PPE & Disinfection
COVID-19 Preparation for Biomedical Professionals

ASSIST INTERNATIONAL
❖ Foundation of love and respect
   - Respond kindly rather than react if you disagree
❖ It is everybody’s responsibility to keep ECHO a safe space
❖ Test your equipment ahead of time
❖ Introduce yourself before speaking
❖ Body signals can be distracting
❖ Mute microphone when not speaking
❖ Avoid making noise (i.e. potato chips, shuffling papers, whispering, cell phones, loud bags, etc.)
Project ECHO Etiquette

❖ **Mute microphone** when not speaking
  - Left bottom corner of your screen
❖ Remember to **unmute before speaking**
❖ Position **webcam** effectively to show your face if alone or to capture the whole group
❖ Have a light source from the front (Avoid being backlit)
❖ Test both audio and video
❖ Speak close to microphone
❖ IT issues? Send a message through chat/email.
## Agenda

<table>
<thead>
<tr>
<th>Time Allotted</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minutes</td>
<td>Introduction</td>
<td>Erin &amp; Benjin</td>
</tr>
<tr>
<td>40 minutes</td>
<td>Didactic – PPE &amp; Disinfection</td>
<td>Guna</td>
</tr>
<tr>
<td>10 minutes</td>
<td>Discussion</td>
<td>All</td>
</tr>
</tbody>
</table>
Project ECHO Etiquette

• The foundation of our discussions on Project ECHO is respect & understanding

• Please keep your microphone muted when you are not speaking

• Each of us has something to contribute; all are welcome to participate when we open the floor for discussion at the end of the session or in the chat bar
Learning Objectives

By the end of this session, the participant will be able to:

• Understand transmission of the COVID 19 virus
• Utilize proper personal protective equipment
• Understand the medical equipment necessary to treat patients with COVID 19
• Disinfect equipment properly between patients
This course has been adapted to address equipment and supplies used to prevent, control, and otherwise respond to the COVID-19 cases. We have specifically referenced the following publications:

- **WHO Covid 19 Homepage**
  - WHO COVID-19 v4 Operational & Logistics Disease Commodity Packages, updated March 6 2020


- **PAHO Coronavirus Disease (COVID-19) Resources**
COVID-19 Awareness

Equipment & Medical Supplies
### Surveillance

<table>
<thead>
<tr>
<th>INTERVENTION</th>
<th>COMMODITY</th>
<th>TECHNICAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Collection</td>
<td>Triple packaging boxes</td>
<td>Triple packaging boxes for transport</td>
</tr>
<tr>
<td></td>
<td>Viral transport medium</td>
<td>Viral transport medium with swab. Medium 1ml, 2ml or 3ml</td>
</tr>
<tr>
<td></td>
<td>Sharps container boxes</td>
<td>Puncture-resistant container for collection and disposal of used, disposable and auto-disable syringes and needles. 5 L capacity accommodating approximately 100 syringes. Boxes to be prominently marked.</td>
</tr>
<tr>
<td>Diagnostics</td>
<td></td>
<td><strong>Guidance on regulations for the transport of infectious substances 2019–2020.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Comply with the CLSI standard M40-A (for the Quality Control of Microbiology Specimen Transport Devices).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Compatible with molecular and cell culture techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>WHO performance specification E10/IC.1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• WHO/UNICEF standard E10/IC.2 or equivalent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical guidance for COVID-19 is available online.</td>
</tr>
</tbody>
</table>

https://www.who.int/docs/default-source/coronaviruse/dcp-ncov-v4.pdf?sfvrsn=f5fe6234_7&download=true
# Triage & Screening

<table>
<thead>
<tr>
<th>INTERVENTION</th>
<th>COMMODITY</th>
<th>TECHNICAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREVENTION &amp; CONTROL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triage/Screening PPE</td>
<td>Gloves, examination, non-sterile</td>
<td>Gloves, examination, nitrile, powder-free, non-sterile, single-use. Sizes: small, medium, large</td>
</tr>
<tr>
<td></td>
<td>Mask, surgical – health care worker</td>
<td>Surgical mask, good breathability, internal and external faces should be clearly identified Type II or higher.</td>
</tr>
<tr>
<td></td>
<td>Mask, surgical – patient</td>
<td>Surgical mask, good breathability, internal and external faces should be clearly identified Type I.</td>
</tr>
</tbody>
</table>

https://www.who.int/docs/default-source/coronaviruse/dcp-ncov-v4.pdf?sfvrsn=f5fe6234_7&download=true
Case Management

The bulk of this session will be based on the following devices, pulled from the WHO list of priority equipment for treating cases of severe COVID-19:
- Oxygen Concentrator
- Patient Monitoring & Pulse Oximeters
- Patient Ventilator for Critical Care
- Laryngoscope (Adult, Neonate)
- Suction Pumps
- Infusion giving set incl. Infusion Pumps, Syringe Pumps
- Defibrillators

