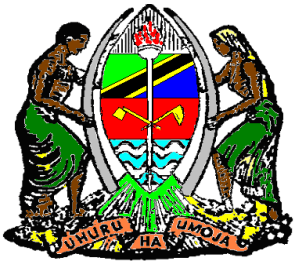
**THE UNITED REPUBLIC OF TANZANIA**




**MNISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN**

# NATIONAL INFECTION PREVENTION AND CONTROL GUIDELINES FOR HEALTHCARE SERVICES IN TANZANIA

**JUNE, 2018**

## FOREWORD

The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) is firmly committed to ensure safe, quality healthcare services to the people of Tanzania and to provide protection from outbreaks of infectious diseases. The infection prevention and control guidelines contained in this document are a reflection of this commitment.

Infection prevention is a critical component of quality health services, yet it has received insufficient attention in the healthcare settings. Healthcare Associated Infections (HAIs), may be transmitted in different ways, either from a patient, a relative or a staff member. They may also be transmitted through the air or contaminated water, food, drugs, medical equipment and objects in the environment such as furniture or dishes. In addition, the elevated rates of prevalence of highly infectious and potentially life-threatening diseases in Tanzania, such as HIV/AIDS, Cholera, Tuberculosis and Bloody diarrheal diseases, also demand that special attention be placed on safe and effective infection prevention practices.

Also, Antimicrobial Resistance (AMR) in our Health Facilities has been increasing to an alarming rate. This has made the MoHCDGEC to develop an AMR Action Plan (2017-2022) to address the situation. Among the priority areas articulated in the Action Plan is “Infection Prevention and Control in health care”. This means that the revised guideline has come timely given its potential for contributing to the efforts to control the spread of antimicrobial resistance in our healthcare settings. Therefore, all Health Facilities need to implement the recommended practices and actions in this guideline to ensure patient and staff safety as well as prevent spread of antimicrobial resistant pathogens.
Implementation of this guideline is also pivotal in making Health Facilities capable of handling threats from Viral Haemorrhagic Fevers (VHFs) such the Ebola Virus Disease (EVD). This revised guideline has provided a specific chapter 26, which provides guidance on the recommended IPC practices when handling suspected or confirmed cases of VHFs.

The purpose of this document is to provide all healthcare providers with basic infection prevention and control guidelines and safety precautions applicable in their day-to-day activities.

The MoHCDGEC is dedicated to strengthen and support these practices and will ensure proper implementation through increased budgetary allocations to meet the requirements for improved infection prevention and control. Likewise, the combined efforts of every healthcare worker will ultimately result in improved quality of care for all patients and health personnel.

Mpoki

**Dr. Mpoki M. Ulisubisya**
**PERMANENT SECRETARY (HEALTH)**

**ACKNOWLEDGEMENTS**

This document is the product of extensive and wide consultation among organizations and individuals with vested interest in providing quality services especially in the area of infection prevention and control (IPC) for healthcare services in Tanzania. The Ministry of Health, Community Development, Gender, Elderly and Children wishes to extend sincere gratitude to all those who have contributed materially, physically and technically towards the development of these important guidelines.

Special thanks go to Dr. Joseph C. Hokororo, the Coordinator of IPC and safety at the Ministry for his tireless efforts towards finalisation of this guideline. I would like to thank the Director of Health Quality Assurance - Dr Mohamed A. Mohamed and Assistant Director of Health Services Inspectorate and Quality Assurance Section - Dr Eliudi S. Eliakimu for their coordination role that has resulted in finalisation of this guideline. Also, the Ministry would like to thank Medipeace Tanzania and KOICA for Financial and Technical support in particular from the following staff - Sehyeon Kim, Dr. Nyambuli Jigabha, and Fatuma Salimu that has made the review of the National IPC Guideline 2018 a success.

We would like to acknowledge and congratulate the experts who have devoted their time, energy and knowledge to the development of these guidelines. Their names are given in Appendix II. These experts and medical colleagues were drawn from various Divisions of the MoHCDGEC, National and Regional Referral Hospitals, Council Level Hospital, Kairuki Memorial University, Private Hospitals in Tanzania, and the National Institute for Medical Research (NIMR).

Finally, we would like to extend our cordial gratitude in advance to all those who on being exposed to these guidelines will feel it is their duty to offer to us their constructive criticism and comments aimed at improving the document.

**Prof. Muhammad Bakari Kambi**
**CHIEF MEDICAL OFFICER**

## ACRONYMS AND ABBREVIATIONS

| | | |
|---|---|---|
| ABHR | - | Alcohol-Based Hand Rub |
| AIDS | - | Acquired Immunodeficiency Syndrome |
| ACH | - | Air Change per Hour |
| CAUTI | - | Catheter-Associated Urinary Tract Infection |
| CDC | - | Centres for Disease Control and Prevention |
| CLABSI | - | Central Line-Associated Blood Stream Infection |
| CSSD | - | Central Sterilization and Supplies Department |
| CTUs | - | Cholera Treatment Units |
| EVD | - | Ebola Virus Disease |
| GIT | - | Gastrointestinal Tract |
| HBV | - | Hepatitis B Virus |
| HCV | - | Hepatitis C Virus |
| HCF | - | Healthcare Facility |
| HCW | - | Healthcare Waste |
| HCWM | - | Healthcare Waste Management |
| HIV | - | Human Immunodeficiency Virus |
| HLD | - | High-Level Disinfection |
| HSCT | - | Haematopoietic Stem Cell Transplant |
| ICU | - | Intensive Care Unit |
| IPC | - | Infection Prevention Control |
| IUD | - | Intrauterine Device |
| MoHCDGEC | - | Ministry of Health, Community Development, Gender, Elderly and Children |
| MRSA | - | Methicillin-Resistant *Staphylococcus Aureus* |
| NICU | - | Neonatal Intensive Care Unit |
| OCV | - | Oral Cholera Vaccine |
| OPA | - | Ortho-Phthalaldehyde |
| OPD | - | Out Patient Department |
| ORS | - | Oral Rehydration Therapy |
| PEP | - | Post Exposure Prophylaxis |
| PLHIV | - | People Living with Human Immunodeficiency Virus |
| PPE | - | Personal Protective Equipment |
| PPM | - | Planned Preventive Maintenance |
| PVI | - | Povidine Iodine |
| RRT | - | Rapid Response Team |
| SARS | - | Severe Acute Respiratory Syndrome |
| SSIs | - | Surgical Site Infections |
| TFDA | - | Tanzania Food and Drug Authority |
| TB | - | Tuberculosis |
| UP | - | Universal Precautions |
| UTIs | - | Urinary Tract Infections |
| VAE | - | Ventilator-associated events |
| VHFs | - | Viral Haemorrhagic Fevers |
| VIP | - | Ventilated Improved Pit |
| WASH | - | Water, Sanitation and Hygiene |
| WHO/AFRO | - | World Health Organization /African Regional Office |

## HOW TO USE THIS MANUAL

Infection prevention and control is multidisciplinary and requires compliance by all levels of healthcare providers. Infection prevention deals primarily with preventing the spread of infectious diseases through the air, blood or body fluids, faecal-oral and food-borne. Such compliance is obligatory to prevent and control nosocomial and other infections in healthcare settings as well as in the community. These guidelines have been developed by the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) of Tanzania to aid health workers to understand and use evidence-based infection prevention practices.

**The expected users of this guideline include:**

- Policy makers, health managers and administrators
- Healthcare providers and trainers
- Programme officers
- Government and private health facilities and training institutions
- Regional Health Management Teams and Council Health Management Teams
- People working at the community level to promote quality of healthcare, e.g.,
- Facility Health Management Committees
- Individuals, groups, and international organizations engaged in healthcare service provision

**These guidelines are made up of five chapters (parts) as follows:**

i. Part I: Background

ii. Part II: Fundaments of Infection Prevention and Control

iii. Part III: Processes in Infection Prevention and Control

iv. Part IV: Preventing Infection in Special Settings

v. Part V: Infection Prevention and Control Management

## PART I: BACKGROUND

### 1.0. INTRODUCTION

Health care associated infections occur as results of health care in facilities or in the community. Infections can take place in all types of health facilities and can be major causes of death or morbidity in many facilities worldwide. At any one time, over 1.4 million people worldwide suffer from infectious complications of health care. Health care workers may also be infected. These Health care associated infections cause problems in healthcare settings globally.

Transmission of infection continues to be a major problem in Tanzania with the burden of infectious disease very high, as reflected in the Tanzania HIV Impact Survey (THIS), a household based national survey, which was conducted between October 2016 and August 2017 to measure the status of Tanzania's national HIV response:

- Prevalence of HIV among adults, ages 15 to 64 years in Tanzania is 5.0 percent (6.5 percent among females and 3.5 percent among males). This corresponds to approximately 1.4 million people living with HIV (PLHIV) ages 15 to 64 years in Tanzania;
- Annual incidence of HIV among adults aged 15 to 64 years in Tanzania is 0.29 percent (0.40 percent among females and 0.17 percent among males). This corresponds to approximately 81,000 new cases of HIV annually among adults' ages 15 to 64 years in Tanzania.
- A total of 65,902 cases of all forms were notified in 2016, which shows an increase of 5.6% or 3507 cases compared to the year 2015. Among the cases notified, new and relapse cases were 64,404 (95.5%) of which 27,655 (39%) were bacteriological confirmed (TB programme, 2016)

Furthermore more, the world is facing threat of emerging and re-emerging infections such as Ebola viruses as indicated by the World Health Organization as of year 2014, around 10,000 people have been influenced with Ebola infection. The episode of Ebola in African locale is courged with a high death rate.

Diarrhoeal diseases are the second leading cause of death in children under five years old. These are both preventable and treatable. Each year diarrhoea kills around 525 000 children under five. A significant proportion of diarrhoeal disease can be prevented through safe drinking-water and adequate sanitation and hygiene. Globally, there are nearly 1.7 billion cases of childhood diarrhoeal disease every year. Diarrhoea is a leading cause of malnutrition in children under five years old according to WHO, 2017.

The World Health Organisation recommends the emergence of life-threatening infections such as severe acute respiratory syndrome (SARS) and viral haemorrhagic fevers (e.g., Ebola and Marburg viral infections), Cholera, HIV and

AIDS as well as increase the magnitude of antimicrobial resistance highlight the urgent need for efficient infection control practices in health care settings. Failure to apply infection control measures favours the spread of pathogens, and health-care settings can act as amplifiers of disease during outbreaks, with an impact on both hospital and community health at large.

### 1.1. Healthcare-Associated Infections

Healthcare-Associated Infections (HAIs) refer to infections associated with the delivery of healthcare in healthcare settings, long-term care facilities, ambulatory settings, home care and other settings. These unanticipated infections that develop during the course of medical or surgical treatment may result in significant patient illnesses and deaths (morbidity and mortality); prolong the duration of hospital stays; and necessitate additional diagnostic and therapeutic interventions, which generate added costs. The Ministry of Health, Community Development, Gender, Elderly and Children provide national leadership in surveillance, outbreak investigation, laboratory research and prevention of HAIs. The prevention and reduction of HAIs is also a top priority for IPC program in a way of contribution to the Anti-Microbial Resistance in the country and internationally at large.

#### 1.1.1. Risk factors for HAIs

Preventing HAIs is critical to patient safety. Any patient is at risk for developing an HAI, although there are certain factors that increase the risk of infection. These include, for example, patient characteristics, such as, age or underlying diseases or conditions that may compromise the immune system; presence of indwelling or invasive medical devices, such as catheters or breathing tubes; complications from surgical procedures; and antibiotic use. The risk of infection related to invasive devices increases the longer the device is left in place.

Patients in the healthcare setting are also at increased risk of HAIs from exposure to organisms that are transmitted between patients and healthcare workers.
Overuse of antibiotics also contributes to the problem of HAIs by promoting the emergence of antibiotic resistant organisms that cause HAIs and are difficult to treat, limit treatment options and may prolong a patient's length of stay. Up to 50 percent of antimicrobial use in hospitals is unnecessary and inappropriate and also contributes to the growing problem of *Clostridium difficile* infections, which are at historically high levels. A commitment to the responsible use of antibiotics is often called antimicrobial stewardship.

#### 1.1.2. HAIs – extent, costs of the problem

HAIs are infections that patients acquire during the course of receiving healthcare treatment for other conditions. According to WHO meta-analysis which was done in 2011, Tanzania has an estimate of 15 clients acquiring HAI amongst 100 clients'

receiving healthcare services. Also, CDC healthcare-associated infection (HAI) prevalence survey provides an updated estimate of the overall problem of HAIs in U.S. hospitals. Based on a large sample of U.S. acute care hospitals, the survey found that on any given day, about 1 in 25 hospital patients has at least one healthcare-associated infection. There were an estimated 722,000 HAIs in U.S acute care hospitals in 2011. About 75,000 hospital patients with HAIs died during their hospitalizations. More than half of all HAIs occurred outside of the intensive care unit. The direct and indirect costs of HAIs are estimated to total $97-147 billion annually.

### 1.1.3. Major types of HAIs

The four most common types of HAIs are related to invasive devices or surgical procedures and include:

- Catheter-associated urinary tract infection (CAUTI)
- Central line-associated bloodstream infection (CLABSI)
- Surgical Site Infection (SSI)
- Ventilator-associated events (VAE)

A variety of organisms are responsible for many different types of HAIs. These organisms causing HAIs include:

- *Acinetobacter*
- *Burkholderia cepacia*
- *Clostridium difficile*
- Enterobacteriaceae (carbapenem-resistance)
- Gram-negative bacteria
- *Klebsiella*
- Methicillin-resistant *Staphylococcus aureus*
- Norovirus
- *Pseudomonas aeruginosa*
- *Staphylococcus aureus*
- Tuberculosis (TB)
- Vancomycin-intermediate *Staphylococcus aureus*
- Vancomycin-resistant *Staphylococcus aureus*
- Vancomycin-resistant Enterococci (VRE)

The data mostly reflect reported cases and not the actual situation of the burden of infectious disease in sub Saharan Africa, which may be much higher. Infectious diseases, if not controlled, may lead to high rates of Healthcare Associated Infection (those acquired in healthcare facilities). Infection prevention is therefore one of the prerequisites for ensuring safe healthcare service delivery, as well as protecting the population from outbreaks of infectious diseases.

## 1.2. Situation Analysis

A situation analysis of infection prevention practices in Tanzanian health facilities revealed that IP practices are poor for the following reasons:

- **Lack of adherence to guidelines and standards for certain procedures**
  Despite the availability of PC guidelines and standards developed, health care

workers and others who take part in healthcare provision services, there is inadequate compliance to those guidelines and standards.

- **Inadequate knowledge and skills among healthcare service providers**
  Healthcare workers especially those working at lower facilities have no adequate knowledge and skill for IPC basics.
- **Deficiency of equipment and materials**
  There are inadequate amounts of personal protective equipment (PPE) and supplies such gloves, goggles, plastic aprons and boots. The lack of PPE increases the risk of occupational infections among healthcare workers and clients. In recent years there has been a progressive decline in provision of equipment and materials in healthcare facilities for prevention of infection.
- **Inadequate supportive supervision**
  There is a shortage of qualified supportive supervisory staff; a lack of supportive supervision has been identified at all levels of healthcare service delivery.
- **Lack of renovation and maintenance of infrastructure**
  Systems such as electrical, water and drainage are often not fully functional, and facility conditions are often overcrowded. These problems are due to a lack of awareness, inadequate qualified human resources, financial constraints and the lack of involving frontline health workers in planning.

## 2.0. RATIONALE

These guidelines for prevention and control of infectious diseases were updated due the following reasons;

- Many healthcare providers have not had any updates of information related to infection prevention despite the fact that over the past two decades many changes have occurred due to the emergence of infections such as, Ebola, HIV/AIDS and Influenza.
- Emerging and re-emerging of infectious diseases such as Viral Haemorrhagic Fevers (VHF) and Influenza
- Availability of new scientific information that simplifies provision of safe and effective prevention and control measures.
- An individual’s right to good health requires a safe healthcare environment for both providers and clients.
- The HIV/AIDS epidemic has increased the risk for transmission of infections of in the health care settings due to the various procedures conducted in these facilities.
- There is increased awareness of how risky it is to work in healthcare facilities.
- Healthcare facilities are prone to infection transmission due to the following:
  - Routine invasive procedures

- Exposure; infected or contaminated service providers may transmit infectious agents among clients or one another
- Patients who are susceptible to infection because of compromised immunity
- Patients who often have infections that can be easily transmitted to others
- Services that are sometimes provided in congested physical settings

### 2.1. Importance of Infection Prevention and Control

Infection prevention and control is important for patients, clients, healthcare service providers and communities as follows.

#### 2.1.1. Patients /Clients

- Health facility-acquired (nosocomial) infections are difficult and costly to deal with because they:
  - Increase the length of hospitalization
  - Require treatment with expensive, antimicrobial agents
  - Increase use of other interventions (laboratory, surgery, etc.)
  - Increase drug resistance

#### 2.1.2. Healthcare Workers

- Risk of infection from airborne, waterborne and blood-borne pathogens such as HBV, HCV, and HIV is high.

#### 2.1.3. Communities

- Health facility-acquired infections may contribute to preventable morbidity and mortality in the communities
- Anti-microbial resistance acquired in a hospital can spread to families and the community when colonized patients are discharged
- Hazardous hospital wastes may carry microorganisms and their disposal can pose serious risks for communities and the environment
- Caretakers of infected persons at the household level need to observe basic IPC for household members' safety and for patient protection
- Protects the community from infectious agents.

## 3.0. GOAL AND OBJECTIVES OF INFECTION PREVENTION AND CONTROL GUIDELINES

### 3.1. Overall Goal

The overall goal of IPC is to achieve safe, effective healthcare practices at all levels of the health care facilities, with the aim of providing a comprehensive reference for all healthcare service providers in Tanzania.

### 3.2. Objectives

1. To protect patients /clients from nosocomial infections
2. To protect health care workers from occupational infections
3. To protect communities from infectious diseases
4. To prevent the environment from pollution

## PART II: FUNDAMENTALS OF INFECTION PREVENTION AND CONTROL

### 4.0. THE INFECTIOUS DISEASE TRANSMISSION CYCLE

Infectious bacteria, viruses and other microorganisms successfully survive and spread infections wherever favourable conditions exist. Essential factors in the transmission of disease producing microorganisms from person to person are illustrated below.

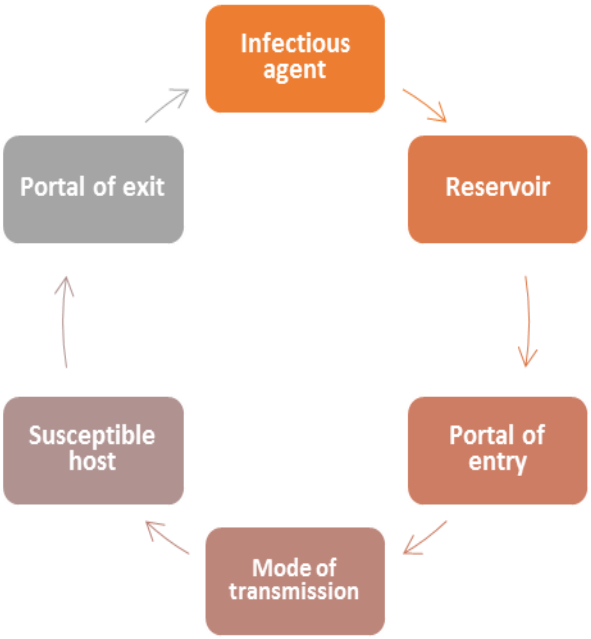



**Figure 1. Infection transmission cycle**

**Table 1. Description of the Components of Disease Transmission Cycle**

| | |
|---|---|
| **Infectious agent** | The micro-organisms that can cause infection or disease, e.g. bacteria, viruses, fungi and parasites |
| **Reservoir** | Place where organisms grow and multiply; people, water and solutions, instruments and other items, equipment, soil and air |
| **Portal of entry** | Where the infectious agents get into a susceptible host; broken skin, puncture wound, surgical site, mucous membranes |
| **Susceptible host** | Any person who is liable to be infected; clients/patients, service providers and auxiliary staff, community members |
| **Portal of exit** | Where the infectious agents get out of the host e.g. respiratory, genitourinary, vascular systems, GIT, skin, mucous membranes, placenta |

### 4.1. Modes of Transmission

There are several ways in which diseases can be transmitted:

**Direct**

- Contact e.g. Haemorrhagic fever virus, enteric pathogens, MDR Bacteria, HBV, HIV (blood)
- Droplet e.g. Influenza and Rubella viruses, Diphtheria
- Airborne e.g. TB, Chicken pox and Measles

**Indirect**

- Faecal oral - Common vehicle e.g. (food, water) e.g. Salmonella, Cholera or diarrhoea
- Vector borne e.g. malaria, dengue fever

**Standard Precautions**

Standard precautions are simple set of effective practice guidelines (creating a physical, mechanical and chemical barrier) to protect healthcare workers and patients from infection with a range of pathogens including blood-borne pathogens. The practices are used when caring for all patients regardless of their diagnosis.

#### 4.1.1. Purposes of Practicing Standard Precautions

The purposes for practicing standard precautions are:

- To prevent and reduce the risk of transmitting microorganisms from known or unknown sources of infection (e.g., patients, contaminated objects, used needles and syringes, etc.) within the healthcare environment
- To prevent patients/clients from hospital acquired infections or health care related infections.
- To protect health care workers (HCWs) from occupational infections
- To protect communities from acquiring infectious diseases
- To prevent environmental pollution

#### 4.1.2. Principles of Practicing Standard Precautions Components

Every HCW should:

- Consider every person (patient/clients or staff) as potentially infectious and susceptible to infection
- Use appropriate hand hygiene techniques including; routine hand washing, hand antisepsis, antiseptic hand rub and surgical hand scrub
- Wear personal protective equipment which include: boots, aprons, gowns, gloves, masks, protective eyewear and caps
- Appropriately handle sharps, patient care and resuscitation equipment and appropriately manage patient placement and environmental cleaning.
- Not recap needles.

- Safely dispose of infectious waste materials to protect those who handle them and prevent injury or spread to the community
- Promptly and carefully clean up spills of blood and other body fluids after the spill event.
- Process instruments by cleaning, and sterilization or high-level disinfection following recommended procedures
- Introduce cough etiquette to patients, caregivers and visitors with signs and symptoms of respiratory illness, including cough, congestion, rhinorrhoea, or increased production of respiratory secretions.
- Triage technique should be applied to isolate patients and clients with respiratory problems.

## 4.2. Transmission Based Precautions

### 4.2.1. Contact Transmission

This is the most important and most frequent mode of transmission of nosocomial infection and is divided into two sub-groups:

- Direct-contact transmission
- Indirect-contact transmission.

Direct-contact transmission involves a direct body surface-to body surface contact and physical transfer of microorganisms between an infected or colonized person and a susceptible host.

Indirect-contact transmission involves contact of a susceptible host with a contaminated intermediate object, usually inanimate, such as contaminated instruments, needles or dressings, or contaminated hands and gloves.

#### 4.2.1.1. Contact Precautions

Contact transmission is the most common route of transmission of infectious agents. It may be any of the following:

- ***Direct contact***, which occurs through touching e.g. a person, may transmit microorganisms to others by touching them.
- ***Indirect contact***, which occurs when microorganisms are transferred via contaminated objects e.g. *C. difficile* might be transferred between patients, if a commode used by a patient with *C. difficile* is taken to another patient without cleaning and disinfecting the commode in between uses.

Contact Precautions is used in addition to Standard Precautions, to prevent transmission of infectious agents, including epidemiologically important microorganisms, which are spread by direct/indirect contact involving passive transfer of microorganisms to a susceptible host via an intermediate object, such as contaminated hands that are not washed between patients or contaminated

instruments or other inanimate objects in the patient environment. Examples where Contact Precautions apply include clients/patients/residents with

- Clostridium difficile
- Gastroenteritis
- Undiagnosed diarrhoea
- Scabies
- Pediculosis (Head Lice)

**Patient Placement**

- Preferred accommodation in acute care for Contact Precautions is a single room with a dedicated toilet and patient sink.
- If single rooms are unavailable, clients / patients / residents may be cohorted with other clients/patients/residents who are infected with the same microorganism.
- Infection risk to other occupants of the room must be considered when selecting roommates.

**Personal Protective Equipment**

- Where patients or residents are placed in isolation rooms, a disposable gown and gloves must be worn on entering the patient's isolation room.
- Gloves must be removed and hands cleaned on exit from the room.
- Wear gloves and gown/ apron only when there is bodily contact (i.e. HCW's clothing will have direct contact with the patient) or potentially contaminated environmental surfaces or equipment in close proximity to the patient.
- Remove and discard gloves before removing gown / apron.
- Clean hands after removing each PPE.
- Where there is no bodily contact, hand hygiene is to be practised according to 7 moments. Remove gown before leaving the patient-care environment and perform hand hygiene immediately.

**Environmental control**

- Clients/patients/residents care items, bedside equipment and frequently touched surfaces are to be cleaned daily.
- Clean the environmental surfaces with hospital-approved disinfectants
- Al surfaces should be decontaminated with a minimal dilution of sodium hypochlorite disinfectant of 0.5% (or 5,000 parts per million available chlorine); for MDRO patients in a cubicle, the environment is best cleaned with sodium hypochlorite disinfectant with 2% available chlorine.

**Patient - care equipment and linen**

- Where possible, dedicate the use of non-critical patient-care equipment and items such a stethoscope, sphygmomanometer or bedside commode to a single client/patient/resident (or cohort of clients/patients/residents infected or

colonised with the pathogen) to avoid sharing between clients/patients/residents.

- If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use on another client/patient/resident.
- Contaminated linen should be handled as little as possible to prevent gross microbial contamination of the air.
- Linen from the clients/patients/residents' isolation room should be handled as per this guideline.

**Clients/patients/residents transport**

- Clients/patients/residents movement and transport from the room should be limited unless for essential purposes.
- If clients/patients/residents need to be transported out of the room, inform the receiving department of the need for Contact Precautions.
- Staff who accompany the client/patient/resident during the transportation are to discard gown and gloves and perform hand hygiene before leaving the room.
- They need not put on gown / apron and gloves during transportation. This is to prevent environmental contamination that could occur through contaminated gloves and gowns/apron.
- Clients/patients/residents who are respiratory dispersers should wear a surgical mask en-route.
- Infection prevention and control precautions should be maintained to minimise the risk of transmission of micro-organisms to other clients/patients/residents and contamination of environmental surfaces or other equipment.
- The linen trolley should be removed for washing after transfer of clients/patients/residents.
- Clean or wipe trolley/ wheelchair with hospital-approved disinfectant.

**Communication**

- Infection Prevention and Control staff should inform clinical staff via e-mail or phone call to update them on the Contact Precautions to be taken.
- The need for Contact Precautions can be identified using coloured stickers in patient case sheets, 'O slot' vision outside the patient room, OT chit, and electronic tagging to inform all HCPs on the precautions to be taken.

### 4.2.2. Droplet Transmission

Droplets are generated from the source person primarily during coughing, sneezing and talking or during the performance of certain procedures such as resuscitation, suctioning and bronchoscopy. Transmission occurs when droplets containing microorganisms generated by the infected person are propelled a short distance through the air and deposited on the host's conjunctivae, nasal mucosa, or mouth.

For transmission to occur, the source and the susceptible host need to be within approximately one meter (3 feet) of one another.

#### 4.2.2.1. Droplet Precautions

Droplet Precautions when used in addition to Standard Precautions are intended to prevent transmission of pathogens spread through close respiratory or mucous membrane contact with respiratory secretions. Examples where Droplet Precautions are indicated include patients with the following infectious agents:

- *B. pertussis*
- Influenza virus
- Adenovirus
- Rhinovirus
- *N. meningitidis*
- Goup A *Streptococcus* (for the first 24 hours of antimicrobial therapy).

**Patient Placement**

- A single patient room is preferred for patients who require Droplet Precautions.
- When a single-patient room is not available, consultation with infection prevention and control personnel is recommended to assess the various risks associated with other patient placement options (e.g. cohorting, keeping the patient with an existing roommate).
- Spatial separation of > 1 m and drawing the curtain between patient beds is especially important for patients in multi-bed rooms with infections transmitted by the droplet route.
- Droplet Precautions signage for the appropriate Personal Protective Equipment to be worn should be place before entering patient room to guide people on the precautions to be taken.
- Steps on appropriate PPE removal should also be displayed.

**Personal Protective Equipment (PPE) / Hand Hygiene**

- Healthcare personnel should wear a surgical mask for close contact with an infectious patient; the mask is generally donned upon room entry.
- Patients on Droplet Precautions who must be transported outside of the room should wear a mask if tolerated and follow Respiratory Hygiene/Cough Etiquette.
- Staff should perform hand hygiene according to 7 moments of this guideline.
- After leaving the patient-care environment and removing the surgical mask, staff must perform hand hygiene immediately.

**Environmental Control**

- Patient-care items, bedside equipment and frequently touched surfaces are cleaned daily or as deemed necessary.

- Clean the environmental surfaces with hospital-approved disinfectants.

**Patient - care equipment and linen**

- Where possible, dedicate the use of non-critical patient-care equipment and items such a stethoscope, sphygmomanometer or bedside commode to a single patient (or cohort of patients infected or colonised with the pathogen) to avoid sharing between patients.
- If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use on another patient.
- Contaminated linen should be handled as little as possible to prevent gross microbial contamination of the air.
- All linen from the patient's isolation room should be handled as per this guideline.

**Patient Transport**

- Patient movement and transport from the room should be limited unless for essential purposes.
- If a patient needs to be transported out of the room, inform the receiving department of the need for Droplet Precautions.
- Staff involved in the patient's transfer should wear appropriate PPE during transportation.
- The patient should wear a surgical mask and follow Respiratory Hygiene /Cough Etiquette in order to minimise the dispersal of droplet nuclei during transportation.
- Infection prevention and control precautions should be maintained to minimise the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or other equipment.
- The linen on the trolley should be removed for washing after transfer of patient.
- Clean or wipe trolley/ wheelchair with hospital-approved disinfectant.

