Environmental and Equipment hygiene

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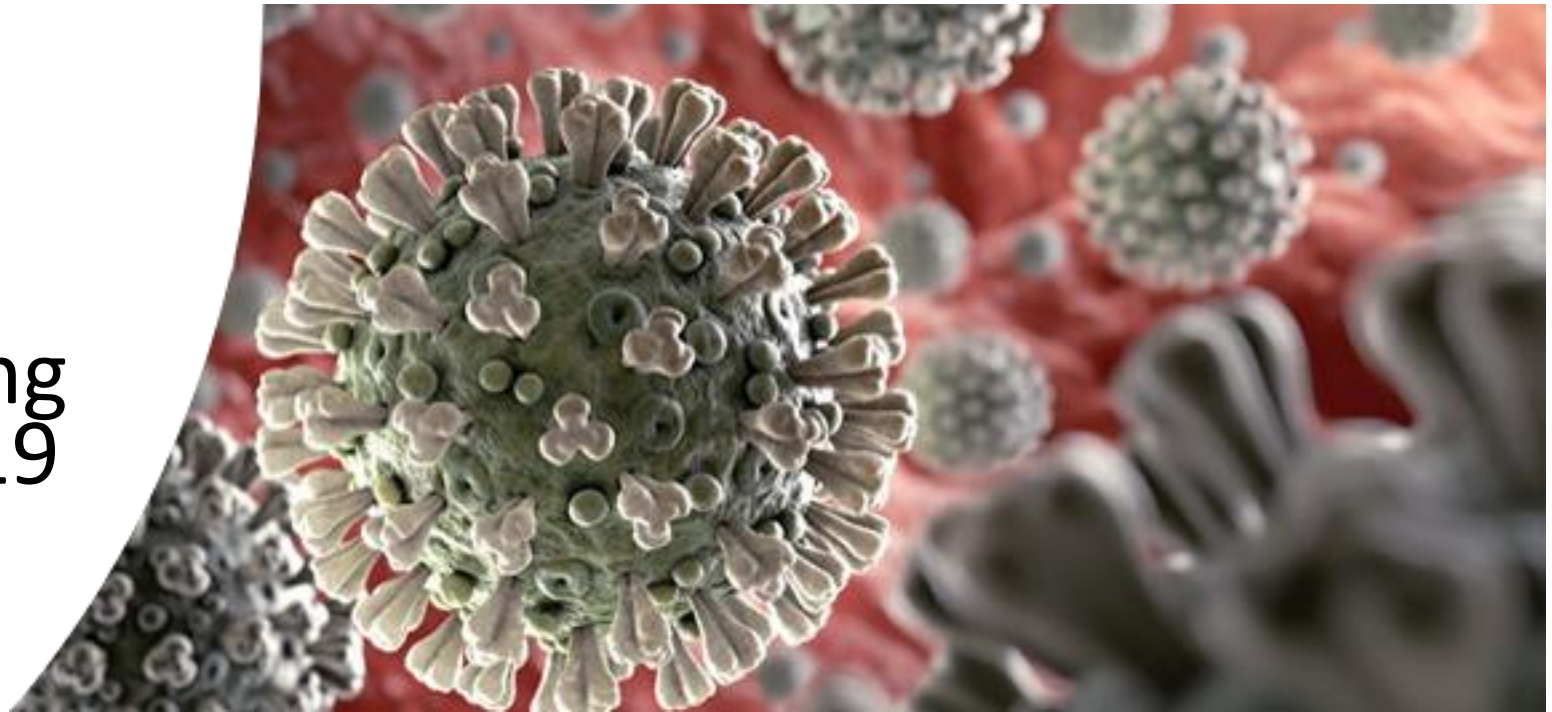
Preventing and controlling transmission of COVID 19 infection



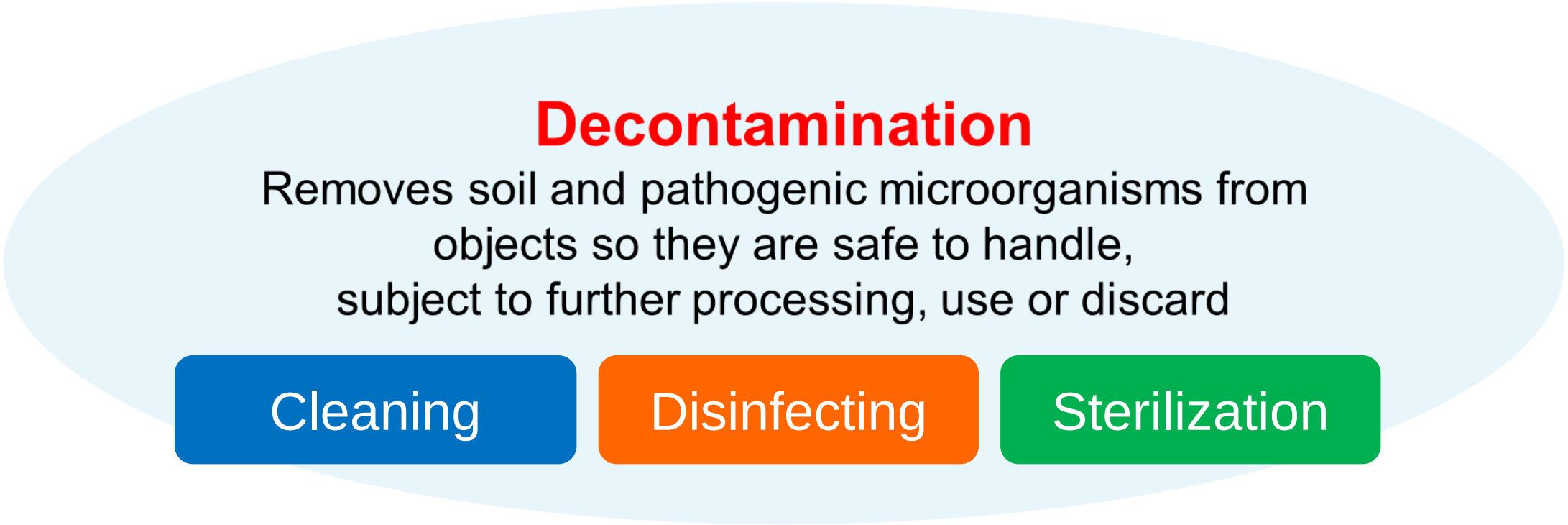
Outline

- Rationale for Cleaning medical devices
- Outline key environmental cleaning principles
- Management of linen in the context of COVID-19
- Waste management during COVID -19