Other recommended supplies include:
- Flow Splitter (for oxygen supply)
- Flowmeter, Thorpe tube
- Humidifier, non-heated
- Nasal prongs
- Catheter
- Oxygen Mask
- Venturi Mask
- Endotracheal tubes, with and without cuffs
- Endotracheal tube introducer, Bougie & Stylet
- Colorimetric end tidal CO2 detector
- Resuscitator, adult and child
- Oropharyngeal airway, Guedel, sterile, single use
- Nasopharyngeal airway

https://www.who.int/docs/default-source/coronaviruse/dcp-ncov-v4.pdf?sfvrsn=f5fe6234_7&download=true
From the World Health Organizations’ “Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected,” the following procedures are recommended:

- Screening and triage
- Immediate implementation of infection prevention and control (IPC) measures
- Collection of specimens for laboratory diagnosis

★ Management of mild COVID-19: symptomatic treatment and monitoring
★ Management of severe COVID-19: oxygen therapy and monitoring
★ Management of critical COVID-19: acute respiratory distress syndrome

https://www.who.int/docs/default-source/coronaviruse/dcp-ncov-v4.pdf?sfvrsn=f5fe6234_7&download=true
Outline

• Overview of the natural history of COVID-19
• Standard precautions
• Transmission-based precautions
• Risk evaluation and PPE
• Requirements for the use of PPE
• Routine decontamination of reusable non-invasive patient care equipment
Session 1

Personal Protective Equipment

For the Biomedical Professional
Natural history of COVID-19

Other coronavirus (SARS; MERS-CoV)?

Pathogen
COVID-19

Susceptible host
Any individual exposed to the virus

Portal of Entry
Airway; others?

Transmission
Spillover? H2H Tx

Reservoir
Unknown

Portal of Exit
Airway; others?

Survival in surfaces?
Ventilation systems?

Respiratory droplets
Mucous membrane contact
This advice stands for civilians, as well as professionals:

• Avoid close contact with people who are sick.
• Avoid touching your eyes, nose, and mouth.
• Stay home when you are sick.
• Practice social distancing, especially if your age or underlying health conditions put you at higher risk.
• Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
• Clean and disinfect frequently touched objects and surfaces using a regular household cleaning spray or wipe.
Standard precautions

A set of practices that are applied to the care of patients, regardless of the state of infection (suspicion or confirmation), in any place where health services are provided.

The following are always recommended for clinicians and biomedical professionals:

- Hand hygiene (water and soap or alcohol-based solutions)
- Use of personal protective equipment (PPE) according to risk
- Respiratory hygiene (or cough etiquette)
- Practice safe injection
- Sterilization / disinfection of medical devices
- Environmental cleaning
What’s so dangerous about COVID 19?

• The virus is stable for long periods of time on surfaces and in aerosols. According to a study from experts at the National Institute of Health, the Center for Disease Control, UCLA, and Princeton University the virus is detectable:
  • In aerosols for up to 3 Hours
  • On copper for up to 4 Hours
  • On cardboard for up to 24 Hours
  • On plastic and stainless steel for up to 3 Days

• How is COVID 19 different from SARS?
  • Most people are contagious before they show symptoms

Personal Protective Equipment

• Also Known As: PPE
• Our focus will be on the use of personal protective equipment (PPE) according to the risk
Transmission-Based Precautions

• Contact precaution
• Droplet precaution
• Airborne precaution
General Principles of PPE

1. Hand hygiene should always be performed despite PPE use.

2. Remove and replace if necessary any damaged or broken pieces of re-usable PPE as soon as you become aware that they are not in full working order.

3. Remove all PPE as soon as possible after completing the care and avoid contaminating the environment outside the isolation room; any other patient or worker; and yourself.

4. Discard all items of PPE carefully and perform hand hygiene immediately afterwards.
Contact Precaution: Gloves & Shoe Covers

• Gloves & shoe covers are an essential item of PPE and are used to prevent the healthcare worker from being exposed to direct contact with the blood or body fluid of an infected patient.

Gloves DO NOT replace hand hygiene.

• Contact precautions prevent contamination in both directions; your shoes carry germs from everything you contact outside the hospital, and the shoe cover stops you from carrying hospital contaminants home with you.
Gowns are used in addition to gloves if there is risk of fluids or blood from the patient splashing onto the healthcare worker’s body.

The same gown can be used when providing care to more than one patient but only those patients in a cohort area and only if the gown does not have direct contact with a patient.