**Communication**

- Infection Prevention and Control staff should inform clinical staff via e-mail or phone call to update them on Droplet Precautions to be taken.
- The need for Droplet Precautions can be identified using coloured stickers in the patient case sheet, 'O slot' vision outside the patient room, OT chit, or electronic tagging to inform all healthcare on the precautions to be taken.

### 4.2.3. Airborne Transmission

Airborne transmission occurs by dissemination of either airborne droplet nuclei (small particle residue) of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time, or of dust particles containing the infectious agent.

Microorganisms carried in this manner can be dispersed widely by air currents and may be inhaled by a susceptible host within the same room or over a long distance from the source patient, depending on environmental factors. Microorganisms transmitted by airborne transmission include:

- Mycobacterium tuberculosis
- Rubella
- Varicella viruses

Such transmission may result in an explosive outbreak.

#### 4.2.3.1. Airborne Infection Isolation Precautions

Airborne Precautions used in addition to Standard Precautions, are intended to reduce the risk of airborne transmission of infectious agents (< 5 μm in size). Minute infectious droplets may be generated by an infectious person during coughing, sneezing, talking or performing of procedures (e.g. Intubation). These droplets remain suspended in air for long periods of time.

Airborne transmission is further classified into obligate or preferential airborne transmission:

- ***Obligate airborne transmission*** occurs with pathogens that are transmitted only by deposition of droplet nuclei under natural conditions (e.g. pulmonary tuberculosis).
- ***Preferential airborne transmission*** occurs with pathogens that can initiate infection by multiple routes but are predominantly transmitted by droplet nuclei (e.g. measles and chickenpox).

**Patient Placement**

Place patient in a special room and the room should meet the following ventilation standards:

- Minimum 12 air changes per hour (ACH)
- Inward directional airflow from adjacent spaces to the room with negative pressure differentials of > - 2.5 Pascal
- Supply of clean air flowing first to the area of the room where staff or visitors are likely to be present, and then flowing across the bed area to the exhaust
- Exhaust air directed to outside or HEPA-filtered, if recirculated
- Room monitored on initiation of use and at least daily when in use
- Door kept closed at all times when not required for entry and exit

If a special room is not available, place patient in an adequately ventilated single room or transfer patient to a facility that has a special room available with applying proper PPE. For more details, refer to Infection Prevention and Control for TB guidelines.

**Aerosol-generating procedures**

- Aerosol-generating procedures associated with risk of pathogen transmission (e.g. Intubation, bronchoscopy) should be performed using appropriate PPE in an Air.

**Personal Protective Equipment (PPE)**

- Airborne Precautions are used in addition to Standard Precautions for patients known or suspected of having airborne transmission illness.
- Wear approved N95 or higher-level respirators are used to prevent inhalation of small particles that may contain infectious agents transmitted via the airborne route.
- Healthcare personnel should wear a fit-tested an approved N95 or higher-level respirator for respiratory protection before entering the room of a patient who requires airborne precautions.
- Perform user-sealed check of N95 mask or respirator each time it is being donned to minimise leakage around the face piece.
- Avoid touching or fiddling with the mask once the mask is properly applied.
- Change the respirator if wet or soiled. Remove N95 mask or respirator correctly outside the patient room or in changing room and ensure that the door of the patient room is closed.
- Discard respirator into appropriate waste bin and perform hand hygiene immediately.

**Environment Controls- Equipment /Consumables**

- Dedicated use of non-critical patient-care equipment and items such a stethoscope, sphygmomanometer and thermometer are recommended.
- If use of common equipment or items is unavoidable, ensure adequate cleaning and decontamination of the equipment or items after and between patient use.
- Contaminated linen should be handled as little as possible to prevent gross microbial contamination of the air and is to be managed as per hospital protocol.

**Environment Controls- Dishware and eating utensils**

- The combination of hot water and detergents used in dishwashers is sufficient to decontaminate dishware (e.g., dishes, glasses, cups) and eating utensils.
- Therefore, reusable dishware and utensils may be used for patients.
- Disposable dishes and eating utensils may be used if there are no adequate resources for cleaning dishes and utensils.

**Environment Cleaning**

- Daily environmental and surface cleaning of the isolation room with hospital approved disinfectant is recommended.
- Pay special attention to cleaning frequently touched surfaces.

**Personnel Restriction**

- Whenever possible, susceptible HCWs should not enter the rooms of patients known or suspected to have Measles (rubella), Varicella (chickenpox), disseminated Zoster, or Smallpox.

**Visitors**

- Visitors who are non-household contacts should be discouraged from visiting. They should be counselled about their risk and taught how to use an N95 respirator appropriately if they do visit.

**Patient Transport**

- Patient movement and transport from the room should be limited unless for essential purposes.
- If a patient needs to be transported out of the room, inform the receiving department of the need for airborne precautions.
- Healthcare personnel should wear an N95 mask or respirator during transportation of patients. Patients should wear a surgical mask if tolerable and follow Respiratory Hygiene /Cough Etiquette in order to minimise the dispersal of droplet nuclei during transportation.

**Communication**

- Display an airborne precaution sign outside the isolation room to alert and guide HCWs on the wearing of appropriate PPE.
- Indicate on investigation or procedure request forms (e.g. Radiology, Physiotherapy, operation etc.) that the patient is on airborne infection isolation precautions to alert HCWs on the infection risk.

Notify the receiving department or health facility before transporting or transferring the patient to allow adequate preparation of infection prevention and control measures.

### 4.2.4. Common Vehicle Transmission

Common vehicle transmission applies to microorganisms transmitted by contaminated items such as:

- Foods – e.g., Salmonella
- Water – e.g., Shigellosis
- Injections/ intravenous solutions – e.g., HIV, Hepatitis B
- Blood – e.g., Hepatitis B, C, HIV
- Equipment and devices – e.g., HIV, Hepatitis B

**Measures for control**

- Health education and promotion
- Food safety and food hygiene

- Clean food preparation areas and kitchenware with soap and safe water/ chlorine or acetic acid (vinegar) and let dry completely before reuse
- Wash hand before and after eating food
- Wash fruits and vegetables with chlorine 0.001%
- Observe food hygiene
- Cook food well, keep it covered, eat it hot, and peel fruits and vegetables.
- Be sure to cook seafood, especially shellfish, until it is very hot all the way through.
- Avoid raw foods other than fruits and vegetables you have peeled yourself.
- Clean up safely— in the kitchen

- Drink safe water
  - Boil it or treat it with a 0.001% chlorine product or household bleach.
  - If boiling, bring your water to a complete boil for at least 1 minute.
  - To treat your water with chlorine, use one of the locally available treatment products and follow the instructions.
  - If a chlorine treatment product is not available, you can treat your water with household bleach.
  - Always store your treated water in a clean, covered container.
  - Piped water sources, drinks sold in cups or bags, or ice may not be safe and should be boiled or treated with chlorine
- Practice hand hygiene as detailed in this guideline
- Health facility onsite water treatment and safe storage
- For the blood borne infections observe precautionary measures
- Health facility environmental cleaning, waste management and safe last office procedures
- Vaccinations

### 4.2.5. Vector-Borne Transmission

- Vector-borne transmission refers to transmission by other living organisms (animal, insect, birds, etc.) vectors.
- Vector-borne transmission occurs when vectors such as mosquitoes, flies, rats and other vermin transmit microorganisms.
- Figure 2 depicts the steps in the transmission of the hepatitis B (HBV) and human immunodeficiency (HIV) viruses from colonized patients or clients (e.g., a family planning client or a pregnant woman attending an antenatal clinic) to healthcare workers. Spread of these viruses from person to person can occur when a staff member (physician, nurse or housekeeping personnel) is exposed to the blood or body fluids of an infected person (e.g., needle-stick injury).

**Measures for control**

- Chemical control
  - Manual space spraying of insecticides or indoor residual spraying
- Engineering control and barriers
  - Screening of the health facilities
  - Use of treated bed nets
- Environmental management
  - Destruction of the breeding site in the health facilities areas
  - Improve environmental cleanness
  - Proper Waste management
  - Proofing water storage containers

**Protective Environment for patient with compromised immune system**

Protective Environment (PE) is designed to accommodate patients with severely compromised immune system to minimize the risk of exposure to fungal spores in the air and reduce the risk of invasive environmental fungal infections.

**Patient Placement**.

- Place allogeneic - Hematopioetic Stem Cell Transplant (HSCT) patients or patients with absolute neutrophil count <500 cells/mL in a PE room.
- No recommendation for placing patients undergoing solid organ transplantation or other immunocompromised patients in a PE.

**Ventilation/Environmental Control**

Protective Environment room should meet the following ventilation/environmental control standards:

- HEPA (high efficiency particulate air) filtration of incoming air, capable of removing 99.97% of particles ≥ 0.3 microns in diameter
- Directed room airflow with the filtered air supply on one side of the room. The air flow across the patient's bed and exhausted on the opposite side of the room.
- Minimum 12 Air Changes per Hour (ACH)
- Positive room air pressure in relation to the corridor with pressure differentials of > +2.5 Pascal.
- Self-closing doors on all room exits
- Well-sealed room that prevent infiltration of outside air
- Proper construction of windows, doors, intake ports and exhaust ports
- Ceilings are smooth, free of fissures, open joints and crevices
- Walls sealed above and below the ceiling
- Monitor room differential pressure on initiation of use and at least daily during when in use
- Door kept closed at all times when not required for entry and exit

For patients who require both PE and airborne precautions (e.g., pulmonary or laryngeal tuberculosis, acute varicella-zoster), use an anteroom to ensure proper air-balance relative to the corridor and the PE room.

- Provide an independent exhaust of contaminated air to the outside.
- Place a HEPA filter in the exhaust duct if recirculated air.
- No carpeting in patient rooms or hallways.
- No upholstered furniture and furnishings. Use smooth and non-porous surfaces and finishes that can be scrubbed or easily cleaned.
- No fresh or dried flowers or potted plants.

**Personal Protective Equipment (PPE)**

- Implement Standard Precautions for patients who are on protective precautions.
- Gown, gloves and mask are NOT required for HCWs and visitors for routine entry into the room.
- Practice good hand hygiene according to 7 moments for hand hygiene.
- Use appropriate PPE as indicated accordingly to standard precautions or for suspect or proven infections for which transmission-based (contact, droplet, airborne) precautions are required.

**Equipment /Consumables**

- Dedicate the use of non-critical patient-care equipment and items such a stethoscope, sphygmomanometer and thermometer.
- If use of common equipment or items is unavoidable, ensure adequate cleaning and decontaminating of the equipment or items after and between patients used.
- Check opened and unopened wound-dressing supplies (e.g., adhesive bandages, elastic adhesive tape) to detect mould contamination before using on patients to prevent subsequent cutaneous transmission.
- Discard all bandages and wound dressings that are expired, have damaged packaging, or are visually contaminated by construction debris or moisture.

**Environment cleaning**

- Avoid dusting methods that disperse dust.
- Daily wet-mopping of all horizontal surfaces including exhaust vent and windows sill using cloths moistened with hospital approved detergent or disinfectant.
- Prohibit exposures of patients to vacuum cleaning that could cause aerosolization of fungal spores
- Use vacuum cleaner equipped with HEPA filters when vacuum cleaning is necessary.
- Closed doors to patient rooms when vacuuming the corridors.

**Personnel Restriction**

- HCWs with diseases transmissible by air, droplet and direct contact (e.g., VZV, infectious gastroenteritis, HSV lesions of lips or fingers, and URIs) should be restricted from patient contact and temporarily reassigned to other duties.
- Health facilities should have a policy regarding the immunizations of HCWs to prevent transmission of vaccine-preventable diseases to severely immunocompromised patients.
- HCWs with blood borne viral infections (e.g., HIV, hepatitis B or C viruses) need not be restricted from patient contact as long as they do not perform high-risk procedures that could result in patient exposure to the HCW's blood or body fluids.

**Visitors**

- Restrict visitors with communicable infectious diseases (e.g., Upper Respiratory Infections, flu-like illnesses and recent exposure to communicable diseases) from visiting severely immunocompromised patients.
- All visitors must be able to understand and follow appropriate hand hygiene before and after patient contact.

**Patient transport**

- Patient movement and transport from the room should be limited unless for diagnostic or therapeutic procedures that cannot be done in the room.
- Should severely immunocompromised patients (e.g. HSCT) required to leave the Protective Environment, they are advised to wear a high-efficiency respirator (e.g. N95 mask) if tolerable to prevent inhalation of fungal spores when there is construction, renovation or other dust-generating activities in and around the healthcare facility.
- There is no recommendation for fit-testing of patients who are using respirators.
- The use of masks or respirators by severely immunocompromised patients when they are outside of the PE for prevention of environmental fungal infections in the absence of construction or renovation has not been evaluated.
- Minimize the length of time that patients who require a PE are outside their rooms for essential purposes.

**Communication**

- Display a protective precaution signage outside the isolation room to alert healthcare personnel. Notify receiving department or healthcare facility before transporting or transferring patient to allow minimizing the length of time patients is outside the PE.

## 5.0. WORKERS HEALTH AND SAFETY IN THE CONTEXT OF INFECTION PREVENTION AND CONTROL

Health care workers are exposed to a number of hazards in the health facility, which include blood and other body fluids, sharp objects, in the course of their routine work. Consequently, they are at risk of infection with blood borne viruses including Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV) and Hepatitis C Virus (HCV). The risk of infection to HCWs depends on the nature and frequency of exposure.

For more details on health facility risks to workers refers (*Refer National Guidelines for Workers Health and Safety in the Health Care Facility Guidelines).*

### 5.1. Occupational Exposure

Occupational exposure to blood and other body fluids can result from percutaneous injury (needle-stick or other sharp injury), mucocutaneous injury (splash of blood or other body fluids into the eyes, nose or mouth) or blood contact with non-intact skin. The most common form of occupational exposure to blood and the most likely to result in infection is needle-stick injury. The most common causes of needle-stick injury are two-handed recapping and unsafe collection and disposal of sharps. HCWs in such areas as operating rooms, delivery rooms, ICU, emergency rooms and laboratories have a higher risk of exposure. Cleaners, health care waste handlers and others whose duties involve handling blood-contaminated items are also at risk.

#### 5.1.1. Strategies to Protect HCWs from Occupational Exposure

Healthcare-Associated Infections (HAIs) are preventable with concurrently applying various controls measures:

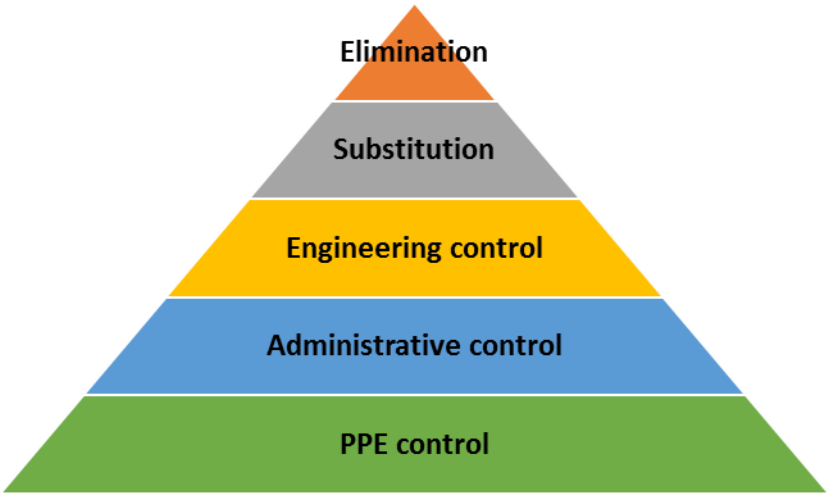



**Figure 1. Hierarchy of controls**

- Good administration structure that supports an organisational infection prevention and control (IPC) **[Administrative control]**

- Good environmental cleanliness, waste management and facility design and layout **[Engineering control]**
- Standard and transmission-based IPC precautions, including safeguard and appropriate use of personal protective equipment **[PPE control].**
- Improved water, sanitation and hygiene infrastructure and services **[Engineering control]**
- A system for surveillance of key process and outcome indicators of IPC performance, and dissemination of results **[Administrative control]**
- Systems to communicate with staff, patients and carers (e.g. to provide information about HAI and IPC policies), and surveys to assess the systems' efficacy. **[Administrative control]**
- improved work environment that consider need for differential-pressure isolation rooms (e.g. negative-pressure rooms with anterooms) to isolate patients with infectious diseases, including airborne respiratory infections **[Engineering control]**
- Maintain the health and wellbeing of HCWs and patients in healthcare facilities, including providing training on workplace improvement, recreational areas, eat places, workers benefit and compensation right **[Administrative control]**
- An IPC program should form part of a risk management system to identify, assess, mitigate and communicate potential communicable disease threats to patients and staff. **[Administrative control]**
- Workplace health and safety programs should identify all threats to staff health—including infectious diseases—and take measures to eliminate or mitigate risk **[Elimination]**
- Implementation of Standard Precaution **[Engineering control & Substitution]**
- Immunization of all health workers, against Hepatitis B, Tetanus and other immunizable diseases **[Administrative control]**
  - Routinely immunization of health workers against infection with HBV is an effective way to protect them.
  - Conduct Pre-vaccination serological testing
  - Measure level of antibody levels between two to six months after the last dose
  - Maintain register of healthcare workers received vaccination.
  - Refer infected workers for appropriate care and treatment
  - Liaise with Occupational Health and Safety focal person for workers benefits and compensation
- Provision of post exposure prophylaxis [Administrative control]
  - Clear policy guidelines and procedures posted in visible places

- Orient healthcare workers on PEP procedure
- Design a mechanism for exposure reporting procedures as per PEP guidelines
- Conduct a thorough Assessment of exposure risk
    - Type and severity of exposure
    - Blood-borne infection status of source person
- Provide an appropriate treatment, follow-up, and counselling of workers after exposure
- Confidentiality of exposed and source person
- Management of exposures training of healthcare personnel
- Rapid access to clinical care
    - Post-exposure prophylaxis (PEP)
    - Testing of source patients/exposed persons

Successful implementation of these strategies requires an effective quality improvement or infection prevention, occupational health and safety, WASH and HCWM with support from the health setting management team (*Refer National Guidelines for workers health and safety in the healthcare facility Guidelines)*

## 6.0. HAND HYGIENE

Hand Hygiene is the most important and effective procedure to prevent and control the spread of hospital associated infections (HAIs). It is the responsibility of all HCWs to carry this out at the right moment during patient care. Effective hand hygiene kills or removes transient bacteria on the skin via any of the following two methods:

- Use of a 70 to 90% Alcohol-Based Hand Rub (ABHR) is the preferred method (when hands are not visibly soiled) for cleaning hands. Using easily-accessible ABHR in health care settings takes less time than traditional hand washing and has been shown to be more effective than washing with soap (even using an antimicrobial soap) and water when hands are not visibly soiled.
- Hand washing with liquid soap and running water must be performed when hands are visibly soiled. The effectiveness of alcohol is inhibited by the presence of organic material. The mechanical action of washing, rinsing and drying is the most important contributor to the removal of transient bacteria that might be present. If hands are visibly soiled and running water is not available, use a moistened towelette to remove the visible soil, followed by ABHR.

Hand hygiene includes care of hands, nails, skin, use of lotions and surgical scrub. Failure to perform appropriate hand hygiene is considered to be a leading cause of nosocomial (hospital-acquired) infections and the spread of multi-resistant microorganisms and has been recognized as a significant contributor to outbreaks of disease (Boyce and Pittet 2002).

**Hand hygiene can be done by**

- Hand washing with liquid soap
- Hand washing with antiseptic agent
- Surgical hand hygiene
- Antiseptic hand rub using a waterless, alcohol-based antiseptic agent

### 6.1. Types of Hand Hygiene

#### 6.1.1. Routine Hand Washing with Liquid Soap and Running Water

Hand washing is a process of mechanically removing soil, debris and organisms from the skin using plain soap and water. Four elements are essential for effective handwashing:

- Liquid soap
- Running water
- Friction
- Drying

**Every HCW should consider the following moment before hand washing**

- Immediately on arrival at work and before leaving work
- Before and after using the toilet
- Before and after each patient contact
- Before and after donning and doffing gloves before preparing, handling, serving or eating food, and feeding a patient
- Before and after any clinical procedure
- Whenever there is a chance of contamination such as;
  - Touching blood, body fluids, secretions, excretions, and exudates from wounds
  - Contact with items known or considered likely to be contaminated with blood, body fluids, secretions, or excretions (e.g., bedpans, urinals, wound dressings) whether or not gloves are worn
  - Attending to children's needs (after changing diaper or toilet, feeding and breastfeeding) after personal body functions such as using the toilet, wiping or blowing one's nose
  - Between all procedures done on the same patient where soiling of hands is likely, to avoid cross-contamination of body sites.
- Ensure all patients and family members are educated in proper hand washing.

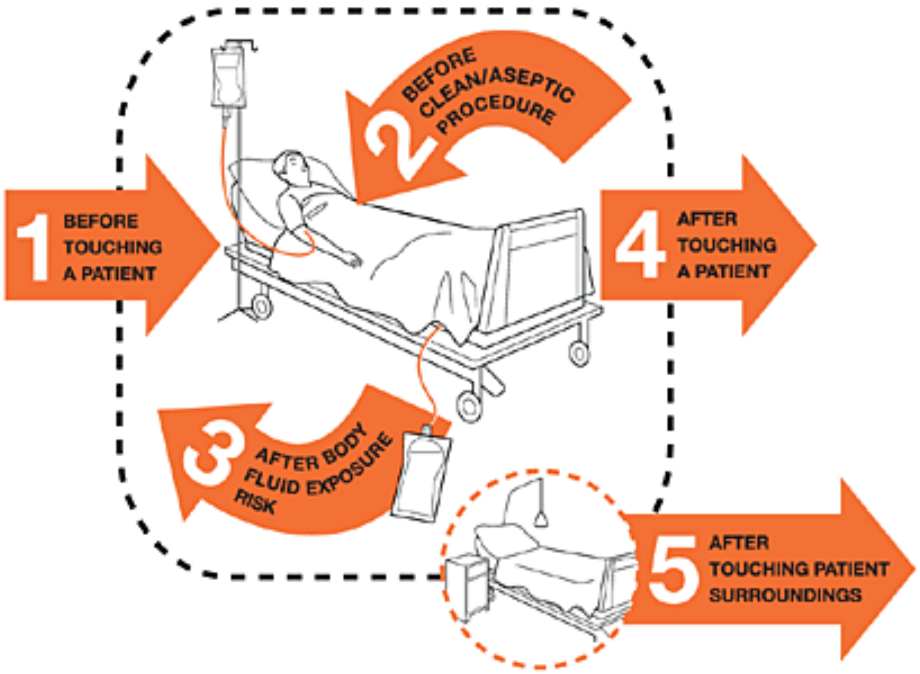



**Figure 2. Key Important Moments for hand washing**

**Standard Operating Procedure for hand washing (in steps)**

- Turn on tap.
- Wet hands thoroughly under running water at least 4 inches above the wrist.
- Soap hands adequately.
- Vigorously rub together all surfaces of lathered hands.
- Rub hands vigorously back and front, in between fingers up to and including the wrist, followed by thorough rinsing under running water. This should be for 10 – 15 seconds.
- Dry hands from tip of fingers to wrist with paper towel. If paper towels are not available, shake off excess water and allow hands to air-dry.
- Use the same paper towel to turn off tap if tap not elbow controlled.

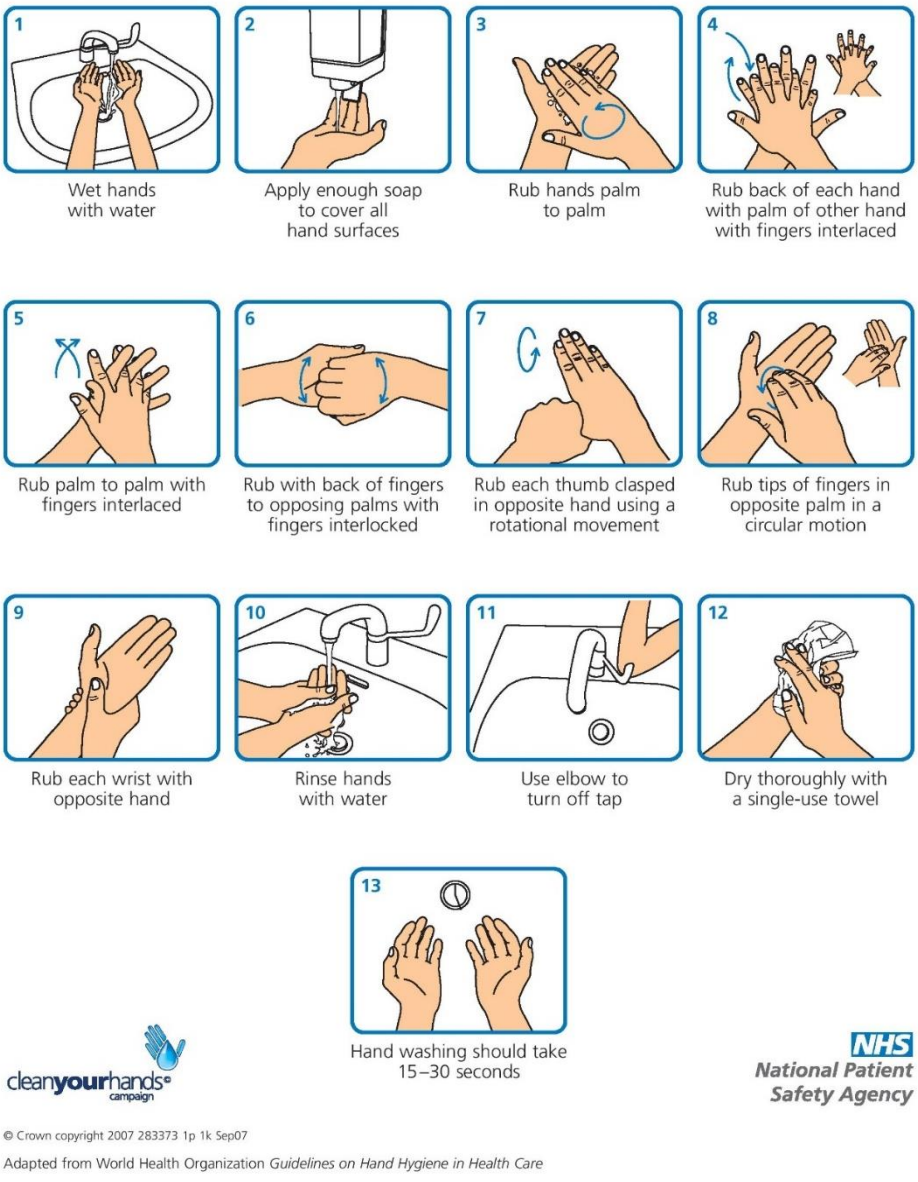



**Figure 3. Hand-washing technique with soap and water**

***Important Notes***

- Immediate re-contamination of the hands by touching sink fixtures may be avoided by using paper towel to turn off taps.
- When running tap water is not available, use a bucket with a tap that can be turned on to wet hands, off to lather hands and turned on again for rinsing. Design of the taps/sinks and the right purchase of the taps, e.g., elbow, is desirable.
- If a bucket with a tap is not available, a bucket/basin and pitcher can be used to create a running stream of water. A helper can pour water from the pitcher over the hands being washed.
- Hand washing should not be repeated in the same container of water.
- Hands should be dried with paper towels/sterile towels per procedure.

### 6.1.2. Hand Washing with Antiseptic and Running Water

This procedure removes transient microorganisms, dirt and kills or inhibits the growth of resident microorganisms. It also may reduce the risk of infections in high-risk situations such as:

- When there is heavy microbial contamination before performing invasive procedures, (e.g., the placement and care of intravascular devices, indwelling urinary catheters);
- Before contact with patients who have immune defects, damage to the integumentary system (e.g., burns, wounds) and percutaneous implanted devices;
- Before and after direct contact with patients who have antimicrobial-resistant organisms.

**Antiseptic agents:** Liquid soap with or without antimicrobial agent.

**Antiseptic agents recommended are:** Povidone-iodine 7.5% surgical scrub or Chlorhexidine 5% surgical scrub (undiluted).

### 6.1.3. Alcohol Hand Rub

- Kills or inhibits the growth of most transient and resident micro-organisms but does not remove micro-organisms or dirty.
- can be used when hand washing with soap and running water is not possible, as long as hands are not visibly soiled with dirty, blood, or other organic material
- Standard Operating Procedure for performing antiseptic hand rub is same as normal hand washing.

The use of an antiseptic hand rub is more effective in killing transient and resident flora than hand washing with antimicrobial agents or plain soap and water. It is quick

and convenient to perform and gives a greater initial reduction in hand flora (Girou et al., 2002). Antiseptic hand rubs also contain a small amount of an emollient such as glycerine, propylene glycol or sorbitol that protects and softens skin.

To be effective, an adequate amount of hand rub solution should be used. For example, by increasing the amount of hand rub from 1 mL to 5 mL per application (about 1 teaspoonful), the effectiveness is increased significantly (Larson, 1988).

****Note:** Since antiseptic hand rubs do not remove soil or organic matter, if hands are visibly soiled or contaminated with blood or body fluids, hand washing with soap and water should be done first.

**Alcohol-Based Solution for Hand Rub**

A non-irritating antiseptic hand rub can be made by adding glycerine, propylene glycol or sorbitol to alcohol (2mL in 100mL of 60-90% ethyl or isopropyl alcohol solution) (Larson, 1990; Pierce, 1990). Use 5mL (about one teaspoonful) for each application and continue rubbing the solution over the hands until they are dry (15-30 seconds).

*Glycerine is often sold in cosmetic departments because it is used as a hand softener.

### Preparation of Alcohol-Based Solution for Hand Rub with Hydrogen

#### Formulation I

To produce final concentrations of ethanol 80% *v/v*, glycerol 1.45% *v/v*, hydrogen peroxide ($H_2O_2$) 0.125% *v/v*.