Objectives

- Explain the rationale for cleaning and disinfection off medical devices
- Outline the best practices for environmental cleaning and disinfection
- Describe management of linen
- Describe the waste management process

Decontamination

- 

Source: World Health Organization. 2016. Decontamination and reprocessing of medical devices for health-care facilities. World Health Organization. Retrieved from : https://www.who.int/infection-prevention/publications/decontamination/en/

Decontamination

Cleaning	The first step required to physically remove contamination by foreign material, e.g. dust, soil. It will also remove organic material, such as blood, secretions, excretions and microorganisms, to prepare a medical device for disinfection or sterilization.
Disinfecting	A process to reduce the number of viable microorganisms to a less harmful level. This process may not inactivate bacterial spores, prions and some viruses.
Sterilization	A validated process used to render an object free from viable microorganisms, including viruses and bacterial spores, but not prions

Factors to consider…

TYPE OF ITEMS/DEVICES Critical, Semi-critical or Non-critical	**PRESENCE of MICROORGANISMS** Number (bioload) and ability to cause infection
TYPE of **MICROORGANISMS** Bacteria, spores, viruses or prions	**PATIENT SUSCEPTIBILITY** Type of procedure: invasive or non-invasive

Cleaning

What is the first step in reprocessing of medical devices?

Why must we clean?

CLEANING PROTECTS

- **THE EQUIPMENT**
  - soil (organic matter) can damage equipment
- **STAFF**
  - inspection before sterilization is required

CLEANING REMOVES

- Potentially infectious microorganisms
- The organic material on which microorganisms thrive
- Soil which protects microorganisms during disinfection and sterilization
- Soil which can inactivate disinfectants

Manual cleaning

You will need the following equipment prepared before starting:

- Cloths
- Brushes
- Spray guns
- Flushing devices

Staff protection

It is essential to protect the healthcare worker with

- Gloves- long domestic rubber gloves.
- Apron (plastic/ waterproof)
- Visor (eye cover)
- Closed toe shoes or boots
- Avoid production of aerosols
- Immunisation- Hepatitis B

Essential requirements of cleaning
The Sinner Cycle

Sinner Circle by Dr Herbert Heinkel in 1959

Cleaning requirements…1

- **Water**
  - Availability of good quality water is essential
    Soft water (low mineral and salt content)
- **Mechanical action**
  - wiping, flushing, brushing, spraying
- **Chemical action**
  - Use a detergent that is medical device compatible
  - Never use domestic grade detergent
  - The correct dosage must be used!
- **Brush**
  - Use a **soft nylon brush** which will not damage the surface of the medical device
  - Do not use *a metal or wire brush*

Cleaning requirements…2

- Heat
  - improves the detergent performance but not over 45° C
- Time
  - recommended contact time for detergent to interact with the various surfaces
- Access to all surfaces
  - Open all hinged devices
  - Disassemble more complex devices
  - Clean lumen with brush

Manual cleaning: Immersion Method

1. Fill sink or appropriate basin with sufficient warm water and detergent (see previous slide) for complete immersion of the device
2. Fully immerse the opened or disassembled medical device
3. Keep below the level of the water and scrub with a soft nylon brush
4. Inspect frequently to ensure all surfaces are clean
5. In another sink or basin, completely immerse the device in clean, purified water and rinse the device thoroughly
6. Mechanically dry; if this not available or not recommended by the manufacturer, air-dry or hand-dry using a disposable clean, non-linting cloth

Cleaning lumen devices

- You cannot clean inside a lumen with just a *soft brush*
- Make sure all lumen devices are well cleaned with a bottle brush and then flush through under pressure with either water or air

Do’s about cleaning

- Ensure **detergent is prepared at the correct concentration** and temperature and used for the recommended contact time.
- **Keep instruments moist and clean** as soon as possible after the procedure.
- **Disassemble instruments** prior to cleaning.
- **Open hinged/jointed instruments** to ensure access to all surfaces.
- **Use appropriate sized brushes** to clean lumen devices.
- Use **soft bristle brushes** to clean serrations and box locks.
- **Inspect instruments** after cleaning.
- **Clean instruments under the surface of the water to reduce the risk of aerosol production.**
- **Follow manufacturer’s instructions** for the cleaning of all medical devices.

Don’ts about cleaning

Never soak **any medical device in** ***any disinfectant*** **prior to cleaning**

- Disinfectants, especially bleach are
  - **Corrosive** and will destroy the medical device,
  - **Leaves a residue** which could cause harm to the patient,
  - Is **inactivated by organic matter** so is a waste of money,
  - Can cause **toxic reactions** in the staff if used incorrectly
- **Do not use water over 45º C** as it coagulates the protein and then is difficult to clean
- **Never use hard or any abrasive item** when cleaning medical devices
- **Don’t scrub under a running tap** because produces aerosols

Key message

First clean, then disinfect!

You can clean without disinfecting and /or sterilizing but you **cannot** sterilize or disinfect without cleaning!!

Environmental Cleaning

- IPC measure for preventing the transmission of COVID-19.
- Definition of cleaning: the physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms).
- Cleaning and disinfection procedures in HCF should be followed consistently and correctly.
- Where possible, dedicate cleaning supplies in higher risk areas (e.g., isolation, delivery, and operating rooms)
- WHO recommends the following disinfectants against COVID-19:
  - 70% Ethyl alcohol to disinfect small areas e.g. reusable dedicated equipment (e.g., thermometers) between uses.
  - Sodium hypochlorite at 0.5% (equivalent 5000ppm) for disinfection of surfaces.