Plastic aprons should be used in addition to gowns if the material of the gown is not fluid repellent and the task to be performed may result in splashes onto the healthcare worker’s body.
Droplet Precaution: Facial Mucosa

- Masks, and eye protection, such as eyewear and goggles, are also important pieces of PPE and are used to protect the eyes, nose or mouth.
- This protects the healthcare worker from any risk of contact with a patient’s respiratory secretions or splashes of blood, body fluids, secretions or excretions.
Putting on PPE
Take off PPE
Droplet Precaution: Masks

• Wear a medical mask when within a 1 meter range of the patient.

• Put the patient in a single room or in a room that contains only other patients with the same diagnosis, or with similar risk factors, and ensure that every patient is separated by at least one metre.

• Ensure that the transportation of a patient to areas outside of the designated room is kept to a minimum.

• Perform hand hygiene immediately after removing the medical mask.
Airborne Precaution: Respirator

• Use a respirator whenever entering and providing care within the patient isolation facilities ensuring that the seal of the respirator is checked before every use.

• Perform hand hygiene immediately after removing the respirator.

• Aerosol-generating procedures (AGP)
How to Perform a Particulate Respirator Seal Check

• Source: https://apps.who.int/iris/handle/10665/69793
# Use of PPE According to Level of Care

<table>
<thead>
<tr>
<th>Level of care</th>
<th>Hand hygiene</th>
<th>Gown</th>
<th>Medical mask</th>
<th>Respirator (N95 or FFP2)</th>
<th>Goggle (eye protection) OR Face shield (facial protection)</th>
<th>Gloves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triage</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection of specimens for laboratory diagnosis</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Suspected or confirmed case of COVID-19 requiring healthcare facility admission and NO aerosol-generating procedure</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Suspected or confirmed case of COVID-19 requiring healthcare facility admission and WITH aerosol-generating procedure</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Session 1

Disinfection

For the Biomedical Professional
CLEANING & DISINFECTION OF MEDICAL EQUIPMENT

Any piece of equipment used in providing patient care must be handled with care, as it may be contaminated and have the potential to spread infection.

General principles to remember when handling contaminated (used) patient care equipment

• It is important to avoid any contact between a used piece of equipment and the skin, mucosa or clothing of the health-care worker, including any handles of the equipment.

• The process of cleaning and disinfecting respiratory equipment frequently results in splashes which could potentially be contaminated.
When cleaning and disinfecting respiratory equipment the health-care worker or BMET should wear:

- rubber gloves,
- a gown and a rubber apron,
- face protection, such as a full-face shield or an eye protection, such as a visor or goggles,
- a face mask,
- Shoe covers,
- hair cover/caps
Patient care equipment should be single-use items if possible.

Reusable (communal) non-invasive equipment must be decontaminated:

• Between each patient and after patient use;
• After blood and body fluid contamination; and
• At regular intervals as part of equipment cleaning
  • Example Patient Bed in ICU
Patient care equipment should be single-use items if possible.

- **Ventilators**
  - Should be protected with a high efficiency filter
  - Reusable breathing circuits should be autoclaved

- **Suction**
  - Closed system suction should be used
  - Replace tubing
  - Replace bottle

- **Patient Monitor**
  - ECG Cables
  - Sensors should be cleaned
Cleaning & Disinfecting

• Clean and disinfect all equipment between uses.
• Thoroughly clean respiratory and re-usable equipment prior to disinfection.
• Health-care workers must use PPE for cleaning and disinfection of all equipment.
• Keep clean and disinfected items dry and in individual packages whenever possible.
Filter and Breathing Circuits

- Most accessories and consumables are single-use:
  - Breathing tubes;
  - Breathing masks;
  - Cannulas;
  - Bacteria (HEPA) filters;
  - HMEF filters;
- Sterilization is the preferred method of equipment decontamination.
  - 121°C/250°F@15 psi for 15 minutes – for heat sensitive items like rubber tubing, filters
  - 132°C/270°F@30 psi for 3 minutes - for items that will not melt at high heat

You must clean items properly before disinfection, or sterilization will not be effective.
When selecting a disinfectant for reprocessing medical equipment in the healthcare setting consider the following:

• The piece of equipment to be disinfected
• The composition of the piece of equipment and its intended use*
• The level of disinfection required
• The availability and capacity of services, physical facilities, organizational resources and personnel

*Spaulding’s Classification for “A Rational Approach to Disinfection”

<table>
<thead>
<tr>
<th>Body Contact</th>
<th>Disinfection Requirements</th>
<th>FDA Device Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>intact skin</td>
<td>low level</td>
<td>non-critical</td>
</tr>
<tr>
<td>mucous membranes</td>
<td>high level</td>
<td>semi-critical</td>
</tr>
<tr>
<td>sterile body cavity</td>
<td>sterilization</td>
<td>critical</td>
</tr>
</tbody>
</table>
Disinfection

High level disinfectants use products that include one of these following:

- 2% glutaraldehyde,
- 6% hydrogen peroxide
- 0.2% peracetic acid
- 7% accelerated hydrogen peroxide
- 0.55% ortho-phthalaldehyde (OPA).

https://www.who.int/emergencies/diseases/novel-coronavirus-2019
Disinfection

• The disinfectants available may vary from country to country.