Pour into a 1000 ml graduated flask:

a. ethanol 96% *v/v*, 833.3 ml
b. $H_2O_2$ 3%, 41.7 ml
c. glycerol 98%,14.5 ml

Top up the flask to 1000 ml with distilled water or water that has been boiled and cooled; shake the flask gently to mix the content.

#### Formulation II

To produce final concentrations of isopropyl alcohol 75% *v/v*, glycerol 1.45% *v/v*, hydrogen peroxide 0.125% *v/v*:

Pour into a 1000 ml graduated flask:

a. isopropyl alcohol (with a purity of 99.8%), 751.5 ml
b. $H_2O_2$ 3%, 41.7 ml
c. Glycerol 98%, 14.5 ml

Top up the flask to 1000 ml with distilled water or water that has been boiled and

cooled; shake the flask gently to mix the content.

****Note:** Only pharmacopoeia quality reagents should be used (e.g. *The International Pharmacopoeia*) and not technical grade products.

## PART A: GUIDE TO LOCAL PRODUCTION

*Part A is intended to guide a local producer in the actual preparation of the formulation.*

### Materials required (small volume production)

| REAGENTS FOR FORMULATION 1: | REAGENTS FOR FORMULATION 2: |
|---|---|
| • Ethanol 96% | • Isopropyl alcohol 99.8% |
| • Hydrogen peroxide 3% | • Hydrogen peroxide 3% |
| • Glycerol 98% | • Glycerol 98% |
| • Sterile distilled or boiled cold water | • Sterile distilled or boiled cold water |

- 10-litre glass or plastic bottles with screw-threaded stoppers ( 1 ), or
- 50-litre plastic tanks (preferably in polypropylene or high density polyethylene, translucent so as to see the liquid level) ( 2 ), or
- Stainless steel tanks with a capacity of 80–100 litres (for mixing without overflowing) ( 3 , 4 )
- Wooden, plastic or metal paddles for mixing ( 5 )
- Measuring cylinders and measuring jugs ( 6 , 7 )
- Plastic or metal funnel
- 100 ml plastic bottles with leak-proof tops ( 8 )
- 500 ml glass or plastic bottles with screw tops ( 8 )
- An alcoholometer: the temperature scale is at the bottom and the ethanol concentration (percentage v/v) at the top ( 9 , 10 , 11 )

**NOTE**

- Glycerol: used as humectant, but other emollients may be used for skin care, provided that they are cheap, widely available and miscible in water and alcohol and do not add to toxicity, or promote allergy.
- Hydrogen peroxide: used to inactivate contaminating bacterial spores in the solution and is not an active substance for hand antisepsis.
- Any further additive to both formulations should be clearly labelled and be non-toxic in case of accidental ingestion.
- A colorant may be added to allow differentiation from other fluids, but should not add to toxicity, promote allergy, or interfere with antimicrobial properties. The addition of perfumes or dyes is not recommended due to risk of allergic reactions.

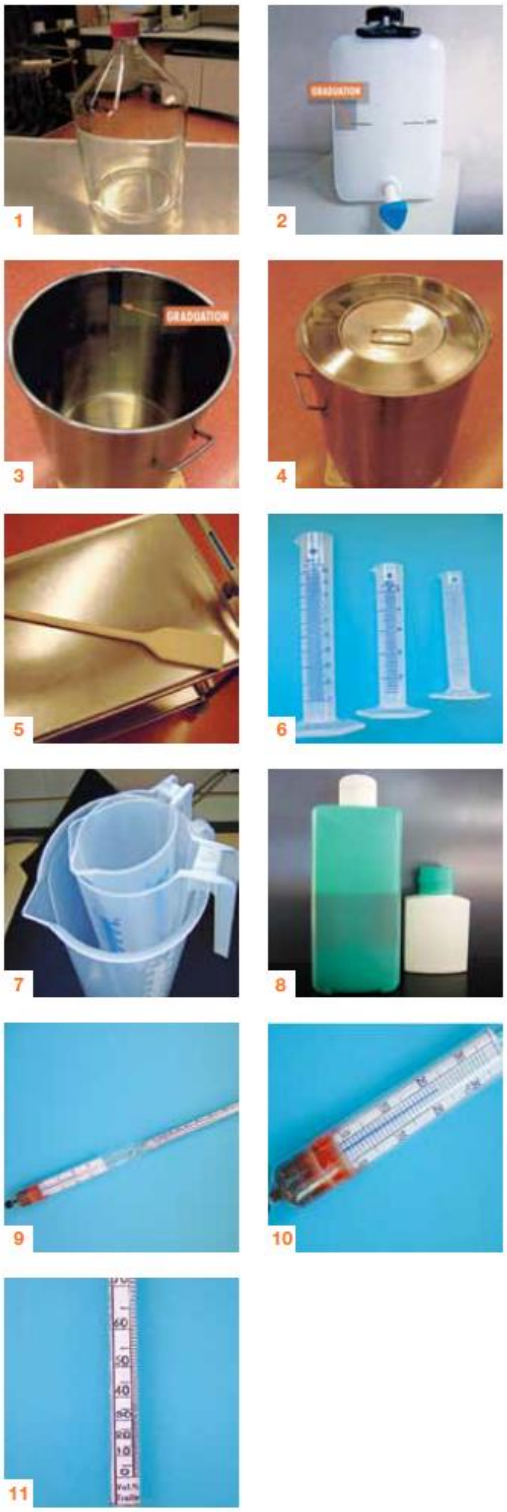



**Figure 4. Part A. Guide to local production**

### 6.1.4. Surgical Hand Hygiene

**This procedure involves** hand washing with water and soap, and hand rubbing with alcohol-based hand rub and friction. **The purposes of surgical hand hygiene are;**

- To prevent wound contamination by microorganisms from hands and arms of surgeons and assistants
- To prevent the growth of microorganisms (rubbing with antiseptic before beginning surgical procedures)


**Figure 5. Standard procedure surgical hand rubbing**

## 6.2. Skin Care

It is important to note the following.

- Frequent hand washing and gloving can irritate skin.
- Hand washing cannot reduce the bacterial counts of personnel with dermatitis.
- Staff responsible for processing instruments and who have open sores or cuts on their hands or forearms should not clean instruments until the lesions are healed unless covered with waterproof dressings.
- Healthcare providers with dermatitis carry high numbers of microorganisms and may be at increased risk of exposure to blood-borne pathogens. Intact skin is a major defence against infection.
- Lotion can ease the dryness resulting from frequent hand washing. It can also help prevent dermatitis from frequent glove use.
- Do not use personal hand creams at work as it may counteract the antiseptic properties in the antiseptic preparation.
- Hand cream containing oil should be avoided as they may cause latex gloves to split.
- Provide alternative hand hygiene products for HCWs with confirmed allergies or adverse reactions to standard products used in the health-care setting.

## 6.3. Other Issues and Considerations Related to Hand Hygiene

### 6.3.1. Use of hand Lotions and Hand Creams

Several studies have shown that regular use (at least twice per day) of such products can help prevent and treat contact dermatitis (McCormick et al., 2000). In addition, moisturizers can prevent drying and damage to the skin and loss of skin fats. There is also biological evidence that emollients, such as glycerol and sorbitol, with or without antiseptics, may decrease cross-contamination because they reduce shedding of bacteria from skin for up to four hours.

### 6.3.2. Management of Lesions and Skin Breaks

Cuticles, hands and forearms should be free of lesions (dermatitis or eczema) and skin breaks (cuts, abrasions and cracking). Cuts and abrasions should be covered with waterproof dressings. If covering them is not possible, surgical staff with skin lesions should not operate until the lesions are healed.

### 6.3.3. Fingernails

Research has shown that the area around the base of nails (subungual space) contains the highest microbial count on the hand (McGinley, Larson and Leydon, 1988). In addition, several studies have shown that long nails may serve as a reservoir for gram-negative bacilli (P. aeruginosa), yeast and other pathogens (Hedderwick et al., 2000). Moreover, long nails, either natural or artificial, tend to

puncture gloves more easily (Olsen et al., 1993). As a result, it is recommended that nails be kept moderately short – not extend more than 3 mm (or 1/8 inch) beyond the fingertip.

### 6.3.4. Use of Artificial Nails

It is strictly not allowed to use artificial nails. Artificial nails (nail wraps, nail tips, acrylic lengtheners, etc.) worn by HCWs can contribute to Healthcare Associated Infection (Hedderwick et al., 2000). In addition, because there is evidence that artificial nails may serve as a reservoir for pathogenic gram-negative bacilli, their use by HCWs should be restricted, especially by surgical team members, and those who:

- work in specialty areas such as neonatal ICUs
- care for patients highly susceptible to infection
- manage patients who have infections with resistant organisms (Moolenaar et al., 2000)

### 6.3.5. Nail Polish

It is strictly not allowed. Chipped nail polish supports the growth of larger numbers of organisms on finger nails compared to freshly polished or natural nails. Also, dark-colored nail polish may prevent dirt and debris under fingernails from being seen and removed (Baumgardner et al., 1993).

### 6.3.6. Jewellery

Although several studies have shown that skin under rings is more heavily colonized than comparable areas of skin on fingers without rings (Jacobson et al., 1985), at the present time it is not known whether wearing rings results in greater transmission of pathogens. It is suggested that surgical team members not wear rings because it may be more difficult for them to put on surgical gloves without tearing the

**Table 2. Soaps and Antiseptic/Antimicrobial Agents for Hand washing**

| Products | Indications | Special Considerations |
|---|---|---|
| • Plain liquid soap | • For routine care of patients<br>• For washing hands soiled with dirt, blood or other organic material | • May contain very low concentrations of antimicrobial agents to prevent microbial contamination growth in the product<br>• **Bar soap and powder soap should not be used** for hand washing as this may result into cross contamination as ones touches the bar. |
| • Waterless antiseptic agents:<br>• Alcohol rinses<br>• Alcohol foams<br>• Alcohol wipes<br>• Alcohol novelettes<br>• Germicidal hand rinse (Hibistat) | • Demonstrated alternative to conventional agents<br>• For use where handwashing facilities are inadequate, impractical or inaccessible (e.g., ambulances, home care, mass immunization)<br>• For situations in which the water supply is interrupted (e.g., planned disruptions, natural disasters) | • Not effective if hands are soiled with dirt or heavily contaminated with blood or other organic material<br>• Follow manufacturer's recommendations for use<br>• Efficacy affected by concentration of alcohol in product<br>• Lotions should be readily available to protect skin integrity |
| • Antiseptic/Anti-microbial agents:<br>• Chlorhexidine gluconate scrub strengths: 2% aqueous foam or 4% liquid | • May be chosen for hand scrubs prior to performance of invasive procedures (e.g., placing intravascular lines or devices)<br>• When caring for severely | • Antiseptic agents may be chosen if it is felt important to reduce the number of resident flora or when the level of microbial contamination is high<br>• For use in high risk areas such as ICUs, neonatal |

| | | |
|---|---|---|
| preparation, 0.5% tincture<br>• Povidone-iodine scrub strengths: 10%, 7.5%, 2%, 0.5% | immunocompromised patients<br>• Based on risk of transmission (e.g., specific micro-organisms)<br>• Critical care areas<br>• Intensive care nurseries<br>• Operating theatre hand scrub<br>• When caring for individuals with antimicrobial resistant organisms | units, operating theatres, labor and delivery rooms, isolation areas, laboratory and dialysis units, for invasive procedures<br>• Antiseptic agents should be chosen when persistent antimicrobial activity on the hand is desired; they are usually available in liquid formulations; antiseptic agents differ in activity and characteristics |

### 6.4. Hand Hygiene Strategy

All health facilities should allocate resources to plan and implement an ongoing program on promoting excellent hand hygiene practices by staff, patients and visitors. A self-assessment on current hand hygiene activities is recommended using a standard Hygiene Self-Assessment Framework. This strategy includes the following:

#### 6.4.1. Build Hand Hygiene Culture

Building Hand Hygiene culture is a vital component in Hand Hygiene Improvement Strategy for all health-care facilities. It refers to ensuring that the health-care facility has the necessary infrastructure in place to allow HCWs to practice hand hygiene. Compliance with hand hygiene is only possible if the health facility setting ensures an adequate infrastructure and if a reliable and permanent supply of hand hygiene products at the right time and location is provided.

#### 6.4.2. Training / Education

All HCWs require training and education on the importance of hand hygiene, the indication on the 7 Moments of hand hygiene and the correct steps of hand hygiene. Clear and standardized message need to be conveyed to all HCWs to ensure consistency in hand hygiene. In addition, this is also to encourage behavioural and cultural change.

#### 6.4.3. Evaluation and feedback

Evaluation and repeated monitoring of a range of indicators indicating hand hygiene practices and infrastructure including knowledge and perception of the problem of healthcare-associated infection and the importance of hand hygiene is an important aspect in improving hand hygiene. Continuous monitoring of any implementation that had been introduced is essential to assess the effectiveness of the strategy in improving hand hygiene in the institution.

#### 6.4.4. Reminders in the workplace

Reminders are important to remind and prompt all HCWs on the importance of hand hygiene and the 7 Moments to hand hygiene. Patients and visitors are also informed of the standard of care that they should expect from their healthcare workers with regards to hand hygiene through these reminders. Reminders can be visual such as posters or audio such as via public announcements. Other initiatives can be in the form of patient educational leaflets, badges etc.

#### 6.4.5. Health Facility Hand Hygiene Policy

This refers to creating an environment and perceptions that facilitate awareness about patient safety issues while guaranteeing consideration of hand hygiene improvement as a high priority at all levels:

**Table 3. Proposed Strategies to Improve Hand washing Techniques and Compliance**

| Obstacle | Strategy |
|---|---|
| Lack of knowledge | • Education with supportive literature, videotaped instructions, hand washing demonstrations; frequent involvement of personnel in education and feedback on infection rates |
| Lack of motivation | • Direct observation and feedback on a regular basis, role models; involvement of staff in studies; application of new technologies<br>• Programmes on hand hygiene for patients and families |
| Unavailability of handwashing | • Hand washing facilities conveniently located facilities throughout the healthcare facility<br>• Available running water<br>• Hand washing facilities in or adjacent to rooms where healthcare procedures are performed • Accessible, adequate supplies of soap and disposable towels<br>• Waterless antiseptic agents readily available in wall-mounted dispensers, or in small containers for mobile care such as home care and for emergency responders |
| Non-acceptance of hand washing | • Availability of hand washing products that have a high products level of acceptability to staff, with appropriateness, cost, supply, etc. being taken into consideration |
| Dermatitis | • Lotions to prevent skin dryness<br>• Lotion supplies in small non-refillable containers<br>• Compatibility between lotion and antiseptic products and effect on glove integrity<br>• Lotions approved by the Infection Prevention and Control Committee |

## 7.0. PERSONAL PROTECTIVE EQUIPMENT

Protective barriers, now commonly referred to as personal protective equipment (PPE), have been used for many years to protect patients from microorganisms present on staff working in healthcare settings. More recently, with the emergence of AIDS, viral Hepatitis, VHF, and the resurgence of tuberculosis in our country, use of PPE now has become important for protecting staff as well. As a consequence, hospital administrators, supervisors and HCWs need to be aware not only of the benefits and limitations of specific PPE, but also of the actual role PPE play in preventing infection so that they can use them effectively and efficiently.

### 7.1. Types of Personal Protective Equipment

Personal protective equipment includes: gloves, masks/respirators, eyewear (face shields, goggles or glasses), caps, gowns, aprons, scrub suit, drapes, hood, boots and other items.

#### 7.1.1. Gloves

Gloves protect hands from infectious materials and protect patients from microorganisms on staff members' hands. They are the most important physical barriers for preventing the spread of infection. There are **three categories of gloves:**

- Surgical gloves (sterile/single use)
- Examination gloves (non-sterile)
- Heavy duty/utility/household gloves

**When to use gloves and the types of various procedures**

- Gloves should be worn when contact with body and blood fluids is anticipated.
- Gloves should be worn as additional measures, not as a substitute for Hand washing.
- Gloves are not required for routine care activities in which contact is limited to a patient's skin.
- Examination gloves shall be worn:
  - for examination and non-surgical procedures
  - for contact with blood, body fluids, secretions and excretions, mucous membranes, draining wounds or non-intact skin (open skin lesions or oxidative rash)
  - for handling items visibly soiled with blood, body fluids, secretions or excretions
  - when the healthcare worker has non-intact skin on his/her hands
  - when inserting an intravenous line
- Surgical gloves shall be worn for surgical and invasive procedures

- Utility gloves are used for decontamination of large equipment, cleaning of floors, walls, healthcare facility furniture such as beds, etc.
- Gloves shall be changed between care activities and procedures with the same patient after contact with materials that may contain high concentrations of microorganisms.
- Gloves shall be removed before moving to another patient or after completion of specific task.
- Hands shall be washed and dried immediately after removing gloves.
- With the exception of utility gloves other gloves shall not be washed, decontaminated and reused.
- Gloves shall not be worn while walking in corridors and traveling in elevators, unless in special circumstances, e.g., transporting laboratory specimens.

**Double Gloving**

The transmission of HBV and HCV from surgeon to patient and vice versa has occurred in the absence of breaks in technique and with apparently intact gloves (Davis, 2001a). Even the best quality, new latex rubber surgical gloves may leak up to 4% of the time. Moreover, latex gloves, especially when exposed to fat in wounds, gradually become weaker and lose their integrity.

Although double gloving is of little benefit in preventing blood exposure if needle sticks or other injuries occur, it may decrease the risk of blood-hand contact. For example, one recent study showed that surgeons wearing single gloves had a blood-hand contact rate of 14% while surgeons wearing double gloves had only a rate 5% (Tokars et al., 1995; Tokars et al., 1992).

Based on this study, the following are reasonable guidelines for when to wear **double gloves:**

- when the procedure involves coming into contact with a large amount of blood or other body fluids (e.g., vaginal deliveries and caesarean sections)
- for orthopaedic procedures in which sharp bone fragments, wire sutures and other sharps are likely to be encountered

**Elbow Length Gloves for Obstetrical Procedures**

Blood contact with the skin and mucous membranes of providers occurs in 25% of vaginal deliveries and 35% of caesarean sections (Davis, 2001). Where the hand and forearm need to be inserted into the vagina (manual removal of a retained placenta) or deep into the uterus to deliver the infant's head (caesarean section), elbow-length, so-called "gauntlet" gloves/ gynaecological gloves help protect the provider from significant blood and amniotic fluid contamination.

### 7.1.2. Scrub Suites and Gowns

**Scrub suits or cover gowns** are worn over, or instead of, street clothes. The main use of cover gowns is to protect the HPs' clothing. A scrub suit usually consists of drawstring pants and a shirt. A V-neck shirt must not be cut so low as to slide off the wearer's shoulders or expose men's chest hair.

**Surgical gowns** were first used to protect patients from microorganisms present on the abdomen and arms of the HCW during surgery. Surgical gowns made of fluid resistant materials do play a role in keeping blood and other body fluids off the skin of personnel, particularly in operating, delivery and emergency rooms.

Lightweight cloth gowns offer little protection and do not provide an effective barrier because moisture can easily pass through them, allowing contamination. Jeans material (denim) or canvas, on the other hand, is too dense for steam penetration (i.e., cannot be sterilized), is difficult to wash and takes too long to dry. The HCW can wear a plastic or rubber apron underneath the gown to prevent contact of the skin with blood and body fluids. If large spills occur, the best things to do is shower or bathe as soon after completing the procedure as possible.

**Standard Operating Procedures for Gowns**

1. The unnecessary use of gowns is **not** recommended.
2. Gowns shall be used for protective isolation.
3. Gowns shall **not** be worn outside the area for which they are intended.
4. Long gowns shall be worn to protect uncovered skin and to prevent soiling of clothing during procedures and patient care activities likely to generate splashes or sprays of blood, body fluids, secretions, or excretions. Plastic aprons are recommended where splashes are likely to occur.
5. Clinical coats and scrub suits should remain in the working place; taking them home increases the risk of infection to the home environment.

### 7.1.3. Masks

**Masks** should be large enough to cover the nose, lower face, jaw and all facial hair (to contain it). They are worn in an attempt to contain moisture droplets expelled as HPs or surgical staff speak, cough or sneeze (droplet precautions), as well as to prevent accidental splashes of blood or other contaminated body fluids from entering the HCW's nose or mouth. Unless the masks are made of fluid-resistant materials, however, they are not effective in preventing either very well.

**Respirators** are specialized types of masks, called particulate respirators (such as N-95), which are recommended for situations in which filtering inhaled air is considered important (e.g., for the care of a person on airborne precautions). They contain multiple layers of filter material and fit the face tightly so that no air leaks around the mask when the HCW breathes.

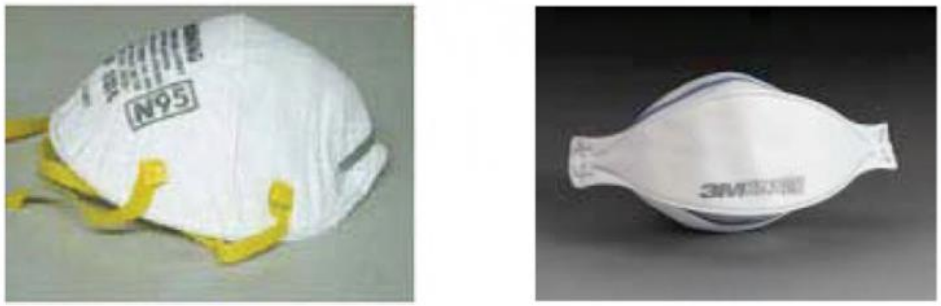



**Figure 6. Particulate N-95 Respirators** (*Adapted from*: World Health Organization (WHO) 2004.)

**There are four types of masks:**

- **The tieback mask**, which has four ties to fasten the mask around the mouth and nose. The side of the mask with the flexible metal tab is worn away from the face with the metal tab placed above the bridge of the nose to help secure the mask and minimize air escaping from the sides (venting).
- **The ear-loop mask** is similar to the tieback mask except that it has two elastic bands used for fastening.
- **Surgical masks** have attached faced shields to help provide a protective barrier against splashes and spatters of blood or other infectious material. These masks are fluid resistant, lightweight, and adequate for most procedures and isolation precautions.
- **N95 respirators** is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles. The 'N95' designation means that when subjected to careful testing, the respirator blocks at least 95% of very small (0.3 micron) test particles. If properly fitted, the filtration capabilities of N95 respirators exceed those of face masks. However, even a properly fitted N95 respirator does not completely eliminate the risk of illness or death.

  **N95 respirators are not designed for children or people with facial hair. Because a proper fit cannot be achieved on children and people with facial hair, the N95 respirator may not provide full protection.**

**Standard Operating Procedures for Masks**

1. Masks should be large enough to cover the nose, lower face, jaw and facial hair.
2. Masks shall be worn where appropriate to protect the mucous membranes of the nose and mouth of the service provider during procedures and patient care.

***Note:** A surgical mask becomes ineffective as a barrier if the integrity is damaged or if it becomes wet (i.e., from perspiration, or if splashed with blood or other potentially infectious material). If this occurs, remove mask and replace with another.*

### 7.1.4. Caps

Caps are used to keep the hair and scalp covered so that flakes of skin and hair are not shed into the wound during surgery. Caps should be large enough to cover all hair. While caps provide some protection to the patient, their primary purpose is to protect the wearer from blood and body-fluid splashes and sprays.

### 7.1.5. Protective Eye Wear

By covering the eyes, protective eyewear protects staff from accidental splashes of blood or body fluid.

**Types of Eye Wear**

- Plastic glasses with solid side shields
- Goggles
- Chin-length face shields
- Protective eye wear
- Mask
- Gown
- Gloves

**Standard Operating Procedure for Eye Wear**

1. Protective eye wear shall be worn where appropriate to protect the mucous membranes of the eyes during procedures and patient care activities likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.
2. Use protective eye wear that is appropriate for the particular procedure.
3. Holding goggles with one hand, lift the bottom strap from the back of the head to the front.
4. If gloved hands are used for these procedures, the gloves should not be contaminated with blood or other potentially infectious material.

   Generally, if protective eye wear, mask, gown and gloves are worn, the order for the removal should be:

***Note:**

1. *Single-use protective barriers should be discarded into the appropriate receptacle(s).*
2. *Re-usable protective barriers should be decontaminated, cleaned, and disinfected according to the appropriate guidelines.*
3. *Wash hands and dry after removing protective barriers.*

### 7.1.6. Boots (Footwear)

Footwear is worn to protect feet from injury by sharps or heavy items, blood and fluids.

**Standard Operating Procedures for Footwear**

1. Rubber or leather boots are recommended because they protect better; they should be kept clean and free of contamination from blood or other fluid spills.
2. Shoe covers are unnecessary if clean, closed-toe, sturdy shoes are available for use only in surgical areas.

### 7.1.7. Apron

The apron is made of rubber or plastic to provide a waterproof barrier along the front of the health worker's body.

**Standard Operating Procedures for Aprons**

1. An apron should be worn when cleaning or during a procedure in which blood or body spills are anticipated.

### 7.1.8. Hoods

A covering for head and neck with an opening for the face, typically forming part of a coat or cloak. The material should be plastic or waterproof.

**Figure 7. Hood**

### 7.1.9. Drapes

**Surgical drapes (sterile)** made of cloth can be placed around a prepared surgical incision to create a work area. Although this area is often called the "sterile field," it is **NOT** sterile. Cloth drapes allow moisture to soak through and can help to spread organisms from skin, even after surgical cleansing with an antiseptic agent, into the incision. Thus, neither sterile gloved hands nor sterile or high-level disinfected instruments and other items should touch drapes once they are in place. Using towel drapes to create a work area around the incision limits the amount of skin that needs to be cleaned and reminds the surgical team not to touch the patient.

**Remember**:

- Once a sterile drape touches the patient's skin, it is no longer sterile.
- Sterile cloth drapes do not replace good aseptic technique.

## 7.2. General Procedure for Donning PPE

Steps of donning PPE can vary depending on the procedure to be performed; donning for theatre, isolation, and etc.

- Always perform hand hygiene before donning PPE
- If wearing a gown, don the gown first and fasten in back accordingly
- If wearing a facemask or respirator:
  - Secure ties or elastic band at the back of the head and/or neck
  - Fit flexible band to nose bridge
  - Fit snug to face and below chin
- If wearing goggles or face shield, put it on face and adjust to fit
- If wearing gloves in combination with other PPE, don gloves last

## 7.3. General Procedure for Removing PPE

Steps of removing PPE can vary depending on the procedure has been performed e.g. after exposure to infectious agents.

- Remove PPE before leaving the exam room or patient environment (except respirators which should be removed after exiting the room)
- Removal of gloves:
  - Grasp outside of glove with opposite gloved hand; peel off
  - Hold removed glove in glove hand
  - Slide un-gloved fingers under the remaining glove at the wrist; peel off and discard
- Removal of gowns:
  - Remove in such a way to prevent contamination of clothing or skin
  - Turn contaminated outside surface toward the inside
  - Roll or fold into a bundle and discard if it is not reusable
- Removal of facemask or respirator
  - Avoid touching the front of the mask or respirator
  - Grasp the bottom and the ties/elastic to remove and discard
- Removal of goggles or face shield
  - Avoid touching the front of the goggles or face shield
  - Remove by handling the head band or ear pieces and discard
- Always perform hand hygiene immediately after removing PPE.

**Table 4: How Personal Protective Equipment Blocks the Spread of Microorganisms**

| Where Microorganisms are Found | How Microorganisms are Spread | Barriers to Stop the Spread of Microorganisms | Who the Barrier Protects |
|---|---|---|---|
| **Healthcare staff** | | | |
| Hair and scalp | shedding skin or hair | Cap | Patient |
| nose and mouth | coughing, talking and sneezing | Mask | Patient |
| Body and skin | shedding skin or hair | scrub suit, cover gown | Patient |
| hands | touching | gloves, hand washing or waterless antiseptic hand rub | Patient |
| **Patient's mucous membranes and non- intact skin** | Touching | Gloves | Patient and staff |
| | Splashing or spraying | Gloves, eyewear, mask, drapes, apron | Staff |
| Patient's blood and body fluids | Touching (contact) | Instrument processing | Patient |
| Patient's unprepared skin | | Utility gloves | Staff |
| | Accidental exposure with contaminated needles and scalpel blades | Protective footwear, decontamination and disposal; use a safe or neutral zone during surgery | Staff |
| | Infectious waste | Utility gloves, plastic bags and disposal | Staff and community |
| | Touching | Skin preparation, drapes, gloves. | Patient |
| **Clinic or hospital environment** | Touching | Gloves, handwashing dressings | Staff and their family<br>Staff and community |

***Source:*** Tietjen, L., D. Bossemeyer and N. McIntosh (2003). *Infection Prevention, Guidelines for Healthcare Facilities with Limited Resources.* JHPIEGO Corp., Baltimore, Maryland, page 5-4.

## 8.0. ANTISEPTICS AND DISINFECTANTS

### 8.1. Antiseptics

**Antiseptic c**hemicals that are applied to the skin or other living tissues to inhibit or kill microorganisms (both transient and resident) thereby reducing the total bacterial count.

**Antisepsis**
Process of reducing the number of microorganisms on the skin, mucous membranes or other body tissues by applying an antimicrobial antiseptic agent.

> **Note:** Antiseptics should not be used on inanimate objects such as instruments and surfaces; they do not have same killing power as disinfectants. Although antiseptics are sometimes used as disinfectants (e.g., Savlon or Dettol) for processing instruments and other inanimate object; they are not designed for this use. They do not have the same killing power as chemical disinfectants (e.g., glutaraldehydes, hypochlorite and per oxides) and should not be used for this.