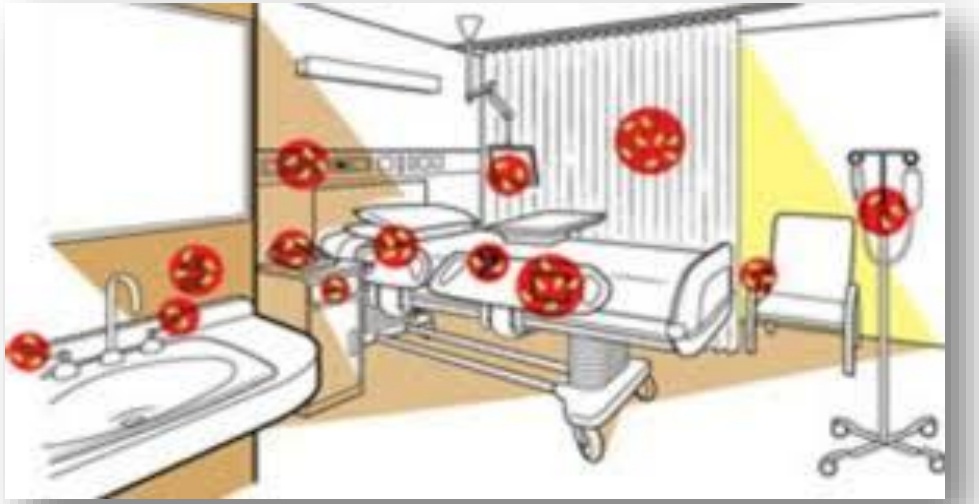
Source: CDC and ICAN. Best Practices for Environmental Cleaning in Healthcare Facilities in Resource-Limited Settings. Atlanta, GA: US Department of Health and Human Services, CDC; Cape Town, South Africa: Infection Control Africa Network; 2019. https://www.cdc.gov/hai/pdfs/resource-limited/environmental-cleaning-508.pdf

Key messages for environmental cleaning in context of COVID-19

1. Environmental cleaning is **important to mitigate the spread** of COVID-19 (contact transmission route)
2. SARS-CoV-2 **can survive on some environmental surfaces for days**, but environmental survival is low compared to many other important pathogens
3. Environmental cleaning using existing best practice methods and strategies is **effective against SARS-CoV-2**
4. SARS-CoV-2 is **susceptible to standard environmental cleaning and disinfection methods** (enveloped virus)

Environmental cleaning in health care

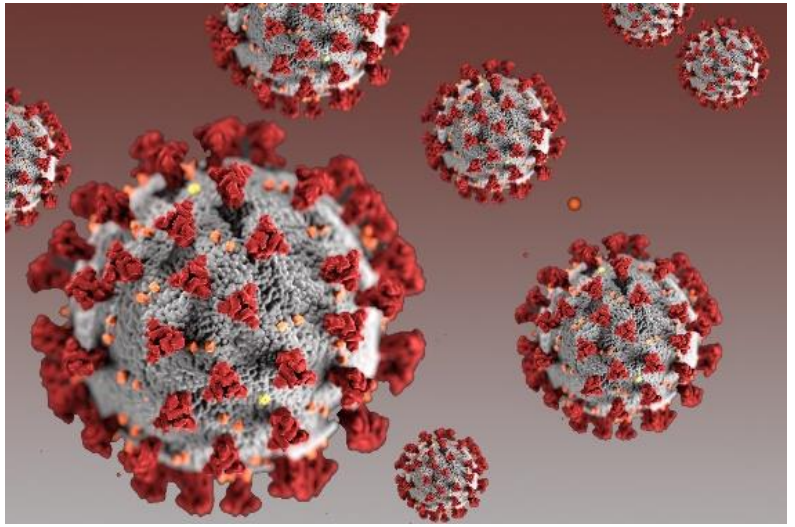
- Cleaning and disinfection (when needed based on risk) of ***environmental surfaces*** and ***non-critical patient care equipment***
- **Environmental surfaces** include:
  - Tables, chairs, floors, walls, bedrails, light switches
- **Non-critical patient care equipment** means:
  - Comes into contact with intact skin only (not mucous membranes, for example)
  - Examples in a clinical setting: IV poles, blood pressure monitors, stethoscopes, mobile computers and workstations, incubators, wheelchairs

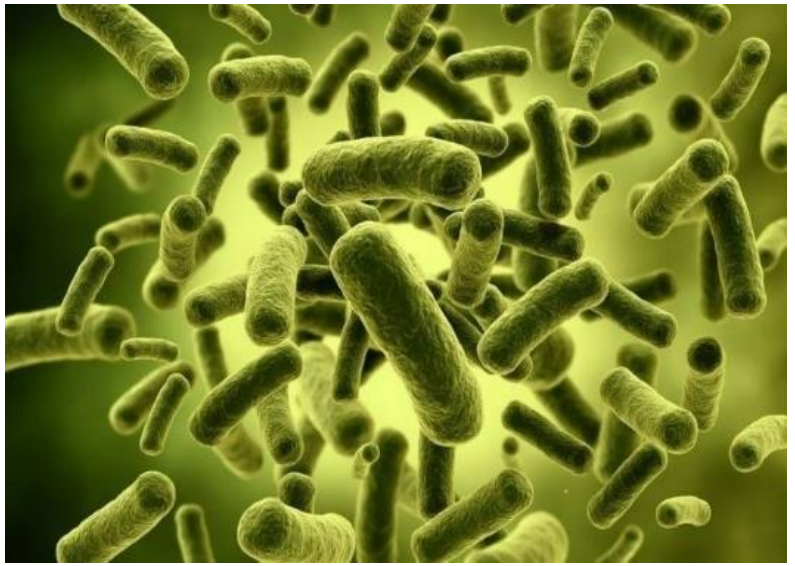


Emphasis is always on surfaces that are frequently touched by HCWs and/or patients "high-touch surfaces"

