets) < 5 micron in size are disseminated in the air. These droplet nuclei can remain suspended in the air for some time. Droplet nuclei are the residuals of droplets and when suspended in the air, dry and produce particles ranging in size from 1-5 micron. These particles can remain suspended in the air for long periods of time, especially when bound on dust particles. Diseases which spread by this mode include open/active pulmonary tuberculosis (TB), measles, chicken pox, pulmonary plague and haemorrhagic fever with pneumonia.

The following precautions need to be taken:

- Implement standard precautions.
- Place patient in a single room that has a monitored negative airflow pressure, and is often referred to as a "negative pressure room". The air should be discharged to the

outdoors or specially filtered before it is circulated to other areas of the health care facility.

- Keep doors closed.
- Anyone who enters the room must wear a special, high filtration, particulate respirator (e.g. N 95) mask.
- Limit the movement and transport of the patient from the room for essential purposes only. If transport is necessary, minimize dispersal of droplet nuclei by masking the patient with a surgical mask.

Droplet Precautions

Diseases, which are transmitted by this route, include pneumonias, pertussis, diphtheria, influenza type B, COVID-19, mumps, and meningitis. Droplet transmission occurs when there is adequate contact between the mucous membranes of the nose and mouth or conjunctivae of a susceptible person and large particle droplets (> 5 microns). These larger droplets generally travel only short distances (3 feet or less). Droplets are usually generated from the infected person during coughing, sneezing, talking or when health care workers undertake procedures such as tracheal suctioning.

The following precautions need to be taken:

- Implement standard precautions
- Place patient in a single room (or in a room with another patient infected by the same pathogen).
- Wear a surgical mask when working within 3 feet of the patient.
- Place a surgical mask on the patient if transport is necessary.
- Special air handling and ventilation are not required to prevent droplet transmission of infection.

Contact Precautions

These should be used for patients who are infected with organisms that are transmitted by direct skin to skin contact or by indirect contact with environmental surfaces or patient care items.

The following precautions need to be taken:

- Implement standard precautions.
- Place patient in a single room (or in a room with another patient infected by the same pathogen). Consider the epidemiology of the disease and the patient population when determining patient placement.
- Wear clean, non-sterile gloves when entering the room.
- Wear a clean, non-sterile gown when entering the room if substantial contact with the patient, environmental surfaces or items in the patient's room is anticipated.
- Limit the movement and transport of the patient from the room; patients should be moved for essential purposes only. If transportation is required, use precautions to minimize the risk of transmission.