**Antiseptic Agents**

- Liquid soap
- Antiseptics, which include 0.5% chlorhexidine with or without glycerol, and povidone-iodine. These reduce both transient and resident flora on the hands.
- They also reduce the risk of infections in high-risk situations, such as:
  - Heavy microbial contamination
  - Before performing invasive procedures, (e.g., the placement and care of intravascular devices and indwelling urinary catheters)
  - Before contact with patients who have immune defects, damage to the integumentary system (e.g., burns, wounds) and percutaneous implanted devices
  - Before and after direct contact with patients who have antimicrobial resistant organisms.

### 8.2. Types and Selection of Antiseptics

Many chemicals qualify as safe antiseptics and are designed to remove as many microorganisms as possible without damaging or irritating the skin or mucous membranes. Some antiseptic solutions have a residual effect (their killing action continues for a period of time). Hence, they are recommended in daily use.

- Alcohol-based solutions (tinctures) of iodine or chlorhexidine
- Alcohols (60–90% ethyl, isopropyl or “methylated spirit”)
- Chlorhexidine gluconate (2–4%) (e.g., Hibitane®, Hibiscrub®, Hibiclens®)
- Chlorhexidine gluconate and cetrimide, various concentrations at least 2% (e.g. Savlon®)

- Iodine (3%); aqueous iodine and alcohol-containing (tincture of iodine) products
- Iodophors (7.5–10%), various other concentrations (e.g., Betadine®)
- Chloroxylenol (Para-chloro-metaxylenol or PCMX) (0.5–3.75%), various other concentrations (e.g., Dettol®)
- Ortho-phthalaldehyde (OPA)
- Triclosan (0.2-2%)

**Table 5 The most frequently used Antiseptics, their microbiologic activities, potential use and effectiveness**

| GROUP | ACTIVITY AGAINST BACTERIA | | | | | | | | POTENTIAL USES | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gram-Positive | Most Gram-Negative | TB | Viruses | Fungi | Endospores | Relative Speed of Action | Affected by Organic Matter | Surgical Scrub | Skin Preparation | |
| Alcohols (60–90% ethyl or isopropyl) | Ex | Ex | Ex | Ex | Ex | None | Fast | Mod | Yes | Yes | Not for use on mucous membranes<br>Not good for physical cleaning of skin, no persistent activity |
| Chlorhexidine (2–4%) (Hibitane, Hibiscrub) | Ex | Good | Fair | Ex | Fair | None | Int | Slight | Yes | Yes | Has good persistent effect<br>Toxicity to ears and eyes |
| Iodine preparations (3%) | Ex | Ex | Ex | Ex | Good | Fair | Int | Marked | No | Yes | Not for use on mucous membranes<br>Can burn skin so remove after several minutes |
| Iodophors (7.5–10%) (Betadine) | Ex | Ex | Fair | Good | Good | None | Int | Mod | Yes | Yes | Can be used on mucous membranes |
| Para-chloro-metaxylenol (PCMX) (0.5–4%) | Good | Ex | Fair | Good | Fair | Unk | Slow | Minimal | No | Yes | Penetrates the skin and should not be used on newborns |
| Triclosan (0.2–2%) | Ex | Good | Fair | Ex | None | Unk | Int | Minimal | Yes | No | Acceptability on hands varies |

Ex—Excellent Unk—Unknown Mod—Moderate Int—Intermediate

*Source:* Tietjen L, D Bossemeyer and N McIntosh 2003.

### 8.3. When to Use Antiseptics

Use antiseptics

- before a clinical procedure involving skin, cervical, or vaginal preparation
- for surgical scrub
- for handwashing in high-risk situations, e.g., before, during and after performing invasive procedures, touching a new-born or an immunosuppressed patient

### 8.4. Surgical Antisepsis

Postoperative wound infections (incisional and deep) remains to be a leading cause of Healthcare Associated Infection in developing countries. The vast majority of postoperative incisional or superficial wound infections are caused by microorganisms (usually bacteria or sometimes fungi) normally found on a patient's skin or from mucous membranes adjacent to the site.

***Note:** Surgical wound infections are less often caused by organisms from the nose, mouth, respiratory tract, hands of surgeons and assistants and organisms from the operating room.

Preoperative surgical antisepsis consists of three processes:

- Hand hygiene
- Gloving
- Applying an antiseptic agent to the surgical site

Whether a postoperative wound infection occurs depends on several risk factors, the most important being:

- the number of microorganisms entering the wound
- the type and virulence (ability to cause the disease) of the bacteria
- the patient's immunity
- external factors: preoperative hospital stay days or duration of the surgical technique or procedure and surgical environment

#### 8.4.1. Skin Preparation Prior to Surgical Procedures

Although skin cannot be sterilized, applying an antiseptic solution minimizes the number of microorganisms around the surgical wound that may contaminate and cause infection.

Step 1: Do not shave hair around the operative site. Shaving increases the risk of infection 5-10 fold because the tiny nicks in the skin provide an ideal setting for microorganisms to grow and multiply (Nichols, 1991; Seropian and Reynolds, 1971). If hair must be cut, trim the hair close to the skin surface with scissors immediately before surgery.

Step 2: Ask the patient about allergic reactions (e.g., to iodine preparations) before

selecting an antiseptic solution.

Step 3: If the skin or external genital area is visibly soiled, gently wash it with soap and clean water and dry the area before applying the antiseptic.

Step 4: Using dry, high-level disinfected forceps and new cotton or gauze squares and antiseptic, thoroughly cleanse the skin. Work from the operative site outward for several centimetres. (A circular motion from the centre out helps to prevent recontamination of the operative site with local skin bacteria.)

Step 5: Allow the antiseptic enough time to be effective before beginning the procedure. For example, when an iodophor is used, allow 2 minutes or wait until the skin is visibly dry before proceeding, because the active agent (free iodine) is only released slowly.

### 8.4.2. Instructions for Cervical or Vaginal Preparation

For **cervical** and **vaginal antisepsis**, prior to inserting a uterine elevator for mini laparotomy or doing an endometrial biopsy, select an aqueous (water-based) antiseptic, such as an iodophor (povidone-iodine) or 2-4% chlorhexidine gluconate (e.g., Savlon if properly prepared). Do not use alcohols or alcohol-containing preparations.

Step 1: Ask the patient about allergic reactions (e.g., to iodine preparations) before selecting an antiseptic

Step 2: If the external genital area is visibly soiled, gently wash it with soap and clean water and dry the area before applying the antiseptic.

Step 3: After inserting the speculum, apply antiseptic solution liberally to the cervix and vagina (two times).

Step 4: If an iodophor is used, allow time (2 minutes) before proceeding.

## 8.5. Storing and Dispensing Antiseptics

- Concentrated antiseptic solutions should be stored in a cool, dark area.
- Never store them in direct sunlight or in excessive heat (e.g., upper shelves in a tin-roofed building).
- Unless supplied commercially in small quantities, pour the antiseptic into a small, re-usable container for daily use.
- Label re-usable containers with the date each time they are washed, dried and refilled
- Make sure the correct name of the solution is on the container each time you refill it.
- **Do not store gauze or cotton wool in antiseptics because this promotes contamination.**

- Establish a routine schedule for preparing new solutions and cleaning reusable containers. (Solution is at increased risk of becoming contaminated). **"Do not "top off" antiseptic dispensers.**
- Wash re-usable containers thoroughly with soap and clean water, and drip dry before refilling.

### 8.6. Disinfectants

Disinfectants are chemicals that kill or inhibit all microorganisms except bacteria endospores on inanimate objects.

#### 8.6.1. Types of disinfectants

**Table 6. Type of disinfectants**

| Level of disinfection required | Spectrum of activity of desinfectant | Active ingredients potentially capable of satisfying these spectra of activity | Factors affecting the efficacy of a disinfectant |
|---|---|---|---|
| High | • Sporicidal<br>• Mycobactericidal<br>• Virucidal<br>• Fungicidal<br>• Bactericidal | • Peracetic acid<br>• Chlorine dioxide<br>• Formaldehyde<br>• Glutaraldehyde<br>• Sodium hypochlorite<br>• Stabilized hydrogen peroxide<br>• Succinaldehyde (succinic aldehyde) | • Concentration<br>• Contact time<br>• Temperature<br>• Presence of organic matter<br>• pH<br>• Presence of calcium or magnesium ions (for example, hardness of the water used for dilution)<br>• Formulation of the disinfectant used |
| Intermediate | • Tuberculocidal<br>• Virucidal<br>• Fungicidal<br>• Bactericidal | • Phenol derivatives<br>• Ethyl and isopropyl alcohols | |
| Low | • Bactericidal | • Quaternary ammonium<br>• Amphiprotic<br>• Amino acids | |

**High-level disinfectants**

- These are substances that kill all bacteria, viruses, fungi, and mycobacterium tuberculosis. Some high-level disinfectants are also chemical sterilant and, given sufficient time, will destroy bacterial endospores.
- Examples of disinfectants:
  - sporicidin 2%
  - chlorhexidine 4%, centrimide 5%
  - hydrogen peroxide 6%
  - chlorine 0.5%

**Intermediate-level disinfectants**

- Kill bacteria and most viruses
- Examples are: alcohols:
  - isopropyl 60-70%

- ethanol 70-90%
- methylated spirit 60-90%
- iodines and iodophor 10% solutions
- povidone - iodine 2.5%
- formaldehyde 8%

***Note:** Recommended for use on blood and other potentially infectious materials. Small, non-lipid viruses, (e.g., enteroviruses) may be resistant. Used for some non-critical items or devices, or on environmental surfaces.

**Low-level disinfectants**

- Kill some bacteria and some viruses and fungi, but do not kill tuberculosis-causing microorganisms and bacterial endospores.
- Examples are:
  - Hydrogen peroxide 3%
  - Phenolics 1-2%
  - Dettol
  - Lysol 5%
  - Carbolic acid 5%

***Note:** Should be used only to decontaminate the environment (surfaces, floors, furniture, walls). They must not be used for processing instruments and other items.

### 8.6.2. Factors Affecting Disinfection

- Nature of the items to be disinfected
- Number of micro-organisms present (a higher number of microorganisms requires more time for disinfection)
- Resistance of microorganisms
  - some microorganisms are more resistant to disinfection then others, e.g., bacterial spores, mycobacteria, hydrophilic viruses, fungi, vegetative bacteria, lipid viruses in that order
  - organisms flourishing in healthcare facility environments (pseudomonas aeruginosa, antibiotic resistant microorganisms) have inherent resistance to certain disinfectants
- Types and concentration of disinfectant used
- Presence of organic materials
  - presence of organic soiling matter (blood, blood products, body fluids, and faeces containing significant amounts of proteins, and proteins) inactivate or slow the action of disinfectants
- Duration of exposure and temperature:
  - the longer the duration of exposure, the higher the degree of disinfection achieved

— higher temperatures increase the killing power of most disinfectants whereas lower temperatures slow the killing power

- Rough surfaces (having crevices, lumen, hinges) need a longer time for disinfection

### 8.6.3. Choosing a Disinfection Method

Disinfectants chosen should be:

- Bactericidal not bacteriostatic
- Active against a wide range of microorganisms
- Not readily inactivated by organic matter (i.e. stable when in contact)
- Rapid activity
- Non-toxic
- Non-corrosive
- Non-damaging to equipment/substances treated
- Cost-effective and available

### 8.6.4. Guide to Use of Disinfectants (instructions)

- Check expiry date of the solution. The date should be clearly marked on the container.
- Follow the manufacturer's instructions AND ensure that the correct (optimum) dilution is used.
- Disinfectant containers must be thoroughly cleaned or sterilized before refill between uses. NEVER TOP UP!!
- Disinfectants must not be used to sterilize instruments or equipment (unless specified in the disinfectant policy, e.g., endoscopes).
- Disinfectants should be supplied, preferably ready for use from the pharmacy (new stocks to be supplied on receipt of empty containers). Do not discard empty containers or use them to store other solutions. Chemicals can be harmful when used in the wrong situations.
- Open containers of disinfectant should not be tolerated in any healthcare environment.
- There is a serious risk of contamination with multiple antibiotic-resistant bacteria such as Pseudomonas spp and spores.
- When disinfectants are indicated for use on surfaces, WIPE. (Do not wash, bathe or flood-wash).
- Always thoroughly decontaminate, then clean articles before disinfection, i.e., remove any substance such as dirt and biological materials.
- The health facility pharmacy should ensure that:
  - the containers are thoroughly cleansed, washed and dried

- the containers are clearly labelled with the type of contents, the in-use dilution and the expiry date
- none of the disinfectants are exposed to inactivating substances, i.e., cork, rubber caps or incompatible detergents

***Note:** Disinfectants should be diluted by knowledgeable personnel in manageable quantities, e.g., 5 litres or less. This will reduce waste. Partially filled containers must not be left on the wards (prevent hoarding).

## 9.0. HEALTH CARE WASTE

The aim is to provide technical guidance on safe health care waste management and to ensure compliance with HCWM regulations, standards, procedures and specifications in order to protect public health and safeguard the environment.

### 9.1. Healthcare Waste Classification

Healthcare waste is classified mainly into two categories which are - Hazardous and Non-hazardous waste.

#### 9.1.1. Non-hazardous Waste

Non-hazardous waste is waste that has not been in contact with infectious agents, hazardous chemicals or radioactive substances and does not pose a sharps hazard. A significant proportion (about 85%) of all waste from health-care facilities is non-hazardous waste and is usually similar in characteristics to municipal solid waste. More than half of all non-hazardous waste from healthcare facility is paper, cardboard and plastics, while the rest comprises discarded food, metal, glass, textiles, plastics and wood.

#### 9.1.2. Hazardous Health Care Waste

Hazardous waste is a waste that poses potential threat to public health and the environment. They can be in the form of solid, liquid or gaseous. Hazardous waste is classified into the following;

**Infectious waste**: is material suspected to contain pathogens (bacteria, viruses, parasites or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. This category includes: Waste contaminated with blood or other body fluids;

**highly infectious waste**: Means all waste materials containing, blood, fluids with **viable biological agents** from infected person or artificially cultivated in significant elevated numbers; Waste from infected patients in isolation wards, cultures and stocks; dishes, devices used to transfer, inoculate and mix cultures of infectious agents. In case of notifiable highly infectious diseases ie. Viral Haemorrhagic fever, such waste materials should follow extra treatment procedure.

**Sharps:** These are items that could cause cuts or puncture wounds and infections. Sharps include needles, hypodermic needles, scalpels and other blades, knives, infusion sets, saws, broken glass and pipettes. Whether or not they are infected, such items are usually considered hazardous health-care waste and should be treated as if they were potentially infected.

**Pathological waste;** These wastes consists of tissues, organs, body parts, blood, body fluids and other waste from surgery and autopsies. It also includes human foetuses and infected animal carcasses.

**Pharmaceutical waste;** These include expired, unused, spilt and contaminated

pharmaceutical products, prescribed and proprietary drugs, vaccines and blood sera that are no longer required, and, due to their chemical or biological nature, need to be disposed of carefully. The category also includes discarded items heavily contaminated during the handling of pharmaceuticals, such as bottles, vials and boxes containing pharmaceutical residues, gloves, masks and connecting tubes.

**Genotoxic waste;** These include certain cytostatic drugs, vomit, urine or faeces from patients treated with cytostatic drugs, chemicals and radioactive material.

**Chemical waste:** These consist of discarded solid, liquid and gaseous chemicals; for example, from diagnostic and experimental work and from cleaning and disinfecting procedures. Chemical waste from health care is considered to be hazardous if it has at least one of the following properties: toxic (harmful); corrosive (e.g. acids of pH <2 and bases of pH >12); flammable; reactive (explosive, water reactive, shock sensitive) and oxidizing.

Wastes from materials with high heavy-metal contents represent a subcategory of hazardous chemical waste and are usually highly toxic. Mercury and cadmium are examples of highly toxic yet common substance in health-care facilities. Mercury wastes are typically generated by spillage from broken clinical equipment (thermometers and aneroid blood pressure equipment) and dental amalgam while cadmium waste comes mainly from discarded batteries

**Radioactive waste:** These are materials contaminated with radionuclides. They are produced as a result of procedures such as in vitro analysis of body tissue and fluid, in vivo organ imaging and tumour localization, and various investigative and therapeutic practices, which include liquids, gas and solids contaminated with radionuclides whose ionizing radiations have genotoxic effects. The ionizing radiations of interest in medicine include X-and y-rays as well as cx- and B- particles. An important difference between these types of radiations is that X-rays tubes only when generating equipment is switched on whereas y-rays, cx- and B- particles emit radiations continuously. The type of radioactive material used n HCFs results in low level radioactive waste and concerns mainly therapeutic and imaging investigation activities where Cobalt 60 Co, Technetium 99mTc, iodine 1311 and iridium 192Ir are most commonly used;

### 9.2. HCW Minimization, Re use-and Recycling

For efficient and effective minimization, of Health Care Waste, authorities, health facilities and other stakeholders shall establish and practice strategies for HCW waste avoidance, reduction, re-use and recycling as follows;

- Minimization of HCW shall include source reduction, use of medical procedures that reduce the volume of waste generated.
- Healthcare facilities should put in place mechanisms to restrict the purchase of supplies that produce a lot of HCW.

**Recycling**

- Healthcare facilities should use separate color coded containers placed at the source of waste generation for recyclable materials.
- Healthcare facilities should practice effective waste segregation at the point of generation to facilitate recycling of recyclable materials.
- All recyclable healthcare waste must be properly treated before taken out of the healthcare facilities

Companied interested with recycling of medical materials must register for the business by the Environmental Health Registration Board.

**Re-use**

- Surgical equipment and other items which are designed for reuse and are sensitive to heat shall be sterilized by approved procedures.
- Operating and waste treatment costs should be reviewed periodically to evaluate any fluctuations. Data shall be collected to allow comparisons between HCF and to establish benchmarks.

### 9.3. Segregation of Healthcare Waste

HCF shall segregate waste to protect personnel from injury and infection by preventing hazardous waste entering inappropriate waste streams. All standard operating procedures of HCW segregation, packaging and labelling shall be displayed in each department;

- Segregation of healthcare waste shall be done at the generation point and is the responsibility of the person/institution that generate it;
- Segregation receptacles must be placed close as possible to waste generator as this will avoid cross contamination;
- Standard colour coded receptacles for each category of waste shall be provided by HCF;
- Segregation of healthcare waste shall consist of separating different waste materials based on the type, treatment and disposal or recyclable options;
- The mixing of non-hazardous and hazardous waste is not permitted. If mixing occurs, all waste contained together in, shall be classified and treated as hazardous waste;
- Staff engaged in the segregation of HCW shall wear appropriate personal protective equipment;
- SOPs or posters for healthcare waste segregation should be displayed at the point of healthcare generation.

**Table 7. Colour cording**

| Waste category | Type of waste | Colour of receptacles and liner | |
|---|---|---|---|
| Non-infectious waste | Paper, packaging materials, plastic bottles, food remains, boxes, cartons | Black/Blue | |
| Infectious waste | Used gloves, dressing materials, specimen containers, infusion packages, catheters, urinal bags | Yellow | |
| Highly infectious waste | Anatomical waste, blood, body fluids, pathological waste, culture materials, stocks, petri dishes, waste from isolation ward or | Red | |
| Sharps waste | Used Syringes and needles, surgical blades, scalpels, needles, scalpels, prickers, blades, broken glass (e.g., pipettes, ampoules, | Yellow Safety Boxes | |

## 9.4. Healthcare Waste Management Procedures

### 9.4.1. Collection and onsite-transportation of Healthcare Waste

For efficient and effective collection and transportation of Health Care Waste, authorities or health facilities management shall;

- Provide standard equipment for collection and transportation of health care waste.
- Provide appropriate personal protective equipment
- Supervise staff to adhere on use of personal protective equipment.
- All infectious waste shall be collected on daily basis
- Hazardous HC W and non-hazardous HCW shall be collected on separate trolleys.
  - The collection/transport route shall be the most direct and shortest one from the collection point to the central storage facility or disposal point and should avoid where food preparation is done and the heavily populated areas.
- HCW should be transported using colour coded/labelled transportation equipment that are not used for any other purpose;
- Collection times should be fixed and reliable
  - The collected waste shall not be left even temporarily anywhere other than at the designated central storage facility;
- Health-care waste shall not be transported by hands to avoid the risk of accident or injury

- All bin liners and /or containers of waste must be marked to identify the unit/ward where the waste was generated
- Spare trolleys/wheeled bins shall be available in case of breakdowns and maintenance
- The trolleys/ wheeled bins shall be cleaned and disinfected after every use.
- All waste bag seals should be in place and intact at the end of transportation.
- There should be separate, secured, storage rooms to maintain segregation of:
  - Radioactive waste
  - Waste containing mercury

### 9.4.2. Health Care Waste storage

For efficient and effective storage of Health Care Waste, authorities or health facilities shall:

- Provide a secured and fenced HCW storage bay
- The bay should have an impermeable, hard-standing floor with good drainage system, easy to clean and disinfect in line with standards and procedures for HCWM
- Ensure separate labelled storage compartment for various types of HCW
- Provide a separate compartment for radioactive waste storage
- Infectious waste must be stored not more than 48 hours from the time of generation.

### 9.4.3. Offsite transportation

For efficient and effective off-site transportation of Health Care Waste, authorities or health facilities shall comply the following:

- Before transportation of the waste, dispatch documents should be completed
- All arrangements should be made between consignor, carrier, and consignee
- In case of trans-boundary movement, the consignee should have confirmed with the relevant competent authorities that the waste can be legally transported
- Transport on public roads should only be conducted by licensed companies
- Transport vehicles and drivers must meet legal requirements for the transport of hazardous waste

*For more detailed information, refer Healthcare Waste Management guidelines.

### 9.4.4. HCW treatment

HCW should be treated before disposal. Methods for treatment depend on the waste characteristics, technology, environmental and safety factors. There are five

processes for the treatment of hazardous health-care waste that include thermal, chemical, irradiation, biological and mechanical. The choice of treatment system depends on local conditions and involves consideration of:

- Available resources including technical expertise
- Waste characteristics and volume
- Technical requirements for installation, operation and maintenance of the treatment system
- Safety and environmental factors
- Cost considerations

*With respect to special waste which include waste containing radioactive materials and mercury shall require special treatment methods and receive special supervision with technical expertise. Radioactive waste materials should be managed under the supervision and recommendation by the Tanzania Atomic Energy Commission. Mercury containing medical devices should be stored and collected centrally for further disposal using internationally acceptable disposal option.*

### 9.4.5. Disposal methods

General non-hazardous and hazardous waste that require direct disposal must be known by the healthcare facilities. The Ministry recommend the following disposal option for non-hazardous waste and hazardous waste that require direct disposal.

**Burning Chamber**
Rural health centers and dispensaries can use this option to burn waste in burning chamber as per MoHCDGEC Healthcare Waste Management guidelines.

**Open burning** of contaminated waste is not recommended because it is hazardous.

**Incineration**

- Incineration, which is a dry oxidation process, is used to reduce organic and combustible waste into inorganic incombustible matter at high temperature.
- Incineration provides high temperatures and destroys microorganisms and therefore is the best method for disposal of contaminated wastes. *Refer Healthcare Waste Management guidelines.
- Having centralized incineration is acceptable if health facility is not capable managing incineration by itself.
- Ashes from the incinerator should be disposed in an ash pit.
- HCW, which cannot be re-used, recycled or dumped in a landfill site, should be incinerated.
- There should be an efficient monitoring system for proper functioning of incinerators

**Non-hazardous waste**

- Non – hazardous waste shall be disposed off in public designated disposal sites.
- In case there is no public disposal site the authority shall establish a designated disposal site for non-hazardous that meet public health and environmental requirement.
- Open burning is strictly not allowed for all types of waste
- The designated disposal site should be secured for unauthorised access and fenced.

**Hazardous waste disposal options**

Hazardous waste must be treated before final disposal. The Ministry recommend the following disposal option for various types of hazardous waste:

**Pathological waste disposal:**

- Every healthcare facility should have a standard designated placenta pit within the facility premises.
- Other pathological waste must be treated, incinerated or buried.
- In case of human remain must be cremated or buried in public cemetery

**Disposal of hazardous ash:**

Fly ash and bottom ash from incineration is generally considered to be hazardous, because of the possibility of having heavy metal content and containing dioxins and furans.

- Hazardous ashes should be disposed of in sites centralized designed for hazardous wastes,
- In the absence of designated disposal sites, the HCF should construct a standard ash pit within or offsite the facility premises.

**Sharp waste disposal**

Even after sterilization, sharp waste may still pose physical risks. The HCF should do the following;

- Sterilized sharp waste can be disposed of in safe sharp pits on the health care facility premises or encapsulated by mixing waste with immobilizing material like cement before disposal.
- In case recycling opportunity exist, sharp waste should be sterilized and taken for recycling with licenced companies.
- Sharps can be incinerated where such high technology incinerator exist and needles smelted and ash disposed of by burial method.

**Disposal options in emergency situations**

- The authority should take appropriate healthcare waste management practices in line with the type of waste generated.

- Appropriate disposal options and procedures must be followed including interim minimal disposal practices.
- Open dumping of boxes/bagged waste should be avoided.

**Liquid waste management**

There should be adequate, accessible and appropriate toilets for patients, staff, caretakers and people with special needs. Wastewater produced should be treated and disposed-off safely to protect workers and the environment.

- For the facilities with Onsite sanitation if involve the emptying of the sock away pit the content should be treated in the sedimentation ponds
- For the facilities connected to sewerage system, the liquid waste from health care facilities should be treated before discharged into sewerage or receiving body.
- Note that sludge and sewage from health-care facilities generated by a basic wastewater-management system should never be used for agricultural or aquaculture purposes. Effluents should have met the required BOD standards
- Liquid pharmaceuticals in vials (but not cytotoxic materials) can be crushed in a closed bucket, mixed with sawdust, and the solid mass incinerated or encapsulated.

**Special waste classes**

Chemical Wastes Containing Heavy Metals (mercury,), **UPOPs, pharmaceutical and cosmetic waste, radioactive waste, e- waste See HCWM guidelines for this management and disposal**

- Pharmaceutical waste and chemical waste should be stored until a safe disposal option has been identified. (refer guideline from pharmaceutical disposal)

## 10.0. WASH IN HEALTHCARE FACILITIES

WASH services provide for water availability and quality, presence of sanitation facilities and availability of soap and water for handwashing. Adequate water, sanitation and hygiene are essential components of providing basic health services. The provision of WASH in health care facilities serves to prevent infections and spread of disease, protect staff and patients, and uphold the dignity of vulnerable populations including pregnant women and the disabled. Many health care facilities in low resource settings have no WASH services, severely compromising the ability to provide safe and people-centered care and presenting serious health risks to both health care providers and those seeking treatment.

### 10.1. Water Supply

The health facility management should ensure the facility has

**Water quality:**
Water for drinking, cooking, personal hygiene, medical activities, cleaning and laundry are safe for the purpose intended. Water free from coliform bacteria; meets national drinking-water quality guideline. All HCFs should treat water with chlorine to meet drinking water standards. The purpose is to provide microbial safety. In case the HCF is dealing with diarrheal epidemic, the level of residual chlorine should be increased to 1mg/l at end points (SPHERE, 2011). However, for other emergencies, the free chlorine residual after each contact time should be between 0.5 and 1.0mg/l (WHO, 2011).

**Water facilities and access to water:**
Sufficient water-collection points and water-use facilities are available in all service areas to allow convenient access to, and use of, water for drinking, food preparation, personal hygiene, medical activities, laundry and cleaning. Sufficient and clearly identified: drinking water, hand-washing and other (Bathing, laundry) water sources.

**Water quantity:**
HFs must ensure that sufficient quantities of water are available to meet all the minimum daily requirements such as infection prevention and control and medical activities, drinking, laundry, bathing, hand washing, and cleaning. This may require interventions to repair the water supply or power supply if the water system requires power to function. It may also involve the installation of temporary water storage facilities such as demountable steel water tanks, bladder tanks or polyethylene tanks. It is recommended minimum water quantities during emergency are presented.

**Table 8 Water requirements for specific needs in HFs**

| Area | Quantity of Water Required |
|---|---|
| Health centres and hospitals | 5 litres/out-patient<br>40-60 litres/in-patient/day<br>Additional quantities may be needed for laundry equipment, flushing toilets, etc. |

| Area | Quantity of Water Required |
|---|---|
| Cholera centres | 60 litres/patient/day<br>15 litres/carer/day |
| Therapeutic feeding centres | 30 litres/in-patient/day<br>15 litres/carer/day |
| Public toilets | 1-2 litres/user/day for hand washing<br>2-8 litres/cubicle/day for toilet cleaning |
| All flushing toilets | 20-40 litres/user/day for conventional flushing toilets connected to a sewer<br>3-5 litres/user/day for pour-flush toilets |
| Anal washing | 1-2 litres/person/day |

**Emergency water supply planning:**

In determining how much water supply (quantity and quality) will be required during the emergency, the HF should first, carry out a water use audit which will involve:

- Working out estimates of the quantity and quality of the water requirements of its various facility functions,
- Identifying which functions are essential to protect patients' health and safety and should remain in operation. This could include such functions as medical gas and suction for ventilator patients if compressors are water cooled. Identify functions that can be temporarily restricted or eliminated (e.g., elective surgery, routine outpatient clinic visits) in the event of an interruption in the facility's water supply,
- Determining the steps required to restrict or eliminate some functions temporarily. For instance, this could include transferring of new acute patients to unaffected facilities,
- Working out estimates of the quantity and quality of water required to continue operation of essential functions so as to meet the emergency demands,
- Finding out any other available alternative water supplies,
- Identifying emergency water conservation measures including an emergency water restriction plan.