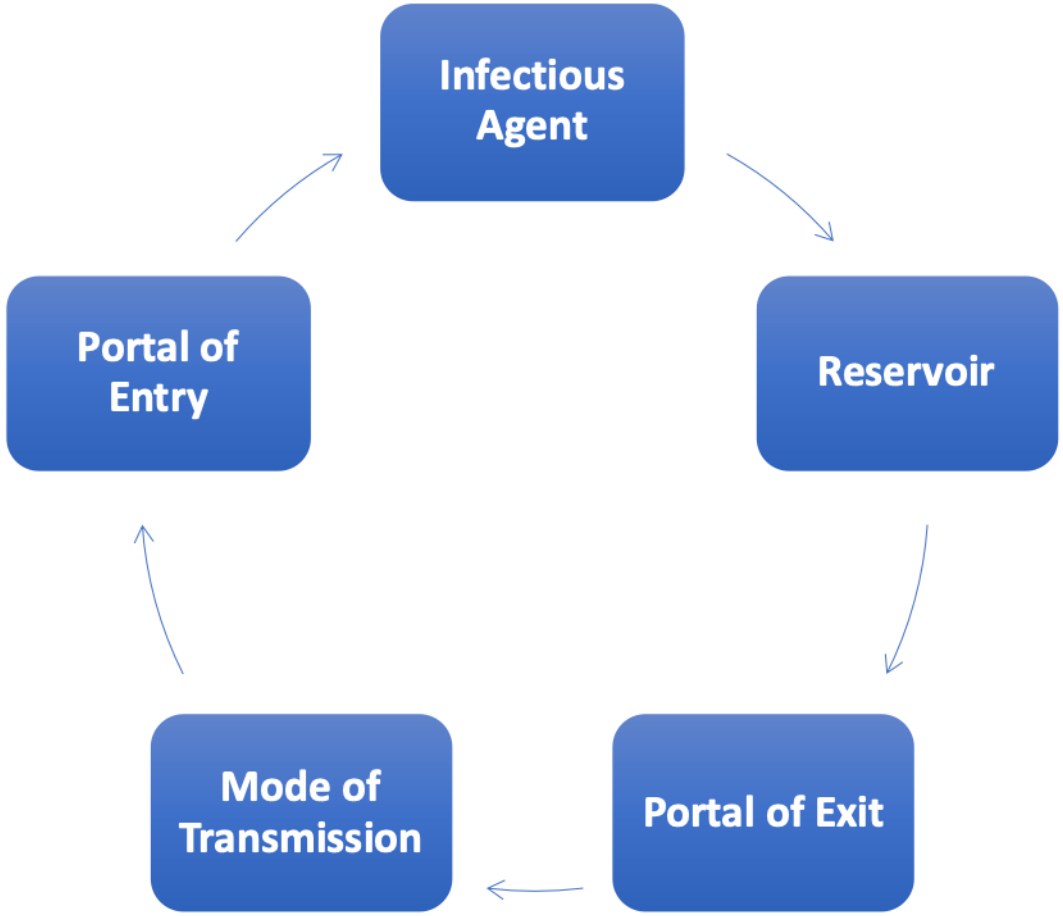
Risk of Contaminated Environment

- Microbes can survive on inanimate surfaces for extended periods: e.g. instruments, floors and tables, clothing including PPE, & in body fluids
- Exposure to contaminated surfaces can lead to colonization/infection
- Microorganisms in environment are transferred to patients mainly by the hands of the HCW
- Facilitate higher risk of transmission





Chain of Infection



- For an infection to spread, all links must be connected
- Breaking any one link, will stop disease transmission!

Primary modes of transmission – COVID-19 virus

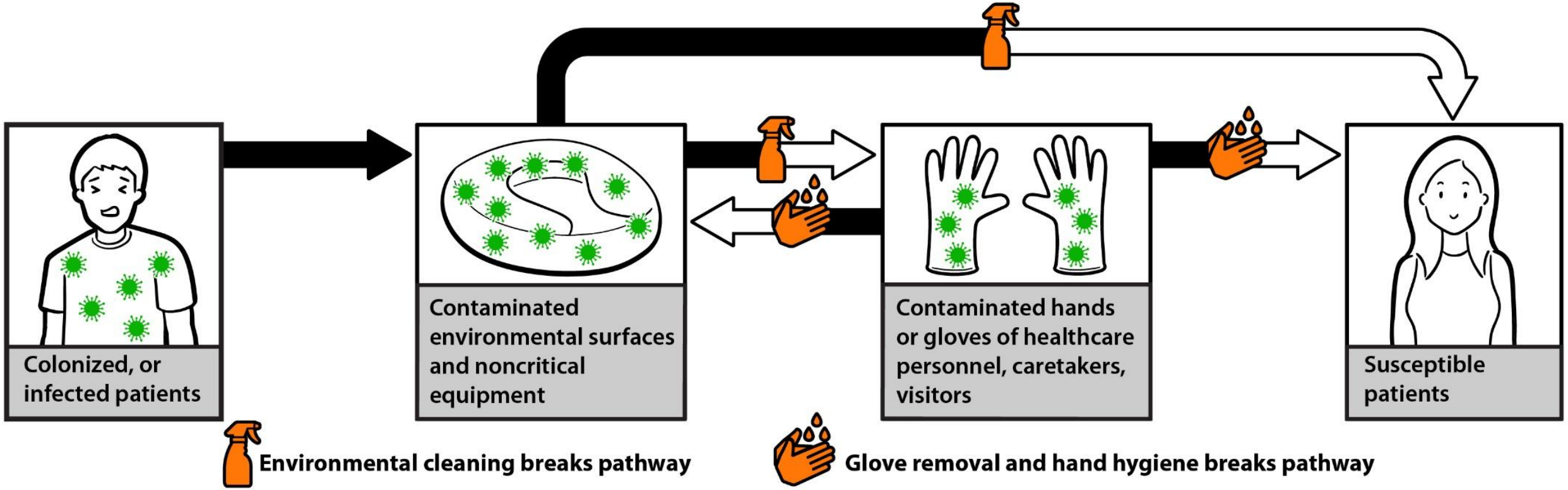
Droplet:

Respiratory droplets are generated when an infected person coughs or sneezes. Any person who is in close contact (within 1 m) with someone who has respiratory symptoms (coughing, sneezing) is at risk of being exposed to potentially infective respiratory droplets.

Contact:

Droplets may also land on surfaces where the virus could remain viable; thus, the immediate environment of an infected individual can serve as a source of transmission (contact transmission).

How do we break this chain of infection?



Disinfectants

Healthcare disinfectants:

- alcohols, chlorine and chlorine compounds, standard and improved hydrogen peroxide, phenolics, iodophors, peracetic acid, and quaternary ammonium compounds.

- To assess appropriateness of disinfectants for the task, look at:
- Active ingredient(s)
- Label claim (spectrum of activity, test organisms)
- Remember the disinfectant hierarchy!

Active ingredient(s)	Spectrum of activity	Level of disinfection
Quaternary ammonium compounds (e.g., alkyl dimethyl benzyl ammonium chloride) (0.1-1%) *newer formulations dimethyl ammonium bromide	Bactericidal Fungicidal	Low-level
Chlorine-releasing agents (e.g., sodium or calcium hypochlorite, sodium dichloroisocyanurate (NaDCC)) at 500ppm	Bactericidal Fungicidal	
Alcohols (60-80%) (e.g., isopropyl alcohol, ethyl alcohol/ethanol) *Ethyl alcohol doesn't inactive poliovirus or HAV, but does adenovirus, enterovirus, rhinovirus	Bactericidal Fungicidal Virucidal* Mycobactericidal	Mid-level
Chlorine-releasing agents (e.g., sodium or calcium hypochlorite, NaDCC) at 1,000ppm	Bactericidal Fungicidal Virucidal Mycobactericidal	
Improved hydrogen peroxide (e.g., 0.5% enhanced action formulation hydrogen peroxide, 3% hydrogen peroxide)	Bactericidal Fungicidal Virucidal Mycobactericidal	
Hypochlorite at 5,000ppm; Hydrogen peroxide at 4-5%	Bactericidal Fungicidal Virucidal Mycobactericidal Sporicidal	High-level (Sporicidal) *not used routinely*

What are the disinfectants we should use in healthcare facilities in the context of COVID-19?