• In disinfecting re-usable respiratory therapy equipment a high-level of disinfection is required. Generally, for environmental cleaning, bleach 3 provides a reasonable level of chemical disinfection.
  • Do not use bleach or chlorine on steel surfaces, such as surgical tools or steel machines. These will corrode.

• The use of a chemical germicide, such as bleach or a physical method such as autoclaving is usually sufficient.
  • Cleaning **must** precede any high-level disinfection activity, or disinfection will be ineffective.
  • Example: Clorox Germicide, Dettol, mediciean.
How to Clean LCD Screens

• Mix equal parts of isopropyl alcohol and distilled water in a clean spray bottle.

• Turn off the patient monitor, and make certain it is cool before proceeding.

• Spray some of your cleaning solution directly onto a microfiber cloth.

• Wipe the patient monitor LCD screen gently, but thoroughly, from top to bottom.
Cleaning and Disinfection of Mechanical Ventilators

- First step make sure you are using PPE
- Power off ventilator and ask the user if the using single use circuit or reusable circuit.
  - If single use – dispose of breathing circuit and filter
  - If reusable – dispose of filter, disassemble tubing and clean with detergent. Rinse and then perform high-level disinfection or sterilization.
- For the screen and metal/plastic surfaces, spray some of your cleaning solution directly onto a microfiber cloth. Wipe the ventilator device gently, but thoroughly, from to bottom and side and back of the device.
- Allow to dry and replace with new filters and patient breathing circuit (or sterilizes patient breathing circuit, if reusable).
- Test function with a test lung
The stages involved in reprocessing re-usable accessories and consumables are as follows:

1. Wash the item with soap or detergent and water
2. Rinse (with distilled water if possible)
3. Disinfect
4. Rinse again if using chemicals to disinfect (other than alcohol)
5. Dry
6. Store.

This process can be used for items such as beds, reusable accessories for suction pumps and ventilators, and similar non-electrical, non-cabled items. Autoclaving is preferred, but this method is second best for cases where there is no autoclave.
Environmental Cleaning

• All horizontal surfaces in areas where care is being provided to a patient must be cleaned every day and whenever visibly soiled. It must also be cleaned whenever a patient is discharged and before a new patient arrives.

• If the surface has had direct contact with patients, such as an examination table or other equipment, the surface must be cleaned and disinfected between different patients.

• All cloths used must be dampened before use. Dusting with a dry cloth or sweeping may lead to aerosolization and should be avoided.
Environmental Cleaning

• Solutions, cloths and mop heads should be changed regularly in accordance with local health authority policies, but at the minimum:
  • All cleaning equipment should be cleaned and dried after each use.
  • Re-usable mop heads should be laundered and dried after every use and before storage.
  • Areas around the patient should be kept clear from unnecessary equipment, supplies and clutter to allow thorough daily cleaning to take place.
  • Examination tables and surrounding equipment that have been used by patients known or suspected to be infected with an ARD of potential concern should be wiped down with disinfectants immediately after use.
Environmental Cleaning

It is also important to note that good ventilation of the area is necessary during and immediately after the process of disinfection, regardless of the type of disinfectant used.

- **Good ventilation looks like**: positive pressure, proper air filtration
- **Bad ventilation looks like**: windows and doors that open into hallways or rooms with people in them
Environmental Cleaning Process

• Put on gown, apron and rubber gloves
• Clean the surface area with water and detergent using a disposable cleaning cloth
• Dispose of the cleaning cloth in the appropriate leak-proof waste container
• Disinfect the area. (NB sodium hypochlorite can be used for disinfection; concentrations ranging from 0.05% to of 0.5% are suggested)
• Remove the rubber gloves and apron and dispose of both items into appropriate container for further cleaning and disinfection
• Remove gown and place it into appropriate container
• Perform hand hygiene
Summary

1. EVERYONE should practice basic hygiene and social distancing

2. In hospital settings, CLINICIANS and BIOMEDICAL PROFESSIONALS should adopt the following, in addition to standard procedures:
   • Increased frequency of basic hygiene like handwashing
   • Increased use of personal protective equipment to protect against droplet and airborne infections, such as respirators and face masks
   • Increased frequency of equipment disinfection

3. The virus can last up to three days on some surfaces, so be sure to use proper disinfectants (as recommended by the CDC or WHO) and to autoclave materials at high enough temperatures/for long enough.
Contributors

Gunalan Dass, Assist International
Benjin Joshua, Assist International
Erin Sharkey, Assist International
Christina Fast, Sterile Processing Education Charitable Trust (SPECT)
Feel free to speak up or use the chat function so that our moderators can speak for you!