**Table 9 Recommended minimum water quantities for HCFs in emergencies**

| Activity | Quantity of Water Required |
|---|---|
| Staff | 5 litres/consultation |
| Outpatients | 5 litres/consultation |
| Inpatient | 40-60 litres/patient /day |
| | 15 litres/carer /day |
| Operating Theatre or Maternity Unit | 100litres /intervention |
| Dry / Supplementary Feeding Centre | 0.5–5 litres/consultation<br>(depend on waiting time) |

| Activity | Quantity of Water Required |
|---|---|
| Wet Supplementary Feeding Centre | 15 litres/consultation |
| Inpatient Therapeutic Feeding Centre | 30 litres/patient/day |
| | 15 litres/carer/day |
| Cholera Treatment Centre | 60 litres/patient/day |
| | 15 litres/carer/day |
| Acute Respiratory or Isolation Ward | 100 litres/patient/day |
| | 15 litres/carer/day |
| Viral Haemorrhagic Fever Isolation Ward | 300–400 litres/patient/day |
| | 15 litres/carer/day |

**Source:** *Water, sanitation and hygiene in Healthcare facilities in emergencies (WHO, 2012)*

**Availability of sufficient number of toilets for users**

It is recommended, there should be at least one toilet available for every 20 users in inpatients HCFs and four toilets in outpatient setting. It is recommended that urinal units be provided in addition to toilets in all male toilet blocks. Provision of urinals should consider the number and frequency of users, appropriateness of urinal designs, and availability of water, and maintenance arrangements. For inpatients HCFs bedpans should be available for seriously sick persons or children.

## 10.2. Specific Excreta Disposal Requirements for Different Levels of Health Facilities

Demand for sanitation services should be determined by the level of the facility. In accordance with the sanitation adequacy criteria outlined above, each level of HF will have excreta disposal facilities (types and number) depending on the number of clients and staff and the services it provides as well as the existing infrastructures such as blocks and departments.

**Table 10 Excreta disposal guidelines for HF levels**

| Facility Level | Number and Types of Excreta Disposal Facilities |
|---|---|
| Dispensary | (i) 2 staff toilets (separate for males and females)<br>(ii) 2 toilets for male and female clients<br>(iii) Male toilets should include urinal units<br>(iv) At least two latrines for people with disability; one for males and another for females together.<br>(v) Additional latrine(s) may be provided next to delivery and/or Child and Health Clinics (RCH) facility depending on the building layout and specific needs in an area.<br>(vi) Flush and/or pour flush toilets with water seal are the recommended latrine options for dispensaries. Ventilated Improved Pit (VIP) latrines may be provided in areas with critical water shortages and for interim uses.<br>(vii) Placenta pit with cover is recommended. |

| Facility Level | Number and Types of Excreta Disposal Facilities |
|---|---|
| Health centers | The following facilities should be provided at the OPD or/and client reception areas;<br>(i) 2 staff toilets (separate for males and females)<br>(ii) 4 toilets (separate) for male and female clients<br>(iii) Urinals should be provided in all male toilet blocks.<br>(iv) 2 toilets for people with disability for males and females<br>(v) Additional to the toilets at the OPD or/and client reception area;<br>(vi) At least one toilet for each ward, service unit and a set of male and female accommodations for staff and clients in office blocks.<br>(vii) A health centre should provide no less than 12 latrine/toilets units in total, inclusive of provision for people with special needs.<br>(viii) Flush toilets, pour flush latrines, and other advanced water-based options provided with adequate water supplies are recommended for installation in health centres.<br>(ix) Excreta disposal and bathing facilities should be provided specifically for delivery clients. Toilets at the delivery unit must be flush toilets with water seal.<br>(x) Bed pans as per HCF requirements<br>(xi) Health centres must be provided with conventional sewage system onsite or offsite for effective liquid waste transportation and disposal. The sewerage systems must be properly maintained and monitored.<br>(xii) Placenta pit with cover is recommended. |

| Facility Level | Number and Types of Excreta Disposal Facilities |
|---|---|
| District hospitals | (i) Excreta disposal infrastructure should include at least two staff toilets (separate for males and females), four toilets, 2 for male and female's clients each, and two toilets for people with disability to be used by males and females in each of the facility's functional block or department.<br>(ii) Actual number of toilets and urinals should be designed based on the number of clients being attended.<br>(iii) At least one toilet for each ward, service unit and a set of male and female accommodations for staff and clients in office blocks and clients' reception areas should be provided.<br>(iv) Excreta disposal facilities (including urinals) for hospitals must be water-based with flushing system and adhere to high quality standards<br>(v) No pit latrines (even improved) are allowed in a hospital setting.<br>(vi) Excreta disposal facilities for hospitals must be provided with sufficient water for regular operations and maintenance all the time.<br>(vii) Sufficient sewage system onsite or offsite (connected to public sewer) should be provided to support excreta disposal systems in accordance with the type of the sanitation infrastructure<br>(viii) Excreta disposal and bathing facilities should be provided specifically for delivery clients. Toilets at the delivery unit must be flush toilets with water seal.<br>(ix) High temperature incinerator and Placenta pit with cover is recommended. |
| Regional referral hospital | (i) At least two staff toilets (separate for males and females),<br>(ii) 4 toilets for male and female clients, and<br>(iii) 2 toilets/latrines for people with disability to be used by males and females in each facility's functional bock or department.<br>(iv) Actual number of toilets and urinals should be designed based on the number of clients being attended.<br>(v) At least one toilet for each ward, service unit and a set of male and female accommodations for staff and clients in office blocks and clients reception areas should be provided.<br>(vi) Adequate quantities of mobile receptacles (wheel chairs with receptacles) and bed pans should be allocated in each ward.<br>(vii) Facilities for excreta disposal, waste water and solid waste management, and environmental cleanness for regional referral hospitals should adhere the minimum requirements as provided for hospitals level<br>(viii) Excreta disposal and bathing facilities should be provided specifically for delivery clients. Toilets at the delivery unit must be flush toilets with water seal.<br>(ix) High temperature incinerator and Placenta pit with cover is recommended. |

| Facility Level | Number and Types of Excreta Disposal Facilities |
|---|---|
| Specialized zonal and national referral hospitals | (i) At least two staff toilets (separate for males and females),<br>(ii) 2 toilets for male and female clients, and<br>(iii) 4 toilets for people with disability to be used by males and females in each of the facility's functional block or department.<br>(iv) Actual number of toilets and urinals should be designed based on the number of clients being attended.<br>(v) At least one toilet for each ward, service unit and a set of male and female accommodations for staff and clients in office blocks and clients reception areas should be provided.<br>(vi) Adequate quantities of mobile receptacles (wheel chairs with receptacles) and bed pans should be allocated in each ward.<br>(vii) Excreta disposal and bathing facilities should be provided specifically for delivery clients. Toilets at the delivery unit must be flush toilets with water seal.<br>(viii) High temperature incinerator is recommended. |

**Landscaping, Gardening and Outdoor Spaces**

Outdoor spaces play a critical role in the creation of dignified environments for treatment, as well key role in infection prevention and control. Landscape should be considered and integrated into any facility design to produce well-planned exterior environment.

Durable and appropriate furnishing can be easily integrated into the landscape approach to create comfortable and low cost outdoor gathering areas that contribute to infection prevention and control as well as staff and patient comfort. (details can be found in National HCWM guidelines)

### 10.3. Hand Washing Facilities and Specifications for Health Facilities

#### 10.3.1. Hand washing facilities and specifications

Hand washing (HW) facilities and materials are important for promotion of hand hygiene practices. Each HF should have access of the hand washing facilities and materials with acceptable WHO specifications as presented in Table 11.

**Table 11. Recommended Specifications of HW facilities in Fs**

| HW Facility | Specifications |
|---|---|
| Hand washing basin | • Should be made of non-porous material, round shape inside with dimensions of 25cm by 35cm depth and without overflow<br>• Should be of elbow/ sensor operating taps, uPVC traps and plastic gadgets<br>• Should be a wall-mounted basin fixed at 120cm above floor |

| HW Facility | Specifications |
|---|---|
| Soap/detergents dispenser | • Should be auto sensor dispenser |
| Hand drying equipment/ materials | • Should be a centred feed hand towel dispenser<br>• Drying material should be a disposable towel (tissue papers) |
| Water supply | • Should be provided both hot and cold which meets WHO water quality standards and Tanzania water quality standards. |
| Sanitizer | • Should be used as alternative in a hand washing facility in case, there is no water. |
| Waste bin | • Should be a round black pedal bin of 12 litters (340mm (height) x 270mm (diameter) |
| Hand washing basin for disabled people | • Wheel chair accessible hand wash basin which is wall mounted with dimensions of 510mm (length) by 685mm (width) |
| Hand drying equipment/ materials | • Should be a centered feed hand towel dispenser<br>• Drying material should be a disposable towel (tissue papers) |

### 10.3.2. Surgeon scrub -sinks

These are plumbing fixtures well equipped to enable medical personnel to scrub their hands prior to a surgical procedure. Surgical scrub sink is essentially used in operating theatre and are designed in a way that promote proper hand washing practices and reduce any possible contamination since all operating procedures are sterile procedure. The sinks are provided with hot and cold-water supply which is activated by a knee-action mixing valve or by wrist or foot control as shown in Figure 9.


**Figure 8. Surgical scrub sinks**

For maintaining the required hygiene practices the surgeon scrub sink should have the following characteristics:

- It should be made of vitreous china, stainless steel, or a material whose durability and imperviousness are equivalent to vitreous china;
- It should be of adequate size and design to permit the scrubbing of both hands and arms without having to come in contact with any surface;
- It should be sized and shaped to prevent splashing of the user;
- It should have a non-swivel faucet that provides adequate flow for quick rinsing;
- It should have hands-free operation (electric eye or knee/foot operation) and be designed to prevent contamination of the hands when water is activated;
- It should have a means of manual adjustment of water temperature;
- It should be equipped with a seam-free backsplash integral with the sink that extends at least 60 cm above sink level;
- Should have backsplashes covering the areas under the paper towel dispenser and soap dispenser.

### 10.3.3. Paper towels

Paper towels are used for drying hands. They are effective, safe and fast, in hand drying than other methods of hand hygiene since they dry hand more quickly and remove bacteria and are less likely to lead to cross contamination. Paper towels also offer the advantages of not needing electrical power where they are installed. In order to make effective use of paper towels HCFs will have to do the following:

- Provide paper towel dispenser in all areas where hand washing facilities are available
- Towel dispensers should be mounted such that access to them is free and splashing or dripping onto adjacent wall and floor surfaces is minimized.
- Provide single-use paper to turn off faucets so as to avoid hand recontamination.
- Paper towels should be provided for use on the exit door hardware
- Waste bins for used towels should be located near the exit door.
- Avoid use of hot-air dryers in any health care facility areas as warm air currents dry hands slowly and can be used by only one individual at a time. This results in queues and the temptation to dry hands on clothing.
- Provide lidded, lined, foot pedal-operated waste bins, with waste bags, in close proximity to each hand washing sink.
- Ensure that paper waste receptacles are a corrosion free material and wide mouth design. Space should be allowed for the placement of waste bins in close proximity to the hand.

### 10.3.4. Hand hygiene sink usage

The following precautions should be taken in order to ensure proper use of hand hygiene sinks:

- Hand hygiene sinks should not be dedicated to any other purpose as each sink will be used for a specified purpose
- Hand washing sinks should be cleaned on a regular basis
- Hand washing sinks should be regularly inspected to ensure they are maintained in good condition.
- Paper towels and liquid soap should be provided at each hand washing sink.
- A current hand washing guide should be posted at each hand washing sink in order promote correct washing methods.

### 10.3.5. Recommended hand washing facilities for HFs

Tables 12 and 13 provide the WHO recommended numbers of hand washing facilities and their locations within the HF.[1]

**Table 12. Recommended number of hand washing facilities per level of facility and locations**

| S/ N | HCF level | Location of hand washing facility in the HF | Number of hand washing basins |
|---|---|---|---|
| 1 | Dispensary | • OPD consultation room<br>• Injection room<br>• RCH section<br>• Pharmacy<br>• Laboratory<br>• Dressing room<br>• Labour room<br>• Sluice room<br>• | 8<br>(1 in each section) |
| | | • Patient toilets (Male and female) | 2<br>(1 in each toilet) |
| | | Staff changing including shower and wash room (male and female) | 2<br>(1 in each toilet) |
| | | Patient toilet for disabled (for both sex) | 1 |

[1] WHO Guidelines on Hand Hygiene Health Care (WHO, 2009)

| S/ N | HCF level | Location of hand washing facility in the HF | Number of hand washing basins |
|---|---|---|---|
| 2 | Health Centre | 2 ODP consultation rooms, Laboratory, Dressing room, Injection room, Labour room, Eye care, Dental section, RCH section, CTC, Mortuary, Pharmacy and Sluice room | 13 (1 per each section or room) |
| | | Inpatient department (male and female) | 2 (1 per each ward) |
| | | Public toilets (male and female) for normal people | 2 (1 per each toilet) |
| | | Public toilets (male and female) for disabled | 2 (1 per each toilet) |
| | | Staff changing including shower and wash room (male and female) | 2 (1 per each toilet) |
| 3 | Hospital | OPD consultation rooms, Laboratory, Dressing room, Injection room, Labour room, Eye care, Dental section, RCH section, CTC, Theater, Nutrition room, Mental Health (psychiatric) section, Central sterilization and supplies room, Pharmacy, Mortuary and sluice room | Minimum: 19<br>Maximum: 19+ depending number OPD rooms for clinicians<br>(1 per each section/ room) |
| | | • Inpatient department (male and female)<br>• Internal medicine<br>• Surgical ward<br>• Obsy/Gyne ward<br>• Paediatric ward | 6 (2 per each) |
| | | • Patient toilets (Male and female) | 2 (1 per each toilet) |
| | | • Labour ward | 1 |
| | | • Catering area | 2 |
| | | • Patient toilet for disabled | 1 (for both sex) |

| S/ N | HCF level | Location of hand washing facility in the HF | Number of hand washing basins |
|---|---|---|---|
| | | Staff changing including shower and wash room (male and female) of labour ward, internal medicine, Obsy/Gyne, paediatric, OPD and surgical ward | 9<br>(1 Hand washing per each changing room should be provided adjacent to WC) |
| 4 | Referral Hospitals | OPD consultation rooms, laboratory, dressing room, injection room, labour room, eye care, dental section, RCH section, CTC, Theater, Nutrition room, Mental Health (psychiatric) section, Central sterilization and supplies room, Pharmacy, Mortuary and Sluice room | Minimum: 20<br>Maximum: 20+ depending number OPD rooms for clinicians (1 per each section/ room) |
| | | • Inpatient department (male and female)<br>• Internal medicine<br>• Surgical ward<br>• Obsytetrics/Gynaecology ward<br>• TB ward<br>• Postnatal ward | 9 |
| | | • Patient toilets (Male and female) | 2<br>(1 per each toilet) |
| | | • Patient toilet for disabled (male and female) | 2<br>(1 per each toilet) |
| | | • Labour ward | 1 |
| | | • Neonatal ward,<br>• Intensive Care Unit (ICU) | 1 (for Neonatal)<br>1+ (for ICU) |
| | | Catering | 2 |
| | | Staff changing including shower and wash room (male and female) of OPD section, Labour ward, Internal medicine, Obsy/ gyne, paediatric, TB ward, Postnatal ward and surgical ward | 12<br>(1 Hand washing per each changing room should be provided adjacent to WC) |
| | | Administration (Facility in charge, Matron and Patron) | 3 (1 for each room) |

**Table 13. Hand washing specifications for specialized/ consultant hospitals**

| Provisions | Location (Directorate/ Department/section) | No. of hand washing basins |
|---|---|---|
| • Hand washing basin<br>• Soap/ detergent dispenser<br>• Hand drying equipment or drying material<br>• Waste bin<br>• Soap/<br>• detergents<br>• Sanitizers<br>• Water supply<br>• SOP for hand washing | **MEDICAL SERVICES DIRECTORATE** | |
| | **OPD** | |
| | • Causality/ Emergency | 18 |
| | • ICU critical | 13 |
| | • Referral | 8 |
| | • NHIF | 8 |
| | • Internal medicine | 19 |
| | • CTC services (TB/HIV) | 2 |
| | • Pediatric clinic | 12 |
| | • Physiotherapy | 4 |
| | • Psychiatric clinic | 6 |
| | • Staff washroom/ bathroom (male and female) | 2 |
| | • OPD pharmacy | 1 |
| | • Cardiovascular centre | |
| | • Super specialty services | 21 |
| | • General medicine | 15 |
| | • Nutrition centre | 1 |
| | • Phlebotomy room | 1 |
| | **SURGICAL SERVICES DIRECTORATE** | 16 |
| | • 8 Surgical wards + 8 washrooms | |
| | • 2 staff bathroom/wash room (male/ female) | 2 |
| | • Emergency medicine theatre | 6 (2: theatre, 4: office) |
| | • ENT Clinic (with 3 offices) | 3 |
| | **Oral Health Clinic** | |
| | • Radiograph | 1 |
| | • Dental room | 2 |
| | • Specialist room | 4 |
| | **OPD Eye Clinic** | |
| | • Ophthalmologist room | 4 |
| | • Other offices | 4 |
| | **Anaesthesia services** | |
| | • 7 Service rooms | 7 |
| | **NURSING SERVICES DIRECTORATE** | |
| | **Block 1 (Wards and services)** | |
| | • 8 Wards with 8 offices | 16 |
| | • 8 bathroom/washroom (patients) + 2 | 10 |

| Provisions | Location (Directorate/ Department/section) | No. of hand washing basins |
|---|---|---|
| | disabled (male and female) | |
| | • 2 staff bathroom/ washroom (male and female) | 2 |
| | • Clinic | 1 |
| | **Block 2 (Wards and services)** | |
| | • 8 Wards with 8 offices | 16 |
| | • 8 bathroom/washroom (patients) + 2 disabled (male and female) | 10 |
| | • 2 staff bathroom/ washroom (male and female) | 2 |
| | **Block 3 (Wards and services)** | |
| | • 6 Wards with 6 offices | 12 |
| | • 6 bathroom/washroom (patients) + 2 disabled (male and female) | 8 |
| | • 2 staff bathroom/ washroom/ cloak room (male and female) | 2 |
| | **Psychiatric Block (wards and services)** | |
| | • 2 wards (male and female) with 2 attached staff rooms + 2 bathrooms/ washroom | 6 |
| | • Acute ward with a staff room +2 bathrooms/ washroom (male and female) | 4 |
| | • IPPM ward with a staff room +2 bathrooms/ washroom (male and female) | |
| | • Clinic with staff office +2 bathrooms/ washroom (male and female) | 4 |
| | • 2 staff bathroom/ washroom/cloak room (male and female) | 2 |
| | **Emergency Medicine Block** | |
| | • 4 Resuscitation room | 4 |
| | • 7 Treatment room | 7 |
| | • Triage room | 1 |
| | • 2 staff bathroom/ washroom/cloak room (male and female) | 2 |
| | • 2 patient bathroom/washroom (male and female) | 2 |
| | **Paediatric Complex block** | |
| | • Wards, Theatre, all other internal medicine rooms | 17 |
| | • Patients bathroom/washroom (male/ female) | 2 |
| | • Staff bathroom/washroom (male/ female) | 2 |

| Provisions | Location (Directorate/ Department/section) | No. of hand washing basins |
|---|---|---|
| | **Maternity Block** | |
| | • 7 Wards with and 7 staff offices | 14 |
| | • 7 Patient bathroom/washroom | 7 |
| | • 2 Staff bathroom/ bathroom (male/ female) | 2 |
| | **Obstetric theatre (rooms)** | |
| | • OP room 1 and 2 | |
| | • Receiving and Recovery rooms | 2 |
| | • Staff bath/wash/changing room (male/ female) | 2 |
| | **Main theatre (rooms/sections)** | |
| | • Operating room | 1 |
| | • Receiving, recovery and packing rooms | 3 |
| | • Staff bath/wash/changing room (male/ female) | 2 |
| | **Emergency theatre** | |
| | • Operating room | 1 |
| | • Receiving, recovery and packing rooms | 3 |
| | • Staff bath/wash/changing room (male/ female) | 2 |
| | **Intensive care unit (sections/ rooms**) | |
| | • 60 rooms for running clinic | |
| | • 1 APCU and 4 ICU | 5 |
| | **Catering services** | |
| | • Dining room, kitchen area, staff shower/cloak/toilet | 3 |
| | **CLINICAL SUPPORT SERVICES DIRECTORATE** | |
| | • Haematology | 1 |
| | • Microbiology/ immunology | 1 |
| | • Parasitology/ Entomology | 1 |
| | • Clinical chemistry | 1 |
| | • Histopathology/ Cytology | 1 |
| | • Mortuary | 1 |
| | • Administrative pathologist | 1 |
| | • Radiology (X-ray, ultrasound) | 1 |
| | • Special X-ray | 1 |
| | • Infusion | 1 |
| | • Pharmacy | 2 |

### 10.4. Bathroom Hygiene

Bathrooms are important infrastructures for controlling and reducing transmission of diseases from workers who handling patients. To improve hygiene practices within HCFs it is necessary to have adequate showers with respect to the level of bed capacities and staffing levels**.** In accordance with WHO, 2012 guidelines the minimum requirements of bathrooms for each level of HCF are provided in Tables 14, 15 and 16.

Whatever level of facility, installation or construction of bathrooms should follow minimum standard guidelines which will include:

- There should be separate bathrooms for HCWs and patients clearly labelled to identify the type of users and sex
- Bathrooms should have well drained floor
- A standard bathroom should have a minimum surface area of 3.25$m^2$
- The ratio of patient per bathroom should be 1:6
- Patient bathrooms should be furnished with wall mounted seat
- Shower facilities should have mixture taps for both cold and hot water
- Bathrooms should be provided with functional emergency alarm call system
- There should be a Free room for wheelchair manoeuvring among hygienic elements
- Each bathroom should have good lighting for extra patient safety

**Table 14 Dispensaries and health centres bathrooms**

| S/N | Level of health facility | Provisions | Location | Description (Number/ User) | Specifications as per user | |
|---|---|---|---|---|---|---|
| | | | | | Urban | Rural |
| 1 | Dispensary | Shower<br>Soap dish<br>Towel/ cloth Hanger<br>Water supply<br>Materials walls<br>Adequate room size<br>Water heater<br>Gall trap<br>Sitting facility<br>Detergents | Delivery room | 1 (for delivering mothers) | • Shower: **Hand shower**<br>• Shower tap: **Mix tap -cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Sitting chair: **bed like (flexible) with smooth washable materials**<br>• Water heater: **Electrical heater**<br>• Wall/ floor materials: **Tiles** | • Shower: **Hand shower or clean bucket and small jack**<br>• Shower tap: **Mix tap –cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Sitting chair: **bed like (flexible) with smooth washable materials**<br>• Water heater: **Electrical heater/ Cooker**<br>• Wall/ floor materials: **Tiles/ cement** |

| S/N | Level of health facility | Provisions | Location | Description (Number/ User) | Specifications as per user | |
|---|---|---|---|---|---|---|
| | | | | | Urban | Rural |
| 2 | Health Centre | Shower<br>Soap dish<br>Towel/ cloth Hanger<br>Water supply<br>Materials walls<br>Adequate room size<br>Water heater<br>Gall trap<br>Sitting facility<br>Detergents | Delivery room (Sluice room) | 1 (for delivering mothers) | • Shower: **Hand shower**<br>• Shower tap: **Mix tap- cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Chair: **bed like (movable and flexible) with smooth washable materials**<br>• Water heater: **Electrical heater**<br>• Wall/ floor materials: **Tiles** | • Shower: **Hand shower or clean bucket and small jack**<br>• Shower tap: **Mix tap - cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Chair: **bed like (movable and flexible) with smooth washable materials**<br>• Water heater: **Electrical heater/ Cooker**<br>• Wall/floor materials: **Tiles/ cement** |

| S/N | Level of health facility | Provisions | Location | Description (Number/ User) | Specifications as per user | |
|---|---|---|---|---|---|---|
| | | | | | Urban | Rural |
| | | | Cloak room | 4 (For staffs, 2-male, 2-female) | • Shower: **Overhead shower**<br>• Shower tap: **Mix tap -cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Water heater: **Electrical heater**<br>• Wall/ floor materials: **Tiles** | • Shower: **Overhead shower**<br>• Shower tap: **Mix tap -cold/ hot water** Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Water heater: **Electrical heater/ Cooker**<br>• Wall/ floor materials: **Tiles/ cement** |

| S/N | Level of health facility | Provisions | Location | Description (Number/ User) | Specifications as per user | |
|---|---|---|---|---|---|---|
| | | | | | **Urban** | **Rural** |
| | | | Inpatient department (male and female wards) | For patients<br><br>4 (2- male, 2-female) | • Shower:<br>• **Overhead shower**<br>• **Hand shower (**for disabled**)**<br>• Shower tap: Shower tap: **Mix tap -cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Chair: **Movable, with smooth washable materials**<br>• Water heater: **Electrical heater**<br>• Wall/ floor materials: **Tiles** | • Shower:<br>• **Overhead shower**<br>• **Hand shower (**for disabled**)**<br>• Shower tap: **Mix tap -cold/ hot water**<br>• Soap dish: **Plastic**<br>• Hanger: **Stainless steel**<br>• Room size:<br>• **Width 150 cm**<br>• **Length 200cm**<br>• Water quality:<br>• **Adequate, meet WHO standards**<br>• Gall trap: **Plastic at the bath floor**<br>• Chair: **Movable, with smooth washable materials**<br>• Water heater: **Electrical heater/ Cooker**<br>• Wall/ floor materials: **Tiles/ cement** |

**Table 15. District and referral hospitals bathrooms**

| S/N | Level of health facility | Provision | Location | Description (Number/ User) |
|---|---|---|---|---|
| 3 | Hospital | • Shower<br>• Soap dish<br>• Towel/ cloth Hanger<br>• Water supply<br>• Materials walls<br>• Adequate room size<br>• Water heater<br>• Gall trap<br>• Sitting facility<br>• Detergents | • Delivery room (Sluice room) | 1 (for delivering mothers) |
| | | | • Cloak room | For staffs 4 (2- male, 2- female) |
| | | | • Inpatient department (male and female wards)<br>• Internal medicine<br>• Obsy/ Gyne<br>• Surgical | For patients 12 (2- male, 2- female for each ward) |
| 4 | Referral Hospital | • Shower<br>• Soap dish<br>• Towel/ cloth Hanger<br>• Water supply<br>• Materials walls<br>• Adequate room size<br>• Water heater<br>• Gall trap<br>• Sitting facility<br>• Detergents | • Delivery room (Sluice room) | 1 (for delivering mothers) |
| | | | • Cloak room | For staffs 4 (2- male, 2- female) |
| | | | • Inpatient department (male / female wards)<br>• Internal medicine<br>• Obsy/ Gyne<br>• Surgical<br>• TB ward<br>• Postnatal ward<br>• Mental health | For patients 17 (2- male, 2- female for each ward) |

**Table 16. Bathroom for specialized hospitals and consultant hospitals**

| Provisions/Structure | Location | |
|---|---|---|
| | **Directorate** | **Departments/ Sections** |
| • Shower<br>• Soap dish<br>• Towel/ cloth hanger<br>• Water supply<br>• Materials walls/ floors<br>• Adequate room size<br>• Water heater<br>• Gall trap<br>• Sitting facility<br>• Detergents | MEDICAL SERVICES DIRECTORATE | **OPD** |
| | | • Staff bathroom |
| | | • Patients bathroom |
| | | • Disabled patient's bathroom |
| | | • Staff bathroom |
| | NURSING SERVICES DIRECTORATE | **Block 1 Wards** |
| | | • Patients bathroom |
| | | • Disabled patient's bathroom |
| | | • Staff bathroom |
| | | **Block 2** |
| | | • Patients bathroom |
| | | • Disabled patient's bathroom |
| | | • Staff bathroom |
| | | **Block 3** |
| | | • Patients bathroom |
| | | • Disabled patient's bathroom |
| | | • Staff bathroom |
| | | **Psychiatric Block** |
| | | • Patients bathroom (male/ female |
| | | • Acute ward bathroom |
| | | • IPPM ward bathroom |
| | | • Staff bathroom of psychiatric block |
| | | **Emergency Block** |
| | | • Staff bathroom |
| | | • Patients bathroom |
| | | **Pediatric complex Block** |
| | | • Staff bathroom |
| | | **Maternity block** |
| | | • Staff bathroom |
| | | • Patients bathroom |
| | SURGICAL | **Main theatre (rooms/sections)** |

| Provisions/Structure | Location | |
|---|---|---|
| | **Directorate** | **Departments/ Sections** |
| | SERVICES DIRECTORATE | • Staff bathroom |
| | | **Emergency theatre** |
| | | • Staff bathroom |
| | | **ICU** |
| | | • Bathrooms of 60 units |
| | CLINICAL SERVICES SUPPORT DIRECTORATE | **Catering services** |
| | | • Bathroom for male and female |
| | | • Bathroom for staff of clinical service support sections |
| | | • Bathroom for staff of mortuary and pathologist |

### 10.5. Laundry Services in Health Facilities

HCFs soiled linen harbours pathogenic microorganisms hence the risk of actual disease transmission from soiled linen is inevitable. HF laundries should be well designed with good drainage system easy to clean and must conform to standards and procedures for HCWM and hence must have the following minimum qualities.

#### 10.5.1. Structure, design and layout of HF laundry facilities

The following criteria should be considered in designing and layout of laundry structures in a health care setting:

- If laundry is built in a multi storey building, linen and laundry services should be located on the ground floor.
- The area to be used must be specifically designated as a laundry and no other activities must be carried out in the same premises.
- The laundry room should not be used for eating or smoking.
- The laundry must not be located in a site which is directly accessible to the kitchen.
- The design of the laundry must facilitate the creation of dirty and clean areas to prevent cross contamination.
- The llaundry should be provided with separate areas for receiving and sorting washing linen
- There should be areas for ironing, folding, repair and storage of clean linen within the laundry facility
- An area for ironing and folding must be allowed for, and adjacent to the clean area.