- Disinfection of environmental surfaces in healthcare facilities should consider not only SARS-CoV-2, but also other clinically important healthcare pathogens
  - Hospitalized patients at increased risk of other infections due to underlying medical conditions and invasive procedures
- The following disinfectants and defined concentrations can be used on environmental surfaces to achieve a >3 log reduction of human coronavirus (Kampf, 2020), and they are also proven to be effective against other clinically relevant pathogens in healthcare settings (contact time ≥1 minute):
  - Ethanol ≥70%
  - Hydrogen peroxide 0.5%
  - Hypochlorite from 0.1% (1,000 ppm)

Use 5,000ppm on hardy pathogens when facility has history with hardy pathogens (*C. auris, C. difficile*)

Use 5,000pm for large blood and body fluid spills

- Other disinfectants can be used, provided they have demonstrated action against other human coronaviruses or harder to kill organisms (e.g., non-enveloped viruses) for healthcare settings, according to the local authorities or regulatory bodies (use manufacturer recommended contact time).

Environmental Decontamination

Some cleaning principles for COVID-19 in healthcare facilities:

- When cleaning in HCF, always move from cleanest to dirtiest:
  - **Clean from top to bottom, outer to inner, and isolation spaces with COVID-19 patients should be clean last**
- Damp dusting and mopping is recommended (Put a damp/moist towel on the end of the broom or mop)
- Isolation spaces where COVID-19 suspects or confirmed cases are being cared for need to have dedicated cleaning/disinfection supplies. These agents should not leave the isolation area and be taken to other departments in the HCF
- Do not spray disinfectants—this may cause some virus to be re-aerosolized.
- If re-using medical equipment between patients, ensure that they are cleaned and disinfected between patients

Source: CDC and ICAN. Best Practices for Environmental Cleaning in Healthcare Facilities in Resource-Limited Settings. Atlanta, GA: US Department of Health and Human Services, CDC; Cape Town, South Africa: Infection Control Africa Network; 2019. https://www.cdc.gov/hai/pdfs/resource-limited/environmental-cleaning-508.pdf

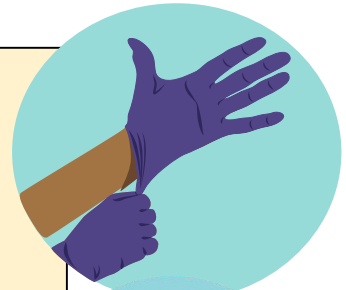
Routine Cleaning an Occupied Room (Six steps)

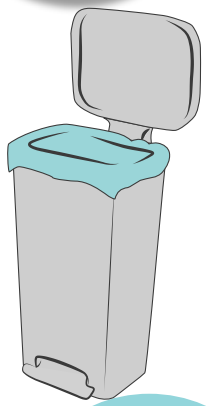
1. Perform hand hygiene

   and don gloves (PPE as needed)
   - Be alert for signage on or near the entry
   - Always knock, greet patient and introduce yourself, explaining why you are there

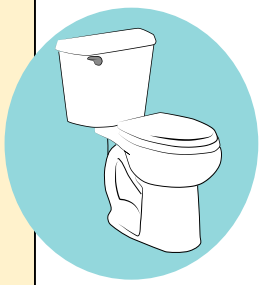
2. Remove trash
   - Remove trash and take to doorway
   - Clean and wipe inside and outside of the waste can
   - Check sharp containers (change when ¾ full)
   - Wipe outside of sharp container

3.Clean and wipe(disinfect) high-touch surfaces
   - Wipe surfaces with disinfectant, turning cloth often
   - Use glass cleaner or other facility-approved product for mirror and glass

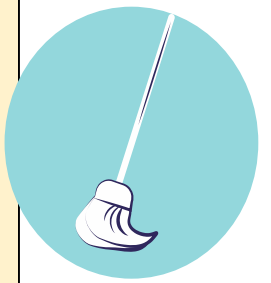




4. Clean bathroom (use separate cleaning cloths)
   - Clean sink/shower – spot clean walls
   - Clean toilet with brush and do this last



5. Mop the floor: starting at the far side of room towards the doorway,

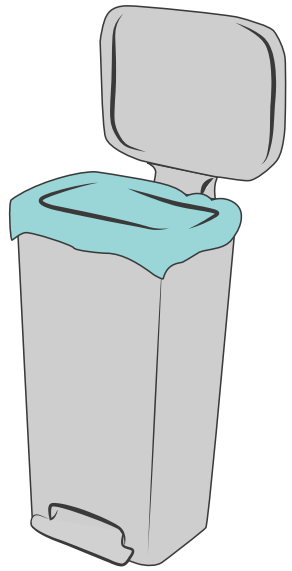


6. Remove gloves and perform hand hygiene. Inspect the room:
   - Report any repairs that are needed.
   - Correct any deficiencies.

Source: Resolve to Save Lives training material

Terminal (Discharge/Transfer) Cleaning and Disinfection (1)

1. Perform hand hygiene and don PPE (glove,..)
2. Be alert for signage on or near the entry door that may indicate need for special precautions
3. Remove trash and soiled linens
   - Place trash in trash bag
   - Clean and wipe inside and outside of the waste can
   - Check sharps container
   - Remove equipment for cleaning (IV Pumps etc.)
   - Inspect mattress for cracks/tears. If cracked or torn, notify supervisor. If mattress is intact, clean and disinfect entire mattress surface
4. High dust (shoulder level/higher) vertical and horizontal surfaces
   - Use extension pole if necessary
   - Dust vents



Source: Resolve to Save Lives training material

Terminal (Discharge/Transfer) Cleaning (2)

5. Clean and disinfect high-touch surfaces
    - Start with door and work around the room in a circular pattern; spot clean walls
    - Clean bathroom using a separate disinfecting cloth
6. Clean and wipe down entire bed frame, frame supporting mattress, mattress and pillows
7. Check walls and spot clean/disinfect
8. Clean and damp wipe all vertical surfaces, counters, ledges, and window sills with microfiber cloth moistened in cleaner/disinfectant solution
9. Clean bathroom (use separate cleaning cloths)
10. Remove gloves and perform hand hygiene. Inspect the room:
    - Is the room ready for another patient?