- The walls and floor should be impervious and properly sealed.
- An industrial drier and washing machine with a sluice and disinfection cycle must be available.
- The tumble drier should be provided and vented externally.
- A separate hand hygiene sink for staff with wall mounted dispensers for soap and paper towels should be provided.
- In the laundry setting plastic fluid repellent aprons and household gloves must be provided.
- Appropriate protective clothing must be worn as required.
- There shall be adequate washing facilities for each HF. Hospitals and health centres must have washing machines. For dispensaries a washing slab may be constructed within the facility premises but must have drainage.
- All health facilities shall have a washing machine
- Linen will be separated according to the department
- There shall be a separate area for drying washed linen
- Where linen management is outsourced, there must be a close supervision by the designated HCWM officer
- All workers at the laundry will be vaccinated against hepatitis B
- There should be changing room for staff
- Adequate ventilation, lighting (both natural and artificial)
- Laundry layout must provide for adequate and safe activity flow. It should provide for a separate entry of contaminated linen and exit of clean linen,
- Washable smooth walls, edges, corners and projections with glazed ceramic tiles must be fixed up to 8 inches height.
- The laundry room should have a smooth ceiling, washable surface and high enough to allow installation and repair.
- The door to the laundry room should be wide enough to admit heavy machinery and trolleys.

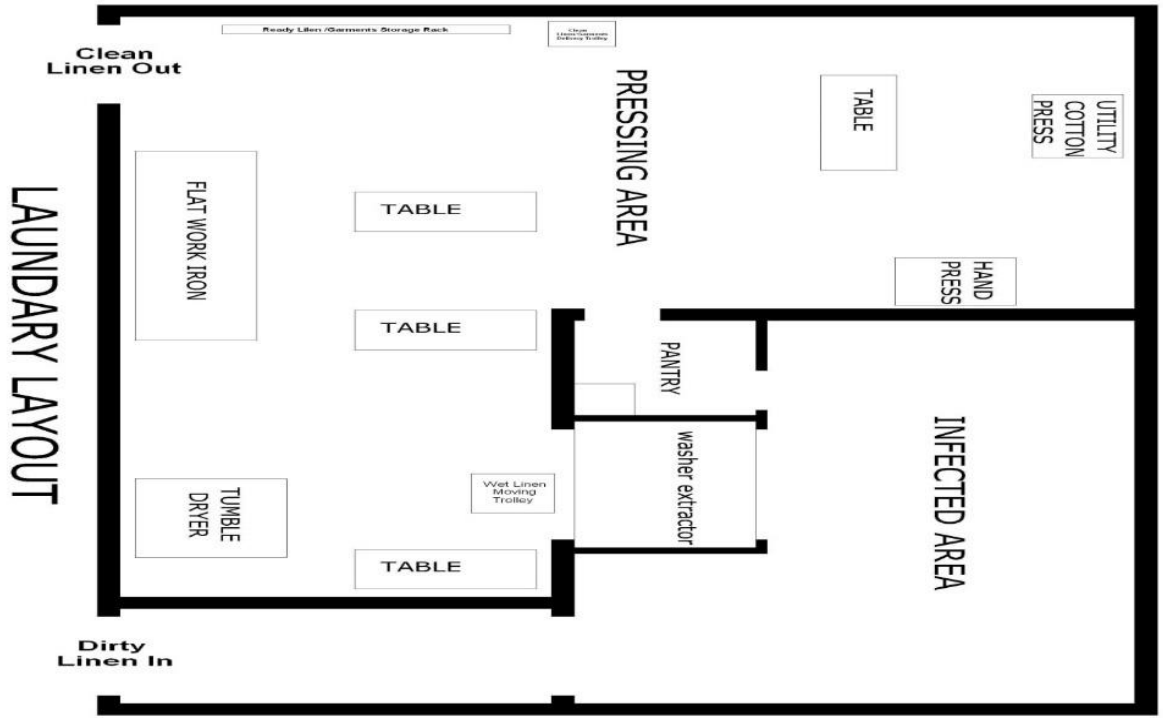



**Figure 9 : An example of Layout design of hospital laundry**

### 10.5.2. Laundry Personnel

- The laundry manager shall have appropriate knowledge of the potential infectious hazards of soiled linen
- Provide regular information to laundry staff about potential infectious hazards and techniques to prevent the spread of micro-organisms in the environment to finished linen and to themselves, as well as safe and appropriate handling procedures for soiled and clean linen.
- An orientation/training module designed for the laundry staff is to be implemented in the facility as part of infection prevention and control training.
- The key staff members are fully trained in appropriate laundry skills and technology; those skills should be maintained by ongoing training and supervision; only appropriately trained personnel handle and store chemicals.
- Instruction to staff in personal hygiene, particularly the need for hand washing after handling soiled linen or removal of protective clothing.
- other laundry personnel include; Senior housekeeper Dhobi Sweeper (Part time) Tailor (part time Housekeeper as Optional
- All personnel must have a medical record kept upon employment. The record should contain the following,
  - Presence or absence of symptoms attributable to, and past history of tuberculosis, viral hepatitis, mumps, measles, rubella, sexually-transmitted infections.

— Complete physical examination

- Periodic evaluations may be done as indicated for job reassignment, for ongoing programs or for evaluation of work-related problems.
- The staff needs to report all infections such as gastroenteritis, dermatitis, pustules, skin lesions and boils and seek immediate medical attention.
- Occupational exposures including needle stick injuries should be immediately reported to the supervisor and/or to the Infection Prevention and Control officer of the facility. A sharps container should be available in the sorting and wash area. Occupational exposures protocol should be available.
- Immunization requirements for linen and laundry personnel are based on the immunization recommendations i.e. hepatitis B

### 10.5.3. Specifications of required laundry services in HFs

The recommended specifications for laundry services in each category of HF are presented in Table 8.7. However, **i**t should be noted that the size of the laundry facility will depend on the number of beds in the HF. The normal standard is that one patient requires 2.5kg of linen per day.

**Table 17. Specifications for laundry services in different levels of HFs**

| S/N | HCF categories/ Levels | Provisions/structures | Specifications |
|---|---|---|---|
| 1 | Consultant hospitals | Quality water, soap, washer extractor, dryer, sinks, folding table diapers, mop heads, cleaning rags and supplies. | 8,400sqft for 570 beds.<br>1patient require 2.5kg of linen per day (e.g. for national hospital of 4,000 beds the space required is 58,947sqft) |
| 2 | Regional and district hospitals | Quality water, soap Washer extractor, dryer, sinks, folding table diapers, mop heads, cleaning rags and supplies. | 8,400sqft for 570 beds. |
| 3 | Health centre | Quality water, soap Washer extractor, dryer, sinks, folding table diapers, mop heads, cleaning rags and supplies. | 8,400sqft for 570 beds. |
| 4 | Dispensary | Quality water, soap washer extractor, dryer, sinks, folding table diapers, mop heads, cleaning rags and supplies. | 8,400sqft for 570 beds. |

### 10.5.4. Planned Preventive and Maintenance (PPM) of a Laundry Facility

Simple preventative maintenance practices on washer-extractors and tumble dyers, helps to extend the life of the equipment. Hence, it is important that the following preventive practices should be done as recommended:

- There should be a working schedule for daily, weekly and monthly laundry cleanliness
- Develop a laundry monthly assessment tool to determine any damage of the laundry facility and plan for replacements and repair.
- Staffs working in laundry are advised to wipe down the door seals at least once a day to make sure they are dry and clean.
- Each day laundry staffs have to check all visible hoses, paying close attention to the water inlet valve hose connection on the machine's backside as well as any chemical connections.
- The lint compartment and screen are to be cleaned on a daily basis. Doing so will allow electrical components to blow, maintaining proper airflow and avoiding overheating.
- It is important for staff to check the cylinder daily for such debris to avoid damage to the linens and the equipment.
- It is also important to wipe down the outside surfaces of both washer-extractors and tumble dryers each day.

### 10.6. Processing Linen

Laundry service is responsible for providing an adequate, clean and constant supply of linen to all users. The basic tasks include: sorting, washing, extracting, drying, ironing, folding, mending storage and delivery.

#### 10.6.1. Sorting of Linen from the wards or section

- Soiled, used or contaminated linen must be categorized before sent to the taken to the Laundry.
- Do not rinse or sort linen in patient care areas (sort in appropriate area
- Each ward or section area must have three colour coded bucket with cover or hamper or plastic bag for keeping the linen. For example; Red colour for highly infectious, Yellow for Infectious and Black colour for Non-Infectious
- All used linen must be removed from the wards or area of use within 24hrs.

**Please note: Soiled linen should be rinsed and then decontaminated** with hospital-approved disinfectant, before transporting to the Laundry i.e. 0.05% of chlorine for 20 minutes.

#### 10.6.2. Transportation of Linen

- Transportation from laundry to hospital should be in a cleaned vehicle with the linen on covered trolleys or in bags.

- Linen and clean linen should be transported in different trolleys, bins, bags or other transport means, including vans or other motor vehicles. If this is not practicable, then trolleys, bins, bags or other transport means that were used to transport soiled linen should be thoroughly cleaned/rinsed and decontaminated with hospital-approved disinfectant and dried before being used for transporting cleaned linen.
- Bags containing soiled linen should be handled carefully to avoid damage and the release of possible contaminated aerosols into the air.
- In addition, workers should not carry wet, soiled linen close to their bodies even if they are wearing a plastic or rubber apron.

### 10.6.3. Unloading and storage of soiled linen at laundry premises

- Sharps objects and other items such as incontinence wear should not be inadvertently discarded into laundry bags
- Soiled linen when unloaded shall be stored in an area separated by a barrier wall, from that where cleaned linen is stored or dispatched.
- Soiled linen shall be processed for washing within 24 hours.
  - Linen must be handled with care to prevent contamination of your uniform /clothes, equipment and environment. Segregate as follows:

**Table 18. Segregation of linen**

| **SAFE HANDLING OF USED LINEN** | |
|---|---|
| ***Which bag would you use for this?*** | |
| **Bag colour** | Linen type |
| **YELLOW** | For infectious linen |
| **RED** | Highly infectious linen: Fouled (soiled with blood or body fluids) infectious, isolation and cytotoxic (attach a cytotoxic label) |
| **BLACK** | Non-infectious linen i.e. kitchen linen |

- Sorting of soiled linen for washing is one of the most important operations in the linen process.
- Sorting shall be according to soil quantity and nature of the linen and segregation according to Highly infectious, Infectious and non- infectious
- Check if the process of inspecting and removing foreign, and, in some cases dangerous, objects (e.g., sharps or broken glass), from soiled linen before washing.
- This step is extremely important because soiled linen from the operating room or clinic occasionally contains sharps (e.g., scalpels, sharp-tipped scissors, hypodermic and suture needles and towel clips).

### 10.6.4. Laundering the linen

**Pre- Washing of Linen**

Linen which is heavily soiled with blood or other body fluids, or other fluids must be rinsed with clean water dissected with appropriate dissecting before placing to the machine

**Thermal disinfection**

- Soiled linen that is to be thermally disinfected shall be washed so that the temperature of the load is maintained at a minimum of 70°C for not less than 25 minutes or 90°C for 10 minutes ( WHO, 2002).
- It is known that 60°C for 30 minutes kills HIV, 70°C for 10 minutes kills vegetative microorganisms and 98°C for 2 minutes kills the Hepatitis B virus.
- If the thermal stability of the soiled linen is such that temperatures above 71°C are permissible, the time for disinfection may be appropriately reduced.
- The loads used in the machines should be as specified by the manufacturers' recommendations. The proper function of the machines such as the time and temperature of cycles should be checked regularly with calibrated instruments.
- Any sensing elements should be placed so that they measure the actual wash temperature (i.e., the temperature of the water in contact with the load).
- As it will take time for heat to penetrate the load, an allowance for mixing time and load level shall be made to ensure that the load is maintained at the correct temperature for the minimum time period.
- For low loading 4 minutes shall be allowed, and for high loading 8 minutes. The minimum time/temperature combinations are therefore—
  - 70°C maintained for not less than 25 minutes; minimum cycle time 14 minutes for low loading or 18 minutes for high loading; or
  - 71°C maintained for not less than 3 minutes; minimum cycle time 7 minutes for low loading or 11 minutes for high loading.
- Steam or Gas may be used as heating elements.

**Chemical disinfection**

- Soiled linen that is heat sensitive and cannot be thermally disinfected shall be washed using a wash cycle and appropriate chemicals registered with the Tanzania Food and Drug Administration
- Wash used linen (sheets, cotton blankets) in hot water (70°C to 80°C) for 3 minutes and detergent, rinse and dry preferably in a dryer or in the sun.
- Heavy-duty washers/dryers are recommended for the hospital laundry.

**Radioactive and radiation contaminated Linen**

- Linen contaminated with radiation or any radioactive material shall be handled, stored, transported, or otherwise disposed of in accordance with the laws,

standards and implementing rules and regulations according Tanzania Atomic Energy Commission (TAEC )

- Some textile items (e.g., surgical drapes and reusable gowns) must be sterilized before use and therefore require steam autoclaving after laundering.
- Use hygienically clean linen (i.e., laundered but not sterilized) in Neonatal Intensive Care units.
- Burn unit linen need not be sterilized (unless specified by institution-specific policy) but should at least be hygienically clean.

**Hand Washing Linen**

**Step 1:** Decontaminate linen in 0.05 chlorine solutions for 20 minutes to aid cleaning and bactericidal action. This should be done after rinsing to remove the blood, faeces, and vomitus

**Step 2:** Use warm water, Wash heavily soiled linen separately from non-soiled linen

**Step 3:** Wash the entire item in water with liquid soap to remove all soils, even if not visible. Add soap (a mild acid agent) to prevent yellowing of linen, if desirable.

**Step 4:** Check the item for cleanliness. Rewash if it is dirty or stained.

**Step 5:** Rinse the item with clean water.

**Detergent for hand washing linen**

- Alkali – for soil removal and suspension
- Liquid surfactant or detergent – for removal of soil and prevents re- soilage
- Chlorine bleach/peroxide bleach – for disinfection and whitening
- Neutralizer – for souring/neutralizing after bleaching
- Fabric softener (optional)

**The recommended wash cycle is as follows:**

- Pre-wash
  - Wetting (flushing)
  - Pre-wash 1 (alkali)
  - Prewash 2 (rinsing)
- Main wash (using detergent or surfactant) with minimum temperature and wash time (see thermal requirements)

  Rinsing cycle:
  - Rinse 1 (with bleach)
  - Rinse 2 (water)
  - Rinse 3 (neutralizer and/or fabric softener)
- Water Extraction
- Separation

- Drying
- Tumble drying is preferred over other methods

**Please note:** Decontamination prior to washing is **not necessary,** unless linen is heavily soiled and will be hand washed (*note: repeat soaking of linen in chlorine, even dilute solutions, will cause the fabric to deteriorate more quickly*). The washing process should have a disinfection cycle in which the temperature in the load is either maintained at 65oC for at least ten minutes or 71oC for at least 3 minutes.

### 10.6.5. Storage of Clean Linen

It is highly recommended that healthcare facilities shall maintain at least 3 parts stock level: 1 set in use, 1 set in the laundry, 1 set as reserve stock. Cleaned linen should be stored in a clean, dry place in a manner that—

- is distinctly separated from soiled linen;
- Prevents contamination (e.g. by aerosols, dust, moisture and vermin); and allows stock rotation, so that the oldest stock may be used first.
- Laundered linen should be stored on non-porous, clean shelves and, if necessary, wrapped in a protective covering.
- Unused linen shall be reprocessed after 3 months.
- Packing and delivery

Depending on the size of the delivery and the nature of the items to be delivered, cleaned linen which is to be returned to the client should be packed (either loose or tied in bundles) into clean trolleys, bins, baskets and covered to prevent soilage; or clean bags and securely fastened.

- Clean linen should be stored in closed cupboards, dedicated covered trolleys or designated covered storage areas with:
- good ventilation
- adequate lighting
- Washed linen is placed in clean containers or on clean surfaces.
- Carts, marked trolleys or other leak proof containers are cleaned before taking clean linen back to the wards.
- Clean linen is covered or wrapped during transportation.

## 11.0. Food Hygiene for Ward/Unit Kitchens Procedure

This procedure should be read in conjunction with the following procedure:

### 11.1. Introduction

- It is essential that food and drink provided in a healthcare environment is handled and managed in such a way that it does not pose any risk to both patients and staff.
- All staff involved in the food chain must ensure good food hygiene practices at all times. Failure to do so could result in a serious outbreak of food poisoning and potential loss of life.
- The serving of food is an important part of the food chain when considering the prevention of food poisoning. It is here that good food hygiene practices including adherence to temperature and time controls is essential.
- Sources of Bacteria which may cause food poisoning include: People; i.e. food handlers, Raw food; Pests, e.g. insects, rodents, cats and birds; Refuse and waste food

### 11.2. Ward/Unit Kitchens

- The design of a kitchen area should provide the minimum practicable equipment necessary for the satisfactory operation of the area;
- This will reflect the nature of activities to be carried out;
- All internal finishes must be intact and capable of being cleaned;
- All food preparation surfaces must be smooth, impervious, easy to clean and durable;
- Splash backs should be provided to the rear of sinks, work surfaces and hand wash, basins;
- A lidded waste bin for the disposal of kitchen waste;
- Any equipment which does not stand on work surfaces should be mobile or wall mounted to facilitate cleaning;
- A supply of drinking water should be provided to the sink. This supply should be marked ‘Drinking water’;
- Every kitchen should display a notice which clearly sets out the following key information;
- The name of the unit manager who is responsible for the maintenance of food hygiene standards in the area;
- Who is allowed to use the area;
- What activities are permitted in the area;
- The cleaning tasks within the area together with a clear statement of who is responsible for their satisfactory completion.

### 11.2.1. Regeneration Points (where relevant)

The siting of regeneration points needs to be carefully considered. If not sited in the main kitchen, it should not be next to toilets, bathrooms or dirty utility rooms or other sources of contamination.

The regeneration area must have the following facilities:

- A hand wash basin with splash backs, complete with soap dispenser and paper hand towels;
- The area must be ventilated;
- Cleanable/impervious wall surfaces must be provided;
- A non- slip easy to clean floor must be provided;
- Foot operated waste bin;
- Electrical supply.

## 11.3. Personal Hygiene

- Always wash your hands before touching food and after using the toilet. Nails must be kept short;
- Hand wash basins must be provided with hot and cold running water, liquid soap and paper towels and not be used for any purpose other than hand washing. Access to the hand wash basin must be kept clear at all times;
- Smoking in any kitchen, food storage area or whilst delivering or receiving food is prohibited by law;
- Disposable aprons must be worn during the serving of meals, clean clothing is essential;
- Cuts and sores on hands must be covered with a clean waterproof high visibility plaster;
- Staff must not handle food if they have even minor infectious conditions, especially those with any form of skin sepsis or gastro-intestinal upset.

## 11.4. Clean as you go in Food areas Guidelines

All ward kitchens and refrigerators are bound by legal requirements and therefore must conform to Food Hygiene Regulations.

- The Local Authority Environmental Health Officer has open access to the Trust and can inspect these areas at any time.

### 11.4.1. Refrigerators

- Refrigerators must be maintained at a temperature of 5°C or below and must only be used for short-term storage.
- Contents of the refrigerator should be checked daily and out of date food discarded.

- Perishable food must be kept covered and stored in the refrigerator. Food must be labelled with the individual patient's name and dated with that day's date. Food must be discarded when it reaches its expiry date.
- The temperature must be checked at least once per day and recorded in a log book. Adjustments must be made if the refrigerator temperature is outside the acceptable range (5°C or below). The temperature must be rechecked after a suitable time period to ensure that adjustments have taken effect.
- Blood, drugs and specimens MUST NOT be stored in a kitchen refrigerator and freezers
- Freezers should only be used in areas where there is a clearly defined need.
- Temperatures should be monitored and recorded daily. The operating temperature of the freezer should be below -18°C. If the unit is unable to maintain the required temperature it should be replaced.
- Blood, drugs and cold compresses MUST NOT be stored in the freezer.
- Food should be subject to stock rotation.

### 11.4.2. Dry food

- Dry food must be stored in washable, pest and moisture-proof containers in a clean, dry cupboard or larder, not under the sink.
- Care must be taken to ensure that, breakfast cereals, hot drinks etc. and therapeutic supplement feeds are used in strict rotation, with those closest to their expiry date used first, avoiding over ordering and 'stock piling' of supplies.
- Expiry dates must always be checked before each use. It is illegal to provide patients with food that is out of date.

### 11.4.3. Microwave Ovens

- Microwaves must not be used for reheating patient meals;
- They may also be used to heat drinks and cereals for patients;
- The manufacturer's instructions must be followed at all times in relation to use, cleaning and maintenance.

### 11.4.4. Water Coolers

- These must be installed and used in accordance with the manufacturers' instructions;
- Machines should be plumbed in to a drinking water supply. Machines which require manual filling are not recommended. Ice Making Machines;
- Ice making machines are not recommended within Milton Keynes Community Health Services. If specific teams/services require such provision, it should first be discussed with the IPC team Beverage Trolleys;

- The beverage trolley must be used, cleaned and maintained in accordance with the manufacturers' instructions;
- Milk provided should either be available in individual containers or in minimal quantities;
- Fresh milk that is left out at room temperature should be disposed of after a maximum of one hour;
- Containers/jugs for milk should be thoroughly washed before refilling;
- Where breakfast is served in a buffet style, jams and spreads must be available in individual portions.

### 11.5. Temperature Control

- Ensure that food is served immediately and never reheated. Confirmation that the food has reached the required temperature (above 63ºC) is made using the appropriate temperature probe by kitchen staff;
- Ensure patients eat food promptly;
- If patients are away from the unit at meal time the hot meal must never be retained for longer than 30 minutes. If the patient is likely to be away for longer, then a meal will need to be arranged for them on their return;

**NB. Safety depends on strict control of time and temperature at ALL stages.

### 11.6. Preparation of Supplement Drinks and Food

Patients who have an inadequate calorific intake or require encouragement with their diet, may require supplement drinks to boost their calorific intake; If recommended it is the responsibility of the nursing staff for these to be prepared and distributed in a safe manner that prevents contamination. The following recommendations therefore apply.

**Single fluid cartons**

i) These need not be refrigerated before use if they are in a sealed container. Refer to instructions on packet;
ii) Check that the date on the carton has not expired before opening;
iii) Once the cartons have been opened they should be consumed within 4 hours or refrigerated. They should be labelled with the date and time of opening before placing in the refrigerator;
iv) After 24 hours of refrigeration they must be discarded.

**Powdered Sachets**

i) Before preparing, ensure that hands are washed well and implements used for mixing are clean and dry before use;

ii) Sachets should be mixed according to the manufacturer's instructions with cold freshly drawn tap water, freshly boiled water, or cold milk directly from the refrigerator;

iii) Sachets which have already been opened should not be used;

iv) The preparation of these drinks should be made in the designated kitchen/kitchen area;

v) Once mixed, any drink should be consumed within 4 hours, if not it must be discarded;

vi) No opened packets should be brought in from home.

**Patients/Relatives**

- Patient/relative access must be controlled by the manager;
- Patients/relatives must not be permitted to prepare their own meals in the kitchen;
- When preparation of meals is considered part of a patient's therapy then they must be supervised by a member of staff;
- Patient's own food, where permitted, should be labelled with the patient's name and dated, placed in sealed containers and stored for a maximum of 24 hours or discarded. It should never be re-heated.

**Cleaning**

- All food surfaces and utensils must be thoroughly cleaned after use with clean and safe water (chlorinated water);
- Where possible, crockery, cutlery, water jugs and food containers must be washed in the ward dishwasher, if provided;
- Cleaning equipment and materials for the kitchen must be kept separately from other cleaning equipment. Colour coding of equipment, i.e. cloths must be adhered to;
- Store cleaning chemicals away from food at all times. These should be kept in their original containers and NEVER decanted into other bottles;
- Do not allow refuse to accumulate in kitchens;
- Place in bins/receptacles immediately and empty these frequently.

**Maintenance**

- All faults or defects should be reported to the Facilities and Estates team for that area;
- There should be a regular and planned maintenance programme in place for appropriate equipment e.g. water coolers.

### 11.7. Procedure for Food Poisoning Incidents

This will require careful investigation and the following should be carried out:

i) Isolate symptomatic patients in a single room. Advice must be sought from the QIT or on call microbiologist via switchboard out of normal working hours;

ii) A stool specimen must be provided, even if the patient has vomiting but no diarrhoea i.e. passing normal stool;

iii) If staff are affected they must go off duty and a stool specimen provided via the Occupational Health Department or their own GP;

iv) If food poisoning is confirmed, a full investigation will be carried out by the Catering Manager and the Infection Prevention and Control Department in conjunction with other relevant staff/organisations as required.

**Reporting Illnesses**

- Personal illness MUST be reported because food poisoning bacteria can be carried on/in the body and thereby passed to food;
- Always report diarrhoea and vomiting immediately to your manager and the Occupational Health Department;
- Septic conditions and skin infections must also be reported to your manager and the Occupational Health Department.

**Manager's responsibilities**

Managers need to be aware that the Food Safety Act and the regulations relating to food safety legislation apply to all NHS premises and sites where food services are provided. They apply to all areas where food or dinks are supplied by the Trust for consumption by patients, staff and visitors. The standards of food hygiene require the need to reflect the nature and activities of the food handling activities carried out in the area.

**Guidelines for kitchen services**

- HCF kitchens should be well designed with good drainage system, ventilation, easy to clean and should conform to standards and procedures for running food premises;
- All windows should be screened to control flies and other insects;
- The food store should be clean and free from vectors;
- There should be a separate changing room for male and female kitchen staff;
- There should be adequate hand washing facilities with running water and liquid soap;
- Food handlers should be screened after every six months (medical examination, pre and regular);
- There should be smoke chimney to control air pollution;
- There should be adequate waste bins.

Where kitchen services are outsourced, there is a need for close supervision by designated health officer. Conditions for outsourcing kitchen services should

necessarily include appropriate business registration and license, TFDA registration, and acceptable environmental cleanliness of the business premises.

## 12.0. MORTUARY HYGIENE

Mortuary hygiene includes general cleaning and laundering, disinfection of essential post-mortem/autopsy equipment, functioning refrigerators, availability of formalin, appropriate personal protective equipment, vaccination, accidental exposure to blood or body fluids and Healthcare waste management and washing facilities

### 12.1. General Cleaning and Laundering

This includes cleaning of the different areas such as preparation tables, chairs, lights, doors, cupboards, floors, walls, washing sinks, washrooms and windows. The general cleaning procedures in the mortuary should be as follows:

- Cleaning is carried out every day in the morning hours, after every service or whenever necessary;
- All parts of equipment and furniture that was used to provide mortuary services should be cleaned by using disinfectants mixed with soaps;
- Linen and mackintosh after post-mortem examination should be changed;
- Single use gloves should be worn when handling contaminated re-useable linen and placed in a laundry bag for routine laundering;
- Cleaning equipment such as mop and brushes should be cleaned after use. If they are solid they have to wash and then soak in Chlorine solution 0.05% for 10 minutes and then dried.

#### 12.1.1. Cleaning and disinfection of essential post-mortem/autopsy equipment

When cleaning and disinfecting of essential equipment for post-mortem and autopsy the following aspects should be seriously taken into account:

- Cleaning of instruments must be done in a dedicated sink and not the normal hand washing sink;
- Personal protective equipment preferably heavy utility gloves should be worn while cleaning;
- Instruments used on intact skin may be cleaning and stored in a dry place, but instruments that penetrate the skin must undergo cleaning and sterilization;
- Used items should be removed from their transport containers and sorted out according to the appropriate cleaning method;
- If cleaning cannot be performed immediately, then instruments should be covered in warm water to prevent soils from becoming fixed, which would make cleaning difficult;
- Instruments should be cleaned and then high-level disinfected;
- Disinfectant solutions should be labelled appropriately (with the name, date and dilution strength);

- Chemical disinfection should be used only for items for which sterilization and thermal disinfection are not suitable for example, items unable to be immersed in water (thermal) or unable to withstand high-pressure gradients (sterilization);
- Sufficient and appropriate disinfectant should be 0.5% chlorine solution for routine mortuary work, embalming and post-mortems, then removed and rinsed with distilled water before being dried and stored;
- Chemical disinfectant solutions should be discarded immediately after use;
- The container should have a close-fitting lid.

### 12.1.2. Other essential aspects in maintaining mortuary hygiene

In addition to the above guidelines other critical hygiene practices which each HCF should ensure are properly addressed in the mortuary environment are outlined in Table 19.

**Table 19. Other critical aspects in maintaining mortuary hygiene**

| Aspect | Precautionary measures |
|---|---|
| **Appropriate PPE** | • Mortuary staff and relatives should wear PPE (Gloves, plastic aprons, gowns, protective eye wears, face masks covering mouths and noses, boots) when handling of dead bodies<br>• Personal protective equipment should be removed after handling of the dead body, then wash hands with liquid soap and water immediately<br>• Placement of boots and procedures for discarding or washing of clothing must be clearly designated.<br>• Single use PPE must be disposed of as an infectious waste |
| **Thermal disinfection** | • This should only be done on items that can be fully immersed in water at high temperatures. All items must be fully immersed for the entire time once the water boils.<br>• Additional items must not be added during this boiling stage. |
| **Body storage** | • Bodies should be stored in a functioning refrigerator and must be maintained at a temperature between 2 to $6^0$C<br>• If long-term storage is required, the body should be maintained at approximately -20$^o$C<br>• A body suspected of harbouring infectious diseases, decomposition, trauma or suspicious deaths should be contained within a body bag which is durable and impermeable to body fluids. |
| **Embalming chemicals** | • There should be embalming chemical (formalin) to temporarily prevent decomposition and restore a natural appearance for viewing a body after death |
| **Washing** | • Change rooms with shower facilities must be available in the |

| | |
|---|---|
| **facilities** | mortuary |
| **Vaccination** | • Hepatitis B vaccination should be provided to all mortuary staff |
| **Accidental exposure to blood or body fluids** | • In case of percutaneous injury or mucocutaneous exposure to blood or body fluids of the dead body, the injured or exposed areas should be washed with copious amount of water<br>• All incidents of percutaneous or mucocutaneous exposure should be reported to the supervisor for proper wound care and post-exposure management |
| **Healthcare waste management** | • Items classified as HCW must be handled and disposed of according to HCWM guidelines. |

### 12.1.3. Equipment and Requirements Needed for Keeping the Deceased in Mortuary

The following are supplies for keeping deceased in the mortuary

- Running water;
- Soap/antiseptic;
- Disinfectant;
- Syringes and needles;
- Glycerine Formaldehyde and paper tissues.