Source: Resolve to Save Lives training material

Some cleaning principles for COVID-19 in healthcare facilities

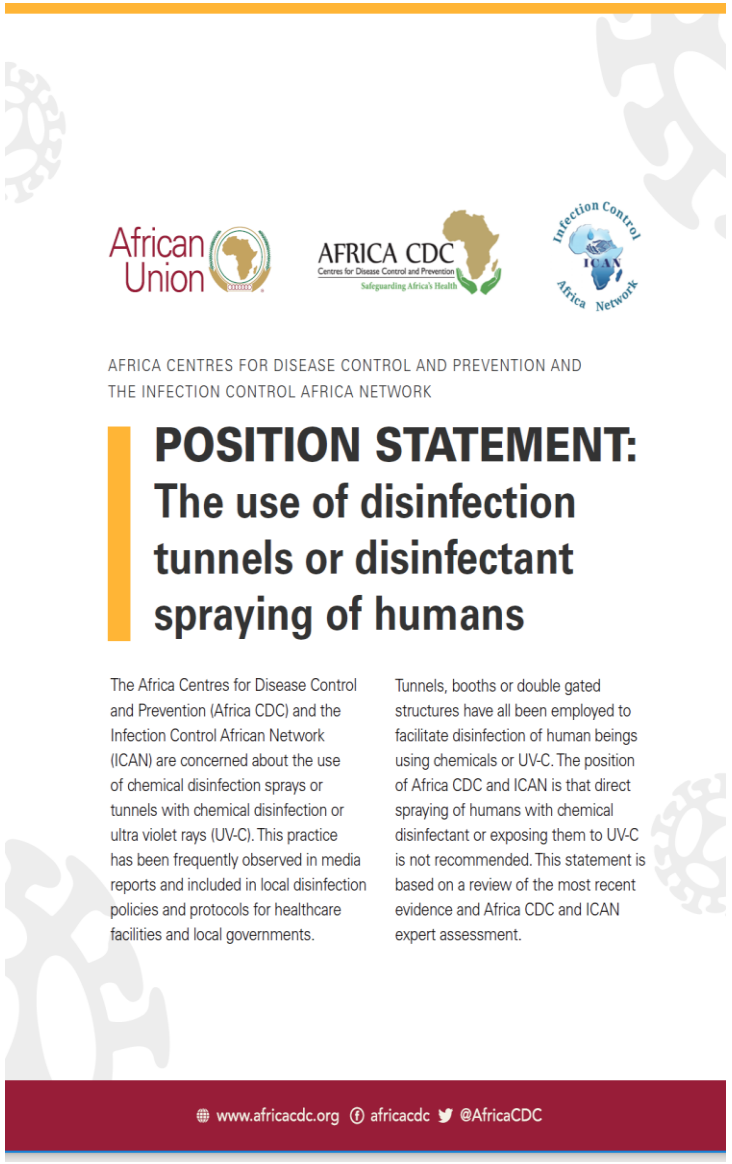
- Increase the frequency of cleaning throughout the healthcare facility. Develop a cleaning schedule for isolation areas of the HCF with COVID-19 patients. More cleaners may need to be hired to meet the cleaning demand
- To disinfect environmental surfaces and medical equipment, 0.5% chlorine solution is needed.
- If chlorine is to be applied as a surface disinfectant, it should be wiped on NOT sprayed
- All waste from the isolation area is considered contaminated and should be disposed of following your facilities methods for contaminated waste
- Cleaners/housekeeping should ensure they are wearing the appropriate PPE when cleaning an isolation room or area

Recommended cleaning schedules in the context of COVID-19

Patient area	Frequency	Person / staff responsible	Products/Supplies	Additional guidance
Triage area	At least twice daily	Environmental cleaning (EC) staff	Cleaning solution (neutral detergent and water); Disinfectant (alcohol, chlorine-based, other as approved*) Freshly made solutions, cloths, and mops for each cleaning session. **Discard/reprocess supplies after each cleaning session.** **Dedicated supplies for inpatient isolation areas.** **PPE**: gowns and/or impermeable aprons, rubber gloves, medical mask, and eye protection (preferably face shield).	Focus on high-touch surfaces, then floors (last)
Inpatient rooms / cohort – occupied	At least twice daily; three times daily if possible (high-touch surfaces)	EC staff OR clinical staff if possible		Focus on high-touch surfaces, starting with shared/common surfaces, then move to each patient bed; use new cloth for each bed if possible
Inpatient rooms – unoccupied (terminal clean)	Upon discharge/ transfer	EC staff		Low-touch surfaces, high-touch surfaces, floors (in that order); waste and linens removed, bed thoroughly cleaned and disinfected
Outpatient / Ambulatory Care rooms	After each patient visit and at least once daily terminal clean	Clinical staff (after each patient); Terminal clean (EC staff)		High touch surfaces to be disinfected after each patient visit; terminal clean as above (end of day)
Hallways / Corridors	At least twice daily	EC staff		High-touch surfaces (e.g., railings)
Patient toilets	Private (at least twice daily); Shared (at least three times daily)	EC staff		High-touch surfaces, including door handles, light switches, counters, faucets, then sink bowls, then toilets and finally floor (in that order)

Key points in Environmental cleaning

- Apply chlorine to surface by wiping and not spraying
- Apply the correct concentration for the correct contact time
- Wipe off after contact time is over, to reduce corrosive activity especially on metalsSpraying of humans with chemicals and fumigation tunnels is potentially dangerous – can damage the eyes and cause skin rashes and affect breathing
- No discernible benefit for coronavirus prevention- virus cannot enter the body through the skin
- **DO NOT SPRAY THE ENVIRONMENT WITH CHLORINE!**
- **DO NOT SPRAY HUMANS WITH CHLORINE!**



General Guidelines for Safe Handling of Linen

- The principles of safe linen handling are based on “clean management” as opposed to sterile
- All health facilities should have well equipped laundry units or access to laundry services
- All laundry units must have:
  - separate areas for sorting dirty/soiled linen, folding, and storing clean linen
  - adequate ventilation (6 - 10 air changes per hour) and physical barriers (walls) between the clean and soiled linen areas
  - sufficient tubs, preferably stainless steel, for the separation and soaking of used and soiled linen.