The following are equipment needed for keeping deceased in mortuary

- Wheeled trolley;
- Refuse bins and bags;
- Translucent plastic body bags;
- Wall charts/whiteboard/blackboard;
- Morgue refrigerator (cold room).

## 12.2. Procedure Caring the Deceased at Mortuary (Embalming)

- Identifying the deceased:
  - Receives the deceased from the ward to mortuary;
  - Checks if identification tags are in place with correct information;
  - Adhering to principles of respect privacy and dignity;
  - Checks if the deceased is in own nightwear or hospital gown and wrapped with two sheets;
  - Checks if the mortuary pillow is placed under deceased head when transferring to mortuary;
- Embalming the deceased:
  - Transfers the deceased body from the concealment trolley onto the tray;

  - Unties the deceased bandages and sheets;
  - Checks if the deceased body has fluid leakage;
  - Assists in embalming (preserving) the deceased body from decomposing by injecting formalin;
  - Pads all body orifices to prevent fluid leakage;
  - Applies glycerine to the whole body of the deceased to prevent fungal and moulds growth;
  - Wraps the body with clean sheet and in good position;
  - Secures sheet with tape;
  - Ties one tag around the ankle for identification;
  - Wraps the deceased body with the second sheet and fasten securely;
  - Do NOT tie the neck too tight since it will cause facial disfigurement;
  - Folds appropriately to cover the head and feet, ensuring that all limbs are held securely in position;
  - Fixes with bandages and/or safety pins;
  - Tapes the second identification tag to the outside of the sheet (or into clear pocket at head of body bag);
  - Places the deceased in a body bag if there is evidence of fluid leakage;
  - Places the deceased body in the morgue refrigerator and close it properly;
- Adhering to Standard Precautions on IPC;
- Removes PPE e.g. gloves and apron;
- Decontaminates the used equipment;
- Disinfects the trolley/carrier used to transport the deceased body by using disinfectant;
- Documenting deceased particulars;
- Writes the deceased particulars on the whiteboard/chalkboard;

### 12.3. Mortuary Layout

For the purpose of infection prevention and control, the facility must comprise of clean activity areas, transit areas, and dirty activity areas:

**Dirty activity areas include:**

- The post-mortem room;
- The dirty utility room/instrument store;
- The body stores.

**Clean activity areas include:**

- The reception area;
- Waiting room(s);
- Interview/counselling room(s);
- Viewing room(s);

- Bier room(s).

The work-flow should be planned so as to minimize and obviate, where possible, the need for movement of people and materials from potentially dirty activity areas to clean activity areas.

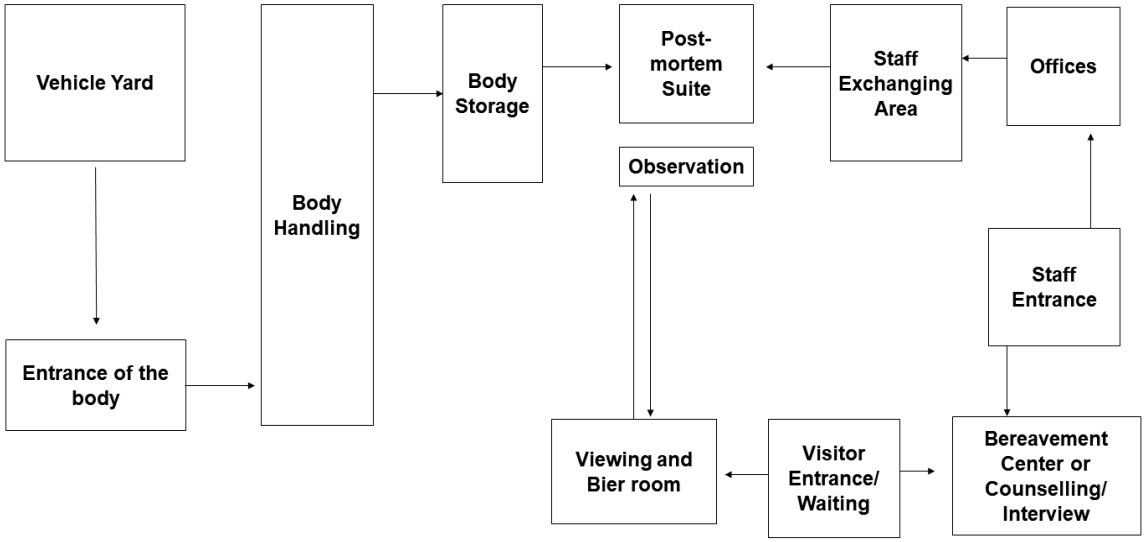



**Figure 10. Layout of Mortuary**

### 12.3.1. Entrance

- The number of entrances will be determined by whether the building is free-standing or linked directly to other hospital buildings;
- If the former, three entrances are required: one for staff, one for the delivery of bodies from the hospital or community (if appropriate) and for collection by undertakers and one for visiting relatives and friends;
- If the latter, the number of entrances required will depend on whether staff, relatives and the arrival of bodies from the hospital share a common approach and then follow separate traffic routes to the individual entrances to the relevant parts of the mortuary, or whether there is direct access from a hospital street to the different parts of the mortuary;
- In either case, an entrance will be needed for collection of bodies by undertakers and, if appropriate, bodies arriving from outside the hospital.

### 12.3.2. Body Viewing room

- This should comprise, at the very least, a separate entrance, a waiting room, an interview/counselling room, access to sanitary facilities, a viewing room and a bier room;

- In the waiting room, interview/counselling room, viewing room and bier room a serene and reassuring environment is desirable.

### 12.3.3. Interviewing Room

- The interview/counselling room should contain comfortable chairs and a small table;
- It may be used by the coroner's officers or mortuary staff to explain findings from PMs or to comfort relatives of the deceased.

### 12.3.4. Viewing Room

- The viewing room should connect both with the waiting room and the bier room. The wall adjacent to the bier room should incorporate a sliding viewing window at a suitable height to allow wheelchair users to touch and view the body;
- The window should be 6 Specific functional and design requirements covered by easily drawn curtains or blinds.

### 12.3.5. Bier Room

- The bier room should adjoin the body handling area and the viewing room. A body to be viewed may be prepared in the body handling area and laid out on a draped bier trolley which will then be wheeled into this room;
- Connecting doors between the two should allow easy, noiseless passage of the trolley, and while viewing is in progress, be kept securely shut;
- Flooring in the bier room should be washable and continuous with that of the body handling area or the connecting link between the two.

****NB:** *Both the viewing room and the bier room should be capable of minor adaptation to suit the needs of all religious beliefs and for devising more appropriate arrangements for viewing bodies of infants.*

### 12.3.6. Body Store and Body Handling Area

**A refrigerated body store is required**

- To maintain bodies and/or fluids in a condition whereby the maximum scientific information can be obtained from a PM and subsequent analytical investigations;
- To limit tissue decomposition while burial or cremation arrangements are being made;
- To hold bodies and the occasional specimen for longer periods in conditions of security.

**Body handling area**

- The body handling area should be adjacent to the PM room and adjoin the bier room;

- Body weighing facilities are required;
- Body weighing may be carried out either on a separate weighing machine or on a trolley which incorporates a weighing mechanism;
- Space is required in the body handling area for parking and manoeuvring trolleys;
- Space is also required for the reception of bodies on trolleys from the hospital;
- the labelling or identification of bodies and entering details in a record book or computer, the placing of shrouds on bodies, the transfer of bodies to the refrigerated body store, the removal and transfer of bodies from the body.

### 12.3.7. Body Storage room

- The body store consists of a number of labelled compartment bays, (refrigerated at approximately 4°C), each containing between three and five racks for holding the body trays upon which bodies are stored;
- Individual compartment bays may either be physically separated from one another or may be open between one another in a continuous run;
  - The former may be used to store radioactive bodies and other high- risk bodies;
  - Compartment bays may either have a door at one end or may be double-ended in the case of pass through fridges; the latter, although more expensive and requiring additional space on the PM room side to allow for the extraction of bodies, are preferable for reasons of hygiene and efficiency;
  - Depending on the size of the installation, a number of the compartment bays should be deep-frozen and an extra wide compartment bay(s) should be provided to accommodate obese bodies.

### 12.3.8. Specification for Post-mortem table/slab

- Post-mortem tables should be easily cleanable and free from traps for potentially infected material;
- Each table should have a hot and cold- water supply and a waste outlet of about 75mm diameter, fitted with a suitable, readily accessible trap and drain pipe;
- They should be fixed to the floor, located over a drain and be supplied with water at low pressure;
- The dissecting bench should have raised edges and slope to a sink(s), which should be deep enough for the washing of organs;
- There should be provision for running water over the bench;

- A sluice is required for the opening of intestines and disposal of contents. A low-pressure water pipe should be provided, preferably in the wall of the sink(s);
- A standing waste bin is required and a filter trap is necessary

## 12.4. Preparation of Deceased for Post-Mortem

### 12.4.1. Equipment and Supplies Needed for Post-Mortem

- Metal ruler;
- Dissecting kit:
  - Dissection knife;
  - Strong forceps;
  - Two scalpel handles (one for cutting, one for burning organ surfaces before taking a microbiology sample);
  - Stout scissors (for cutting bones) and fine scissors for dissection;
- Handsaw;
- Lab supplies;
- Syringes and needles to obtain samples for serology, haematology, or cytology;
- Clean glass slides for collection smears and Containers for keeping specimen.

### 12.4.2. Preparation of a Deceased for Post-Mortem

**Before post-mortem**

- Wash hands;
- Wear PPE;
- Cleaning and disinfection of equipment, instruments and surfaces of the post -mortem room;
- Lay out all surgical instruments and lab supplies, and ensure that they are in good working order.

**During post -mortem**

- Identifies the deceased for post mortem by Name; using name tags and registration book;
- Removes the deceased from the freezer or refrigeration unit;
- Places the body on the post-mortem table;
- Removes mortuary linen from the deceased;
- Lays out all surgical instruments;
- Handles the needed equipment to the mortician;
- Handles containers for specimen;

- Puts specimen for autopsy and investigation in an appropriate container;
- Covers the deceased with mortuary linen;
- Returns the body in the storage;

**Caring of the equipment and supplies after Post-mortem**

- Removes dirty linens;
- Soaks the dirty linens, rinses and dries;
- Disinfects the post-mortem table and equipment;
- Washes the post-mortem table and equipment;
- Stores the equipment;
- Send laboratory specimens if needed;
- Removes PPE;
- Washes hands.

## 12.5. Preparation of Deceased for Burial at the Mortuary/Household

### 12.5.1. Relevant Documents Needed for Deceased to be buried

The following are important documents of which must be available so as to allow deceased to be buried:

- For Non- infectious;
  - Burial permit;
  - Various bill receipts according to health facility regulations.
- For Police case:
  - Police form No.3 (PF3) for deaths that require an investigation or Police report;
  - Burial permit.
- Attachment of all information to the wrist or ankle of the deceased person;
- The person who pronounced life extinct and details of what happened leading up to the death are all important;
- For the police case, seek advice before interfering with anything that might be relevant to establishing the cause of death;
- For Infectious deceased:
  - Burial permit;
  - Infectious verification notes;
  - Notifiable note.

### 12.5.2. Equipment and Supplies Needed for Preparation of Deceased for Burial

- Screen for privacy;
- Gloves for protection against infection;
- Scissors for cutting bandages;

- Apron for protection;
- Identification tags for identity;
- Kidney dish / container for gauzes;
- Galipot / container for cotton swabs;
- Cotton wool for packing orifices of the deceased;
- Sinus forceps for packing cotton wool to the orifice of the deceased if in the mortuary;
- Dissecting forceps for removing soiled dressing if any in the mortuary;
- Plaster for securing gauze in case of wound;
- Soap antiseptic for washing hands;
- Disinfectant for preventing infection;
- Deodorizer for combating foul smell;
- Paper tissues for drying hands;
- Suture thread and needles if in the mortuary;
- Plastic or nylon bags if needed;
- Protective clothing and shoes (surgical gowns, caps, masks, etc.);
- Running water for washing deceased;
- Good natural ventilation;
- Wheeled trolley for transporting deceased within the mortuary;
- Refuse bins and bags for used items;
- Translucent plastic body bags if needed.

### 12.5.3. Procedure for Preparation of Deceased for Burial

- Wash hands;
- Prepare equipment;
- Put on protective equipment;
- Identify the deceased to be prepared and verify;
- Take the deceased out of the refrigerator;
- Bring the deceased on the washing place;
- Unwrap the deceased;
- Check the condition of the deceased to determine swelling, bruises, wound or leakage;
- Dress each wound and any incisions made by applying very strong glues;
- Wash the body with cold water and soap and dry thoroughly;
- Close eyelids with small sutures on the top and bottom lids if needed;
- Close the mouth using sutures in both lips made from the inside if necessary;

- In case of police case remove all intravenous cannula and lines in situ, intravenous infusions and catheters;
- Wash the body and mouth after investigation;
- Dress deceased according to religious or culture;
- Assist the family to apply cosmetics, when necessary;
- Place deceased in the coffin supporting the head higher than the rest of the body;
- Lift the coffin on the trolley;
- Move the coffin to the viewing room and handle it to the responsible person for the last respect or religious activities;
- Ensure all relevant documents are present;
- Ensure all bill have been settled if applicable;
- Document all information as required in the register;
- Clean the room and the trolley following infection prevention and control protocol;
- Continue using universal infection prevention measures to protect people and the scene from contamination;
- Wash hands with soap.

****NB:** Preparation for deceased depends much on the cause of death

### 12.5.4. Assisting the Family at Household Level to Prepare the Body for Burial

- Assist family to follow personal hygienic measures when handling dead body:
  - Avoid direct contact with blood or body fluids from the dead body;
  - Put on gloves;
  - Make sure any wound, cuts and abrasions are covered with bandages or dressing;
  - Observe hand hygiene;
  - Make sure the body is clean and dry;
- Assist the family to prepare dead body for burial:
  - Preparation of a deceased for a burial depend on the needs, personal life, culture and religion of the of the deceased;
  - During preparation the deceased should be treated with dignity and respect;
  - Regardless of what type of disposition that the family choose; bathing and disinfecting the body is important;
- This is done not only for the safety of the funeral home staff, family and friends, but also for dignity and respect of the deceased:
- A human body starts to change immediately after death occurs and bathing and disinfecting are necessary:

  - Prepare the body safely;
  - Be aware of the family's cultural practices and religious beliefs;
  - Help the family understand why some practices cannot be done because they place the family or others at risk for exposure;
  - Counsel the family about why special steps need to be taken to protect the family and community from illness;
  - Identify a family member who has influence with the rest of the family and who can make sure family members avoid dangerous practices such as washing or touching the body without gloves;
  - After bathing consider clothing and other mementos such as jewellery and glasses;
  - Options will vary depending on religious beliefs;
- Simple garments or particular outfits:
- May use clothes previously worn by the individual:
- When it comes to jewellery and mementos, such as wedding rings, glasses, tie clips, etc. can be removed before the final disposition takes place:
- These items can be for temporary viewing purposes or they can be left with the individual indefinitely:
- The final step is preparing the body for private or public viewing:
- Environmental control:
  - Advise the family to buy disinfectant such as house hold sodium hypo chloride (Jik);
  - Assist the family on disposing all used materials;
  - Make sure that all linen contaminated with blood or body fluids are soaked in a fresh prepared household bleach for 30 minutes before washing.

### 12.5.5. Educating Relatives on Self-Protection when Contacting an Infectious Deceased

Diseases that can be transmitted as a result of improper handling of an infectious deceased:

- Hepatitis B;
- Hepatitis C;
- Cholera;
- Ebola;
- Anthrax;
- Meningococcal meningitis;
- Rift Valley Fever;
- Yellow fever.

**Categories of Deceased Based on the Risk of Infection**

There are two categories infectious deceased namely:

- Infectious deceased are those who died due to one of the following diseases;
  - Human Immunodeficiency Virus infection (HIV);
  - Hepatitis C;
  - Meningococcal meningitis;
  - Severe Acute Respiratory Syndrome (SARS);
  - Avian influenza;
  - Cholera;
  - Rabies.
- Highly infectious deceased are those who died due to one of the following diseases
  - Anthrax;
  - Plague;
  - Ebola;
  - Viral haemorrhagic fevers;
  - Rift valley fever;
  - The risks of infection can occur at any stage of handling and disposal of human remains, this includes:
    - Initial collection of remains;
    - Transport of remains from initial collection point;
    - Storage of remains prior to burial or cremation;
    - Hygienic preparation or laying out;
    - Post-mortem examination;
    - Embalming;
    - Laundering, cleaning instruments and disposal of waste used by a deceased;
    - Exhumation.

**Methods of Protecting Self and Contacts of Infectious Deceased**

- Adopt all safety standards for the handling of deceased because not all cases of infection will have been identified before death;
- Adhering to standard precautions is the single most important element in preventing the spread of infection from the deceased individual;
- Standard precautions include hand hygiene, wearing of personal protective equipment, and careful handling of sharp instruments;
- For infectious deceased: use gloves, water resistant gown/ plastic apron, and surgical mask. Use goggles or face shield to protect eyes, if there may be splashes;

- For Very infectious deceased: Use water resistant gown/ plastic apron, surgical mask, eye protection (goggles or face shield), double gloves, shoe covers / boots;
- The deceased from the health facility must be transported in a sealed coffin;
- During ritual/religious preparation discourage viewing, touching and preparation of the body by the family;
- Burial should take place as soon as possible to minimize the risk of spreading the infection;
- Dispose the contaminated valueless material used by deceased by burning, burying or throw in pit latrine;
- Disinfect valuable materials;
- Wash hands immediately after handling deceased or his/her belonging;
- Avoid direct contact with blood or body fluids from the deceased;
- Make sure any wounds, cuts and abrasions, are covered with waterproof bandages or dressings;
- Do not smoke, drink or eat during handling of deceased;
- Do not touch the eyes, mouth or nose after handling infectious deceased;
- Avoid sharps injury, both in the course of examination of deceased and afterwards in dealing with waste disposal and decontamination.

**Educating Contacts on Self Protection when Contacting an Infectious Deceased**

Assess relatives' emotions to decide their readiness to receive education

- Identify a family member who has influence with the rest of the family and who can make sure family members avoid dangerous practices such as washing or touching the body;
- Counsel the family about why special steps need to be taken to protect the family and community from illness;
- Make sure the community leaders understand the importance of hand-washing, decontamination of surfaces, careful laundering of clothes, bedding, and other home infection prevention and control measures;
- Educate the relatives on protecting themselves from infectious dead body and you will concentrate on the following:
  - Hand washing immediately after handling dead body or his/her belonging;
  - Use of gloves and plastic aprons;
  - Importance of transporting dead body in a sealed coffin;
  - Discourage viewing, touching and preparation of the body by the family/mourners;
  - Avoid contact with the blood and body fluids;

  - Burial should take place as soon as possible to minimize the risk of spreading the infection;
  - Disposal of contaminated valueless material used by deceased by burning, burying or throw in pit latrine;
  - Disinfecting valuable materials.
- Accidental exposure to blood or body fluids
  - In case of percutaneous injury or mucocutaneous exposure to blood or body fluids of the dead body, the injured or exposed areas should be washed with copious amount of water;
  - All incidents of percutaneous or mucocutaneous exposure should be reported to the supervisor;
  - The injured person should immediately seek medical advice for proper wound care and post-exposure management;

## 13.0. POST-EXPOSURE PROPHYLAXIS

Post-exposure prophylaxis is generally understood to mean the medical response to prevent the transmission of blood-borne pathogens, including HIV, after exposure to blood and other body fluids (WHO 2007). For more details refers the PEP guidelines.

### 13.1. Types of Exposures

Exposures to blood and other body fluids or tissues can be categorized as occupational or non- occupational. Table below lists the individuals who are potentially at risk for each type of exposure.

**Table 20. Individuals at Risk by Types of Exposures**

| Occupational | Non-Occupational |
|---|---|
| Health care workers | Victims of sexual assault |
| Emergency rescuers | People who share needles or sharps (e.g., intravenous drug users, females who have undergone genital mutilation, and males who have undergone unsafe circumcision procedures) |
| Waste disposal workers | Individuals who have consensual sex |
| Law enforcement personnel | Victims of human bites |
| Fire fighters | Victims of accidents (e.g., road traffic accidents) |

#### 13.1.1. Risk Classification Associated with Different Types of Occupational Exposures to Blood and Other Body Fluids

Different types of occupational exposures are associated with different levels of risk of transmission of blood-borne pathogens.

**Table 21. Levels of Risk According to Type and Severity of Occupational Exposures**

| Risk Classification | Types of Exposures |
|---|---|
| High-Risk Exposures (Occupational post-exposure prophylaxis should be recommended) | • Exposure to a large volume of blood or potentially infectious fluids<br>• Exposure to blood or body fluid contaminated with HIV from a source with high viral load<br>• Injury with a large-bore hollow needle<br>• Injury with device used in artery or vein<br>• Injuries with blood-stained device<br>• Deep and extensive injuries |

| | |
|---|---|
| | • Confirmed drug resistance in source person<br>• Source person has symptomatic HIV infection, AIDS<br>• known high viral load, or is in a window period |
| Low-Risk Exposures (Occupational post-exposure prophylaxis should be recommended) | • Exposure to small volume of blood or potentially infectious fluids<br>• Injury with a solid needle Injury with small size needle<br>• Any superficial injury or mucocutaneous exposure<br>• Bite from a patient with visible bleeding in the mouth that causes bleeding in the exposed worker<br>• Exposure to non-intact skin (e.g., dermatitis, chapped skin, abrasion, or open wound) with blood, visibly bloody fluid, or any other potentially infectious material<br>• Source has asymptomatic HIV infection or known low viral load (< 1,500 RNA copies/mL), in the absence of other risks (for example, high risks) Below is a list of factors that increase risk for the above exposure events:<br>• Source person is known to be HIV-infected with high viral load<br>• Source person has drug-resistant HIV and AIDS<br>• Source person is in a window period<br>• Deep skin penetration |
| No risk Occupational PEP is not warranted | • Exposure to solid-bore needles or sharps not in recent contact with blood<br>• Bite from a patient with visible bleeding in the mouth that causes bleeding in the exposed worker |

### 13.1.2. Risk Factors for Occupational HIV Transmission

The likelihood of HIV infection following exposure is affected by the presence of certain factors:

- type of contact intact skin or broken skin;
- Quantity of blood;
- Disease status of source patient;
- Increased risk with terminal illness and acute (or recent) infection;
- Host defences;
- Post exposure prophylaxis;

- Post-exposure Site Management;
- Wounds and puncture sites should be washed with soap and water;
- Exposed mucous membranes should be flushed with water;
- Post-exposure evaluation should be done (type of body fluid involved);
- Type of exposure should be determined (percutaneous, mucosal, intact skin, etc.);
- Severity of exposure should be assessed – quantity of blood, duration of contact.

### 13.1.3. HIV Risk classification

**Low risk exposure:**

- Exposure to a small volume of blood contaminated with fluid from a symptomatic HIV patient with low viral titre;
- Following an injury with a solid needle;
- Any superficial injury or mucocutaneous exposure.

**High-risk exposure:**

- Exposure to a large volume of blood or potentially infections fluids;
- Exposure to flood or fluid contaminated with blood from a patient with high viral titre;
- Injury with a hollow needle;
- Deep and extensive injuries;
- Confirmed drug resistance in source patients.

### 13.1.4. Source Patient Evaluation

- Clinical status assessment;
- Screening for HIV status of the patient after consent;
- Treatment should not wait for test result and should be commenced within 24 hours post exposure.

### 13.1.5. Baseline and Follow-up Testing

- Baseline testing of HIV antibody should be done to establish sero status of the healthcare worker at time of exposure;
- Repeat testing should be done at 6 and 12 weeks and 6 months post exposure regardless of the use of PEP;
- Pregnancy test should be done for all female workers in reproductive age if their pregnancy status is unknown.

### 13.1.6. Counselling the Healthcare Worker

Healthcare workers should be counselled about their personal risk and

recommendation made to start PEP. Discuss the following:

- Efficacy of drugs;
- Side effects of drugs or toxicity;
- Possible resistance to drugs;
- Obtain history of the health worker (this will influence choice of drugs): possibility of pregnancy, or any other pre-existing medical conditions;
- Recommend a specific regimen and discuss the rationale for choosing that regimen; emphasize adherence;
- Exposed healthcare workers should be encouraged to seek medical advice with any development as acute illness, or drug reaction;
- Should be encouraged to adopt safer sex practices, not to donate blood, or discontinue breast-feeding;
- No need to modify his/her work;
- HBV vaccination should be considered if not already vaccinated.

### 13.1.7. Prophylaxis Regimens

The two-drug PEP regimen as it appears in the current National Guidelines for Management and Care of HIV and AIDS (April 2012) is no longer recommended. The only indication for dual therapy is if the third drug has been stopped for tolerability purposes. Monotherapy of any kind is not recommended and is now obsolete.

**Table 22. Recommended Regimen for HIV PEP Following Occupational and Non-Occupational Exposures**

| HIV PEP (ARV) Regimen | Current MoHCDGEC Recommendations | Comments |
|---|---|---|
| Tenofovir 300mg orally once daily<br>Lamivudine 300mg oraly, once dailyEfavirenz 600mg oraly once dailyPO OD | Preferred first option for HIV PEP | Compared to zidovudine-containing regimen, current evidence shows that this combination is better not only in terms of tolerability, but also efficacy in preventing post-exposure transmission of HIV infection.<br>Studies have shown increased rates of adherence and regimen completion when tenofovir and lamivudine have been used as components of HIV PEP regimen |

****NOTE:** For alternatives regimens see the PEP guidelines

### 13.2. Risk Classification associated with different types of Non-Occupational Exposures to Blood and other Body Fluids

For non-occupational exposures, such as injuries or accidents that involve contact of blood and other body fluids to skin, the risk categorization is similar to that for occupational exposures, as presented in Table 23. However, for other types of non-occupational exposures, the table below summarizes the risk classification.

**Table 23. Risk Classification Associated with Different Types of Non-Occupational Exposures**

| Risk Classification | Types of Exposures |
|---|---|
| High-Risk Exposures (Non-occupational post-exposure prophylaxis should be recommended) | • Unsafe receptive and inserted vaginal or anal intercourse<br>• Rape or assault involving multiple perpetrators<br>• Rape or assault involving anal penetration<br>• Rape or assault in which there is obvious trauma to the genital areas<br>• Rape or assault in which one of the perpetrators is known to be HIV-positive<br>• Sharing of needles in intravenous drug users (who never shared needles)<br>• Condom spillage or breakage during consensual sex<br>• Rape or assault with no obvious trauma to genital areas<br>• Injuries with exposure to blood or other potentially<br>• Infected fluids from a source person known to have symptomatic HIV infection, AIDS, high viral load, unknown HIV status (including needle sticks with a hollow-bore needle, human bites, accidents), or is in a window period.<br>• Injury in which source person has drug-resistant HIV strain |
| Low-Risk Exposures (Non-occupational post-exposure prophylaxis should be recommended) | • Oral-vaginal contact (receptive or insertive)<br>• Oral-anal contact (receptive or insertive)<br>• Receptive penile-oral contact with or without ejaculation<br>• Insertive penile-oral contact with or without ejaculation<br>• Rape or assault involving vaginal or mouth<br>• penetration (with no obvious injuries/trauma)<br>• Bite from a person with visible bleeding in the mouth that causes bleeding in the exposed person |

| Risk Classification | Types of Exposures |
|---|---|
| | • Injuries resulting from trauma cases involving mass<br>• casualties--when there is significant cross-contamination with blood and other body fluids (e.g. motor traffic accidents)<br>• Injury in which source has asymptomatic HIV infection or known low viral load (< 15000 RNA copies/mL), in the absence of other risks (e.g., high risks)<br>• Below is a list of factors that increase risk for the above exposure events:<br>• Source person is known to be HIV-infected with high viral load<br>• Source person is in a window period<br>• An oral mucosa that is not intact (e.g., oral lesions, gingivitis, wounds)<br>• Oral mucosa is not intact (e.g., oral lesions, gingivitis, wounds) --for oral sex exposure<br>• Lack of male circumcision, Cervical ectopy<br>• Blood exposure--it is important to note that blood exposure can be minimal and therefore not recognized by exposed person. If the exposed person reports frank blood exposure, PEP would be indicated<br>• Presence of genital ulcer disease or other STIs<br>• Lack of condom use |
| No Risk<br>(Non-occupational post-exposure prophylaxis not warranted) | • Kissing<br>• Oral-to-oral contact without mucosal damage (mouth- to-mouth resuscitation)<br>• Human bites not involving blood<br>• Exposure to solid-bore needles or sharps not in recent contact with blood<br>• Mutual masturbation without skin breakdown or blood exposure |

### 13.3. Hepatitis B Post-Exposure

Several studies have demonstrated that in susceptible persons (i.e., negative Hepatitis B surface antigen [HbsAg] test and no history of receiving immune serum globulin), giving Hepatitis B immune globulin ( HBIg) is better than conventional serum immune globulin G ( SIgG), or by inference doing nothing, in preventing acute hepatitis B and sero-conversion.

The suggested steps for managing an injury are as follows:

**Step 1:** Treat the exposure site appropriately (e.g., an open wound or cut);

**Step 2:** Give tetanus immunization or booster if indicated (e.g., > 10 years since immunization);

**Step 3:** Assess the risk of HBV exposure and determine the immune status of the patient (i.e., history of jaundice, hepatitis or previous immunization with hepatitis B vaccine). If status is unknown, continue assessment;

**Step 4:** Collect a specimen from the source person (the carrier or person suspected of being infected) if possible and from the patient for HBsAg testing. If testing is not possible, base the HBV status of the infected person on clinical history and clinical findings;

**Step 5:** Give HBIgG (5mL IM) as soon as possible and within 7 days of exposure, and also give the first dose of hepatitis B vaccine, which should be repeated at 1 and 6 months. If active immunization with hepatitis B vaccine is not possible, a second dose of HBIG should be given 1 month later (Chin 2000).