General Guidelines for Safe Handling of Linen (cont.)

- All laundry staff should be trained on guidelines for handling linen and how to use laundry equipment and logistics
- Health facilities should have adequate numbers of linen for use in the different sections
- Standard precautions should be observed when handling all laundry
- Always wear appropriate PPE including utility gloves when handling used linen

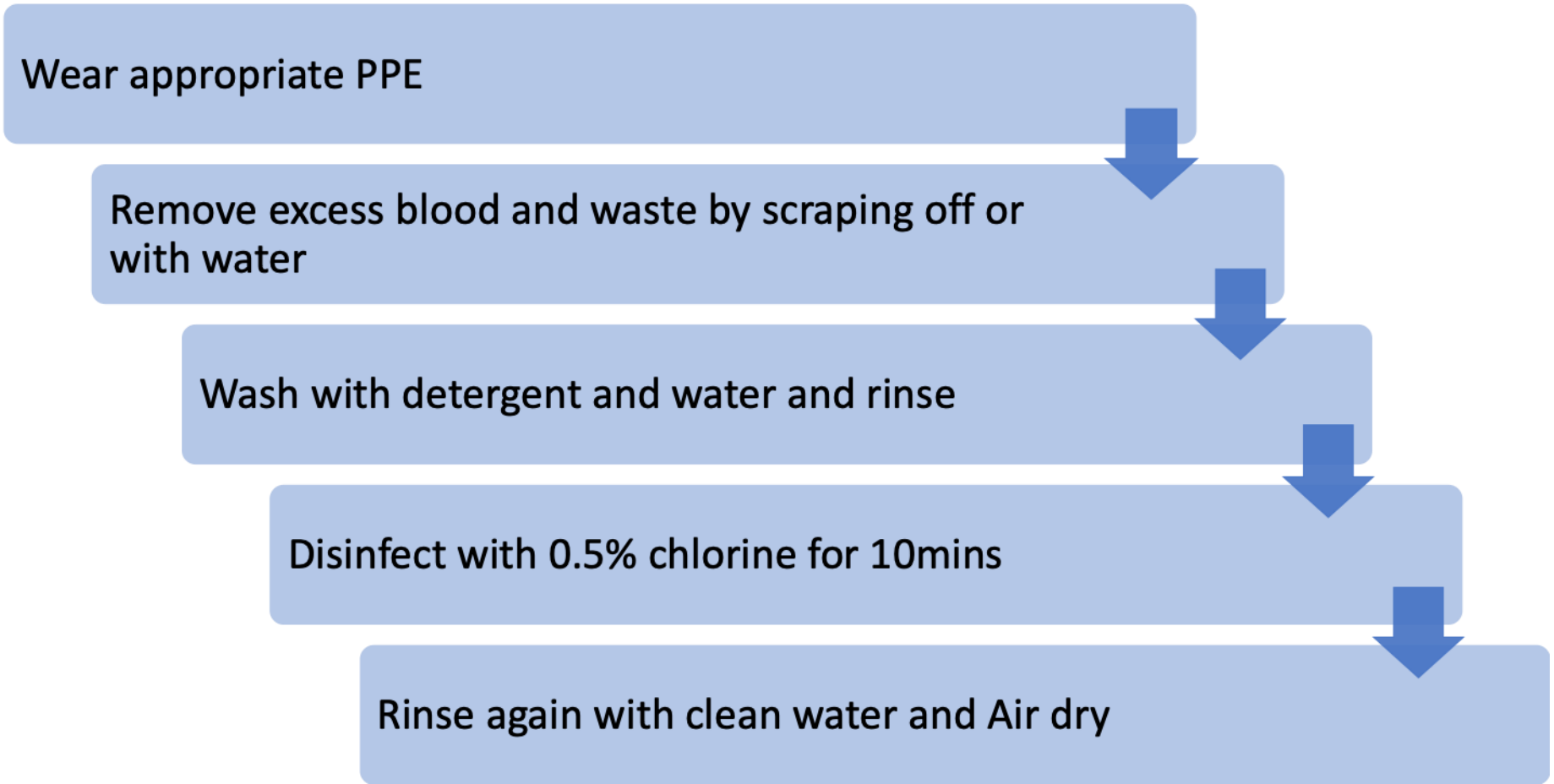
Managing soiled linen

- Wear PPE according to the risk when handling used or soiled linen
- Handle soiled linen with minimum agitation to avoid contamination
- Place soiled linen into bags/containers at point of care
- If linen is grossly soiled:
  - Remove gross soil (e.g. feces, vomit) with a gloved hand and using a flat, firm object
  - Discard solid material into flush toilet and dispose of towel into waste
  - Place soiled linen into a clearly labelled, leak-proof container (e.g., bag and closed bin) in the patient care area
  - To wash linen, use washing machine with a water temperature of 60-90 degrees Celsius with regular detergent.

Management of Linen

Some considerations for disinfection at the healthcare facility for COVID-19 in African settings:

- If a washing machine is not available, place all soiled linen in a large drum with hot water and soap/detergent. Stir with a large stick/spoon then disinfect with 0.5% chlorine .

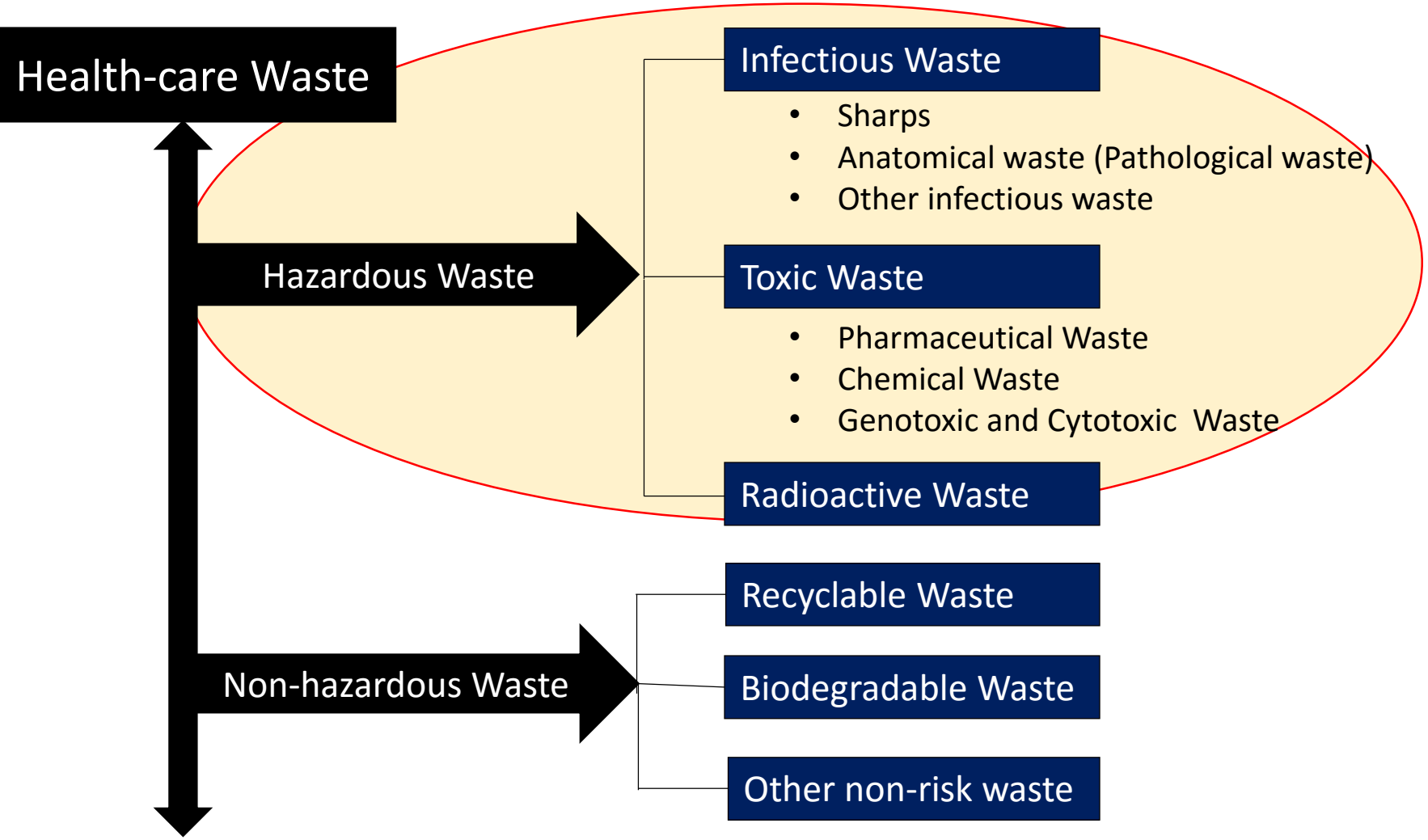


Waste Management

Some general principles of waste management:

- Healthcare facility managers and all staff have a responsibility to ensure that waste is kept under control at all times and disposed of safely
- Healthcare waste shall be segregated into different components, based on the potential hazard nature of the waste
- Separate containers shall be available for each segregated waste component
- Waste containers shall be clearly labelled to help managers control waste production
- Lidded containers should be used for all hazardous waste streams
- Hazardous &general wastes should not be mixed during collection, transport or storage

Types of Waste at Healthcare Facilities



Waste management processes

https://noharm-asia.org/articles/news/asia/opinion-editorial-philippines-managing-covid-19-related-health-care-waste

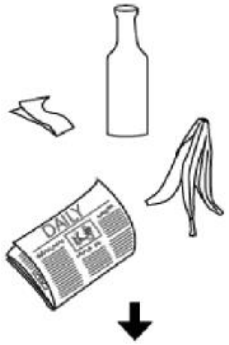
Some general principles of waste management

- Collected waste may be taken to central storage onsite before treatment and disposal provided it is stored securely and remains appropriately labelled and segregated
- All healthcare staff should be trained in waste management

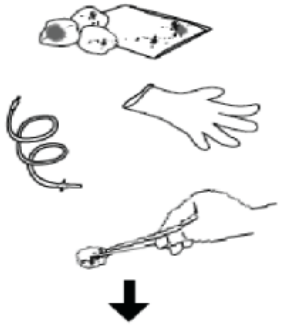
Three bin system

- Sorting waste

General waste



Infectious waste



Sharps waste

Colour coding & labels

Waste type	Container Colour and markings	Type of container
Infectious Clinical Waste	Yellow with biohazard symbol	Strong, leak-proof plastic bag. Held inside rigid, clearly marked lidded bin. Bag preferably 70 µm thick (ISO 7765 2004).
Sharp	Yellow, labelled “sharps”, with Biohazard symbol	Rigid, puncture-resistant container
Pathological **Autoclave and Laboratory waste**	Red, label “Pathological for Burning”	Rigid, leak-proof container with sealable lid
Chemical & Pharmaceutical	Brown, label with relevant symbol and “Do not autoclave”	Unspecified. Bag/box/bin must adequately contain substance (no leakage)
Radiological	Not specified. Label with Radioactive symbol, and “Do not burn”.	Lead-lined box (for on-site storage until activity level falls below proscribed limit)
General	Black	Plastic bag

Some considerations for waste management in healthcare facility for COVID-19 in African settings

- Sharps should have a separate container and should not be mixed with the infectious waste
- Never carry a waste bag up against the body or over the shoulder
- It is important to clearly identify containers for specific categories of waste –
- Implement a color coded waste sorting process- use colored bins
- Lidded containers should be used for all hazardous waste streams
- Hazardous & general wastes should not be mixed during collection, transport or storage
- Collected waste may be taken to central storage onsite before treatment and disposal provided it is stored securely and remains appropriately labelled and segregated
- All healthcare staff should be trained in waste management

References

- CDC and ICAN (2019) Best Practices for Environmental Cleaning in Healthcare Facilities in Resource-Limited Settings. Atlanta, GA: US Department of Health and Human Services, CDC; 2019. Available at: https://www.cdc.gov/hai/prevent/resource-limited/index.html
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- WHO. Fundamentals of health-care waste management. Retrieved from: https://www.who.int/water_sanitation_health/medicalwaste/en/guidancemanual1.pdf
- Presentation by Molly Patrick, M.Eng 0n Environmental cleaning in healthcare facilities in context of COVID-19
- Presentation by Professor Shaheen Mehtar on Environmental spraying when and where?

THANK YOU