### 13.4. Hepatitis C Post-Exposure Guidelines

There is no post-exposure vaccine or drug prophylaxis for Hepatitis C (immune globulin is ineffective). Prevention of exposure, therefore, is the only effective strategy for prevention of HCV.

The CDC (1998) has recommended the following guidelines that institutions should consider for follow up of health workers exposed to HCV-positive blood or other body fluids:

- baseline testing of the source patient (if available and a consent form is signed) for anti-HCV antibody (if the test is available);
- baseline and 6-month follow-up testing of exposed health worker for anti-HCV anti body and liver function screen;
- if available, treatment of early HCV infection with pegylated interferon alfa before significant liver damage has occurred.

## 14.0. INFECTION PREVENTION AND CONTROL PRACTICE IN THE OPERATING DEPARTMENT

The following guidelines are recommended for operating department staff when invasive procedures are carried out, thereby protecting both patients and staff. Every procedure carried out in the operating department should be assessed in terms of blood or body fluid loss, and precautions taken accordingly.

**Operating room**
Operating theatre is a room specifically for use by the anaesthesia and surgical teams and must be not used for other purpose.

**Operating room requires:**

- Good lighting and ventilation;
- Dedicated equipment for procedures;
- Equipment to monitor patients as required procedure;
- Drugs and other consumable for routine and emergence use.

Ensure that standard operating procedures are established for the correct use of the Operating Room (OR) and all staff is trained to follow them: ·

- Keep all doors to the OR closed, except as needed for the passage of equipment, personnel and the patient; ·
- Store some sutures and extra equipment in the OR to decrease the need for people to enter and leave the OR during a case; ·
- Keep to a minimum the number of people allowed to enter the OR, especially after an operation has started; ·
- Keep OR uncluttered and easy to clean; · Between cases, clean and disinfect the table and instrument surfaces; ·
- At the end of each day, clean the OR: start at the top and continue to the floor, including all furniture, overhead equipment and lights, use a liquid disinfectant at a dilution recommended by the manufacturer;
- Sterilize all surgical instruments and supplies after use and store them protected and ready for the next use.

### 14.1. Theatre Layout and Design

Theatre managers, QIT, surgeons and anaesthetists should be involved in the planning of the theatre design/layout. Ideally, the operating theatre suite should be a purposely built independent complex located away from the main flow of traffic but in an area easily accessible to the critical care, surgical and maternity wards and the supporting service departments, e.g. CSSD, laboratory and X-ray departments.

The traffic within the operating suite must be controlled via a security lock system which only allows access to staff, patients and equipment from different entrances

and exits. There should be no thoroughfare through the Operating Theatre.

### 14.1.1. Walls and Ceiling

It is recommended that all surface materials should be hard, nonporous, fire resistant, waterproof, stain proof, seamless and easy to clean. In addition, the corners of the walls and the floor should be coved (round) and smooth for easy cleaning. Washable epoxy resin paint for the walls is ideal, because it lasts a long time and can withstand a daily washing programme. Cheaper paint has a tendency to break off and may fall in an open surgical wound.

Tiles are generally not recommended as these are difficult to clean and collect dust easily.

The walls and ceiling often are used to mount essential devices and equipment to reduce crowding of the floor area therefore the walls must be solid and robust enough to carry the weight of equipment. The ceiling may be used for mounting an operating microscope, or an electrosurgical unit in addition to the operating light.

The walls must be fitted with outlets for oxygen, other medical gases and vacuum, and where possible, an anaesthetic gas scavenging system should be fitted at floor level. There is also a need to fit multiple electric outlets on the walls.

### 14.1.2. Floors

Floors should be smooth, continuous without cracks and breaks, made of materials that will reduce static and should not endanger the safety of personnel.

The surface of the floor shall provide a path of moderate electrical conductivity between all persons and equipment making contact with the floor to prevent the accumulation of dangerous electrostatic charges.

The floor covering should be specified, such as continuous thick and tough vinyl, and the manufacturer’s guidelines for cleaning and maintaining the floor must be available in the cleaning policy.

The floor covering should be curved up the wall to 2.5 cm, thus ensuring that edges are coved and easier to clean than right angled floors.

The floor surface must be suitably hard, nonporous and appropriate for frequent cleaning and there should be no cracks. The floors should have a nonslip surface, to prevent staff from slipping and injuring themselves. When floors are being cleaned, a warning sign “wet floor” should be put up to warn the personnel.

### 14.1.3. Doors

Ideally, sliding or swing doors (self-closing) should be used in the Operating Theatre. Sliding doors are recommended which must remain closed at all times, particularly during an operation because the microbial count in the air rises every time doors swing open from either direction.

There must be a clear glass viewing window in the door to prevent frequent opening and closing of the door. The doors of the Operating Theatre will require baffle plates to balance the airflows.

### 14.1.4. Lighting

Most Operating Theatre lights are white fluorescent because they cast minimal shadow. Lighting should be evenly distributed throughout the room. The anaesthetist must also have sufficient light.

The overhead operating light must:

- Be near daylight in colour and free of shadow;
- Give contrast to the depth and relationship of all anatomic structures. The light may be equipped with an intensity control mechanism. The surgeon may ask for more light when needed therefore a reserve light should be available (e.g. a mobile operation light);
- Provide the diameter light pattern of a focus appropriate for the size of the incision. These are adjusted with controls mounted on the light fixture;
- Be freely adjustable to any position or angle. Most overhead operating lights are ceiling mounted on mobile fixtures. It can be positioned so that light is directed into a single incision or two concurrent operative sites. e) Be spark-proof where anaesthetic gases are used;
- Produce minimum heat to prevent injury to exposed tissues, to ensure the comfort of the sterile team, and to minimize airborne micro-organisms;
- Be easily cleaned. Tracks recessed within the ceiling virtually eliminate dust accumulation. Suspension-mounted tracks (booms) or a centrally mounted fixture must have smooth surfaces easily accessible for cleaning.

A source of light from a circuit separate from the usual supply must be available for use in case of power failure. In case one of the bulbs is not working, it should be replaced as soon as possible, to provide sufficient lighting at all times during an operation. NO oil, for example liquid paraffin, should be put on the operating light.

### 14.1.5. Ventilation

The ventilating system in the Operating Theatre must be mechanical ventilation, supplied from an independent air handling unit (AHU) which ensures a controlled, filtered, clean air supply. Air changes and circulation provide fresh air and prevent accumulation of anaesthetic gases in the room.

**Different modes of ventilation in Operating Theatre**

There are usually two types of Operating Theatres. The **Conventional Operating Theatre** is where 20-24 Air Change Rate (ACH) are delivered via mechanical ventilation ducted into the room and removed via an exhaust system. This is the more common type of ventilation available for conventional OTs for general surgery.

**The second type of Operating Theatre** is the ultra-clean or laminar flow Operating Theatre. Here, 80% of extremely clean air is re-circulated via a canopy above the operating area, and this unidirectional airflow can be up to 300 m/s (meters per second) forming a curtain of air. This type of Operating Theatre is used for ultra-clean operations like implant surgery.

Wall mounted or floor standing air conditioners are not considered appropriate for providing clean air in a sterile environment, they only cool the air and are strongly discouraged.

**Fans are also strictly discouraged.**

The filters clog up easily with dust which comes in directly from the outside and need frequent changing. They do not remove stale air from the Operating Theatre which increases the risk of infection.

### 14.1.6. Air flows

In the Operating Theatre there should always be positive pressure which enters the Operating Theatre suite in the preparation or layup room, to ensure safety of the surgical instruments when the trolleys are being laid up for surgical procedures. The Layup and Operating Theatres should have the highest positive air pressure which flows outwards to the scrub areas, and sub sterile rooms.

Positive pressure forces air out of the room. Air-conditioning units may be a source of micro-organisms that pass through the filters. These must be changed at regular intervals to prevent this and the ducts must be cleaned regularly according to the manufacturer's recommendations.

If air conditioners must be used, the position of the air-conditioning units should be determined in consultation with the hospital engineers, surgeons, infection prevention and control persons and other relevant cadres. Wall mounted air conditioners (which do not regulate the contamination of the delivered air) should be replaced by conventional airflow systems.

**Temperature and Humidity**

The temperature should be maintained at 21 +/- 3 degrees Celsius inside the OT all the time with corresponding relative humidity between 50 to 60%. Appropriate devices to monitor and display these conditions inside the OT may be installed.

Moisture provides a relatively conductive medium, allowing static to leak to earth as fast as it is generated. Sparks form more readily with low humidity and fires are a potential hazard.

**Gas Scavenging System for Anaesthetic Explosive Gases**

In most countries an anaesthetic gas scavenging system is put in place to avoid major explosions. Since most anaesthetic gases are heavy they sink to the bottom and there is a danger of fire or explosion should a spark be produced. The latter can

happen if the humidity is below 45% or with diathermy machines.

### 14.2. Theatre Layout (Structure)

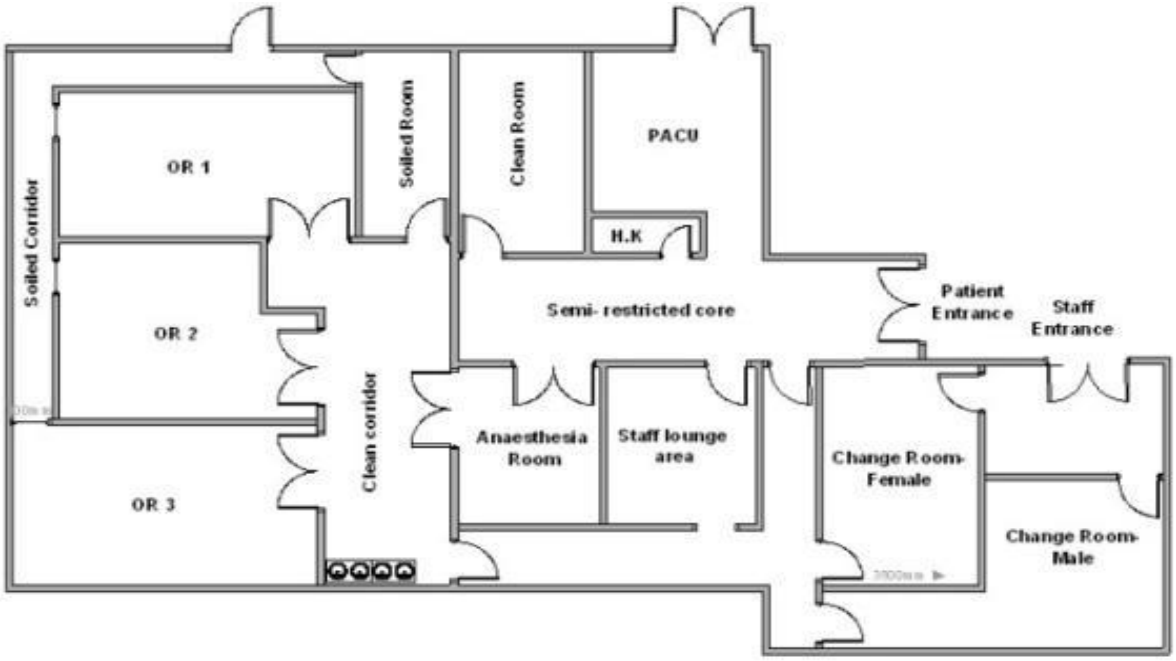



**Figure 11. Theatre Layout**

**Source:** 2012 Cairo International Biomedical Engineering Conference (CIBEC) Cairo, Egypt, December 20-21, 2012

#### 14.2.1. Unrestricted Area (a point through which staff, patients, and materials enter the surgical unit)

Unrestricted areas need no special traffic flow. This area is the entrance from the main corridor and is isolated from other areas of the surgical unit. This is the point through which staff, patients and materials enter the surgical unit.
Post or display signs in each area to clearly indicate the appropriate environmental control and surgical attire. Is equired.to have clear instructions to internal and external customers.

#### 14.2.2. Transition zone (where staff put on surgical attire)

This area consists primarily of dressing rooms and lockers. It is where staff put on surgical attire that allows them to move from unrestricted to semi restricted or restricted areas in the surgical unit. Only authorized staff should enter this area.

#### 14.2.3. Semi-restricted area

A peripheral area of the surgical unit that includes preoperative and recovery rooms, storage space for sterile and HLD items, and corridors leading to the restricted area. Semi- restricted areas should allow only authorized staff and patients. Activities (e.g., instrument processing and storage) for the operating room occur here:

- Set and display rules and protocols of procedural area;
- Limit traffic to authorized staff and patients at all times;
- Have a work area for processing of clean instruments. Have storage space for clean and sterile or high-level disinfected;
- supplies with enclosed shelves to minimize dust and debris collecting on stored items;
- Note: Flip-flops or sandals should not be worn as they provide no protection from dropped sharps;
- Have doors limiting access to the restricted area of the surgical unit;
- Staff should wear clean closed shoes that will protect their feet from fluids and dropped items also should wear surgical attire and a cap;
- Everybody who enters into the semi-restricted area should wear surgical attire.

### 14.2.4. Restricted area (the operating room and scrub sinks)

Restricted areas should allow authorized staff and patients only.

- This area consists of the operating room(s) and scrub sink areas;
- Limit traffic to authorized staff and patients at all times;
- Keep the door closed at all times, except during movement of staff, patients, supplies and equipment;
- Scrubbed staff must wear full surgical attire and cover head and facial hair with a cap and mask;
- Staff should wear clean, closed shoes that will protect their feet from fluids and dropped items;
- Masks are required when sterile supplies are open and scrubbed staff are operating.
- Patients entering the surgical unit should wear clean gowns or be covered with clean linen, and have their hair covered;
- Patients do not need to wear masks during transport (unless they require airborne precautions).

## 14.3. Theatre Attire

Theatre attire is necessary for identification of theatre personnel and is designed to minimise the potential transfer of microorganisms between theatre staff and patients. This uniform also presents a professional image, hence:

- All personnel and visitors entering an operating theatre should wear scrub tops and trousers, provided freshly laundered. These must be changed daily and whenever visibly soiled;

- Footwear should be antistatic and washable, and should be worn only in the theatre department if possible. Shoes should be fully enclosed to provide protection from spillages and accidentally dropped equipment. Each staff member is responsible for cleaning their own shoes;
- Hair should be completely covered by a disposable or washable hat, this should be donned before scrubs to prevent contamination of clean scrubs by staff hair;
- Jewellery cannot only harbour bacteria, but also be a hazard in theatres;
- Plain wedding bands are permitted, although it is recommended that they are removed before hand antisepsis (scrubbing) wherever possible;
- Earrings should not be worn, as they could potentially fall into a wound;
- Fingernails should be kept clean, short and free from nail polish;
- Short nails are less likely to puncture gloves or harm a patient during transfer;
- False nails should not be worn as these have been shown to harbour micro-organisms, even after hand washing, and can inhibit effective hand washing;
- Theatre staff with open cuts, wounds or skin breaks should cover these with a waterproof dressing;
- If staff have ongoing skin conditions such as eczema or similar, an Occupational Health Department referral should be considered before participation in exposure prone procedures;
- Personal hygiene must be of a high standard;
- All visitors to the theatre department must report to reception staff or the theatre co-ordinator prior to entering any restricted area;
- All people entering the theatre (staff and non-staff) will be required to comply to the dress code of the theatre;
- All theatre clothes including hats and masks must be removed prior to leaving the theatre department, and shoes changed if visibly stained.
- Theatre attires should not be worn in unrestricted areas.

### 14.3.1. Hand Preparation & Attire for Scrub Staff

- Surgical hand antisepsis is an extension of hand washing and is undertaken prior to gowning and gloving, and before taking part in a surgical procedure;
- Staff participating in a surgical procedure are required to use recommended antiseptic agents during their hand wash;
- If the current antimicrobial agents supplied by the department, irritate staff skin conditions, then a referral to Occupational Health should be sought so that an alternative product can be sourced;

- Soap and water alone are not considered to be acceptable for surgical hand antisepsis, as soap has no anti-microbial properties;
- Soap can be used if staff also use an alcohol solution or gel afterwards;
- Hand washing should take place for a minimum of 2 minutes;
- Scrub brushes are not recommended for use on the skin as they can lead to skin damage and an increase in skin cell shedding;
- Hands should be held higher than elbows, so that the water drains away from the hands, and should be rinsed from fingertips to elbows using water flow only;
- Vigorous shaking of the hands to dispel water should be avoided;
- Splashing of surgical attire should be avoided as wet clothing can compromise the protection offered by a gown;
- Unless proceeding directly from one case to the next, hand antisepsis should be the same as for the initial scrub;
- Alcohol hand rub gels can be used between cases, when following one case directly with another, unless hands are visibly soiled;
- Double gloving is recommended for both staff and patient safety for every procedure, especially if staff are involved with procedures which involve sawing, drilling or wiring;
- Surgical gowns are supplied in different sizing options and resilience to liquid strike through;
- Other PPE should be worn as indicated by the risk of body fluid splashes. These might include masks with or without visors/goggles to protect the wearers face from splashes etc.;
- Lead aprons should be worn for all procedures where the use of X-ray is anticipated;
- Goggles are provided when procedures include the use of lasers and should be worn to protect the eyes.

### 14.4. Theatre Traffic Flow and Activity Pattern

- All staff will endeavour to maintain a professional demeanour within theatre all times, treat your colleagues with courtesy, respect, and provide the best possible care for all patients who enter the operating room (OR);
- Limiting the numbers and movement of staff through the operating theatre environment minimises transfer of bacteria from one theatre to another, reduces noise pollution and causes less disturbance to the surgical team;
- Talking inside operating theatres must be kept to a minimum and low tone to avoid disruption unless there is a medical emergency;

- To prevent disruption of airflows and minimize the risk of cross infection staff must restrict their movement in and out of each theatre environment;
- Any visitors to the theatre department must report to reception staff or the theatre co-ordinator/in charge prior to entering any semi-restricted or restricted area. They must dress surgical attire;
- To maximise the ventilation, all doors should remain closed when not in use as this helps to maintain the air pressure, temperature and humidity for that theatre;
- If it is necessary to visit another theatre, staff must remove PPE and wash hands before leaving the theatre.

### 14.5. Additional Precautions for Specific Cases

- For those whose infectious status is known, a number of additional precautions are advised depending on the mode of transmission;
- In all known infectious cases unnecessary equipment should be removed from the theatre before the arrival of the patient;
- A clean runner should be appointed who will have no contact with the patient, any infected linen or equipment. This runner will fetch any equipment or consumables required by the scrub team during the case;
- In a case where airborne transmission is likely, a clean outside runner should also be appointed to fetch any extra equipment needed for the case intra-operatively. This staff member should not come into the theatre during the case, but should wait outside;
- Induction and recovery of highly infectious cases should take place within the theatre, and staff numbers should be limited as much as possible;
- Put infectious cases last on the operation list, wherever this is possible;
- Label any specimens and microbiology/histology forms using ‘danger of infection’ stickers, and seal in a clear plastic bag;
- Theatre personnel in contact with the patient should wear a disposable plastic apron and gloves. This is not necessary for staff who are only collecting the patient;
- Bed/trolley linen should be changed in the operation theatre by staff wearing gloves and aprons and put into contaminated linen hamper with alginate liners;
- All surfaces e.g. trolley, bed, operating table, door handles and stretchers having contact with a patient should be wiped with disinfectant after cleaning;
- Soft materials, e.g. Blood Pressure Cuffs must be thoroughly wiped with disinfectant after cleaning.
- Disposable tourniquets must be used;

- Theatre bacterial & fungal sterility check should be done at least quarterly;
- Theatre environment and equipment should be cleaned with detergent and disinfected.
- If chlorine solution is used then this needs to be rinsed off equipment afterwards. Chlorine is unsuitable for some surfaces depending on its component, therefore, health personnel should check manufacturers' guidelines;
- Alcohol hand rub gel should not be used to decontaminate hands if there is visible body fluid or contaminants. Staff must wash hands using soap and water and apply alcohol hand rub gel in addition.

### 14.5.1. Cleaning & Use of Endoscopes

- After use of all endoscopes should be flushed through with one litre of water to ensure there is no blockage to hamper sterilisation. These are then dismantled, soaked in OPA 0.3% solution for 12minutes or according to the manufacturer's guideline.

### 14.5.2. Before surgical procedures

Prepare the following containers or bucket:

- Place a clean, covered container filled with clean water or enzymatic detergent or non-chlorine disinfectant for cleaning of used instruments;
- A container of 0.5% chlorine for surface use;
- A container of 0.05% chlorine for linen for soaking infected linen.

Use other locally available and approved disinfectant decontamination of instruments and other items.

Prepare three standard colour coded waste bin or leak proof plastic bag:

- One waste bin for storage of contaminated waste items (cotton gauze, old dressings);
- Second bin for none contaminated (food remains, papers, water bottle);
- Third bin for highly contaminated waste (Placenta, blood and body tissues);
- Place a puncture-resistant container or safety box for the safe disposal of sharps (e.g., suture needles, hypodermic needles and syringes, and disposable scalpel blades) at the point of use but without contaminating the sterile field;
- Place a leak proof, covered waste container for soiled linen away from sterile items;
- Organize all items in theatre according to the working flow well labelled easy to see, take and return (practice of 5S-KAIZEN-TQM approach);

- Organize tables, Mayo and ring stands side by side in an area away from the traffic patterns and at least 45 cm (18 inches) from walls, cabinets and other non-sterile surfaces;
- Place a clean sheet, a lift sheet and arm board cover on the operating room bed;
- Check and set up suction, oxygen and anaesthesia equipment;
- Place supplies and packages that are ready to open on the tables, not on the floor;
- Mayo stand and other non-sterile surfaces that are to be used during the procedure should be covered with a sterile draper.

### 14.5.3. During surgical procedures

- Limit the number of staff entering the operating room only to those necessary to perform the procedure and to patients;
- Make the surgical team self-sufficient so that outside help is not required;
- Keep the doors closed at all times, except during movement of staff, patients, supplies and equipment;
- Keep the number of people and their movement to a minimum; the numbers of microorganisms increase with activity;
- Keep talking to a minimum in the sterile field;
- Scrubbed staff should wear full surgical attire, including:
  - Sterile surgical gowns on top of the scrub suit;
  - A clean surgical cap that covers the head;
  - Clean boots that protect the feet from fluids or dropped items;
  - Wear surgical gloves, protective eye wear and mask covering the mouth, nose and any facial hair;
  - Wear face shield and plastic or goggles, plastic or rubber apron;
  - Scrubbed staff should keep their arms and hands within the operative field at all times and touch only sterile items or areas;
- Non-scrubbed staff should:
  - Stay at the periphery of the operating room;
  - Keep their distance from sterile areas;
  - Not lean or reach over the operative field.

**Handling spillage of blood, vomitus, urine, faeces or contaminated debris** using the following steps

**Table 24. Handling spillage of blood, vomitus, urine, faeces or contaminated debris**

| Action | Rationale |
|---|---|
| Put on disposable apron and gloves (wear facial protection if there is a risk of splashing to the face) | To protect against risk of contamination |
| Cover spill with disposable, absorbent paper towels | To prevent further handling by others and risk of contamination |
| Collect the blood, vomitus from the floor | discard the spills into clinical (infectious) waste |
| Wipe with paper towel or reusable cloth to soak up the majority of the spill. | To minimize spread of infection |
| Pour with 0.5% chlorine solution on the floor surface as promptly as possible and leave for 5-10 minutes after soaking majority of the spill. | For disinfection of the floor |
| Dry the area.by using disposable or reusable cloth | To leave the place clean |
| Discard all used materials into appropriate waste bag (see above). Remove protective equipment and discard in waste bag. | To prevent risk of contamination |
| Wash hands thoroughly | To prevent transmission of infection |

**Source:** WHO 2004 Practical guideline

****Note:** Do not pour Chlorine solution on the spillage as it does not kill microbe and can risk the spread of infection.

### 14.5.4. After surgical procedures

**Non-scrubbed staff wearing utility gloves should**:

- Collect all waste and remove it from the room in closed leak proof containers;
- Close and remove puncture-resistant containers when they are three quarters full;
- Remove covered containers with a 0.5% chlorine solution;
- Instruments and surgical gloves from the room;
- Remove soiled linen in closed leak proof containers;

- Remove waste, soiled linen, soiled instruments and equipment, and leak proof, covered waste container. (Be sure that these items do not renter the restricted area.)

****Note**: Never store instruments and other items in the operating room. Controls movements of staff and the use of surgical attire which might increase chance of infection as one move from unrestricted to restricted areas. Staff with respiratory or skin infections or uncovered open sores should never be allowed to work in any area of the surgical unit unless they can use appropriate protective gear. Display a signboard in Swahili to limit the entry of unauthorized persons might work in some facilities.

### 14.6. Environmental Cleaning & Decontamination

- Cleaning Between Patients;
- Each case should be assessed individually with all items which have been in contact with the patient cleaned with either detergent wipes or a detergent solution;
- Anybody fluid spills should be cleaned immediately and then disinfected with a solution of chlorine or other disinfectants according to manufactural instructions;
- Floors and equipment should be cleaned if visibly soiled or if contact with patient has taken place.

#### 14.6.1. Daily & Weekly Cleaning Schedule

- Cleaning of all theatre furniture and equipment should take place at the end of each operation list;
- Operating tables should be thoroughly cleaned and should be raised to their full height to enable bases be thoroughly cleaned, then lowered again afterwards.

#### 14.6.2. Pre-planned Annual Cleaning & Maintenance (PPM)

- Plan and conduct pre-planned annual cleaning & maintenance which includes deep cleaning of walls, ceilings etc., painting of walls, changing of ventilation filters, general maintenance and inspection of fixtures, fittings and lights.

#### 14.6.3. Standards of Environmental Cleanliness

- The operating room and accompanying rooms, i.e. anaesthetic room, prep area etc. should be kept free of unnecessary equipment & clutter to facilitate cleaning;
- Theatres should be free of visible dust;
- Storage of sterile equipment & consumables should be above waist level;

- Ventilation grilles should not be obstructed or occluded;
- Storage of consumables, supplies etc should be kept to a minimum in theatre, and stock should be rotated to ensure there is no build- up of dust or bio-burden;
- Theatres should be kept in a good state of repair. Any chipped paintwork, continuous tiling or defects in floors or fabrics should be reported and dealt with promptly.

### 14.6.4. Eating & Drinking by Staff in the theatre environment

- All food and drink should be consumed in appropriate areas only e.g. staff coffee room.
- Hands should be washed with soap and water before returning to the theatre.

## PART III: PROCESSES IN INFECTION PREVENTION AND CONTROL

### 15.0. TRAFFIC FLOW AND ACTIVITY PATTERNS

The process of infection prevention control requires specific interventions during care of patients with evidenced based actions. The process involves the facilities and healthcare workers to have an ability to execute duties and comply with recommended best patient care practices. Adherence to the standards on IPC during care of patients it is an important measure to improve quality of care and to implement risk reduction and reduce hospital acquired infections (HAIs).

Regulating the flow of visitor's, patients, clients and staff plays a central role in preventing disease transmission in health care facilities. The number of microorganisms in designated area tends to be related to the number of people present and their activities. Microbial contamination is expected and is found to be high in areas such as waiting room and places were soiled surgical instruments and other equipment are initially processed. Contamination can be minimised by reducing the number of people permitted into an area and by restricting the activities that take place there.

**Procedural area**

Where patients are examined and procedures are carried out (e.g., pelvic examinations, wound care management, blood drawing, immunizations, IUD insertions and removals, and normal childbirth) occur. The following guidelines apply to areas where HCWs perform procedures on patients:

- Set and display rules and protocols of procedural area i.e. theatre, labour ward, CSSD, ICU, etc.
- Permit only the patient and the staff performing and assisting with procedures in the procedure room. The number of people should be kept to a minimum.
- Patients or clients must were health facility clothes/uniform when admitted and patients undergoing major surgical procedures must wear facility-provided hospital clothes
- Staff should wear attire and PPE appropriate for the procedure they are performing.
- A covered container filled with disinfectant should be available for the immediate decontamination of instruments and other items after they have been used but do not use chlorine
- A leak-proof, 3 bin system colour coded must be covered with waste container should be available for the disposal of contaminated waste items.
- A puncture-resistant container or safety box should be available for the safe disposal of sharps at the point of generation.
- Clean, high-level disinfected and sterile supplies should be stored and available in procedure rooms.

- All items from the procedural area must be well organized in a “can see” “can take” and “can return” principle (practice of 5S-KAIZEN-TQM approach)
- Organize the equipment and furniture according to the working flow.
- Where major and minor operations are performed. The Surgical unit also includes preoperative and recovery rooms as well as several other areas. The surgical unit is divided into four designated areas including unrestricted area, transition zone, semi-restricted area, and restricted area.

**Space and Equipment Requirements**

The space, equipment and need for well-defined traffic flow and activity patterns become more complex and may differ from lower to higher level health facility. However, for the secondary (district and designated hospital) and tertiary health facility (regional referral hospital and national referral hospital), the type of surgical procedure changes from general surgery and obstetrics to open heart surgery. These include the following.

- Changing room and scrub area for clinic staff
- Preoperative area where clients are examined and evaluated prior to surgery
- Operating room
- Recovery area for patient observation after surgery (may be combined with the preoperative area)
- Processing area for cleaning and sterilizing or high-level disinfecting instruments and other items
- Space for storing sterile packs and/or high-level disinfected containers of instruments and other items

## 16.0. CENTRAL STERILIZATION SUPPLY DEPARTMENT (CSSD)

The CSSD is the area where instruments and equipment are processed, and where staff should be specially trained in handling, processing and storing instruments, equipment and other clean, sterile or high-level disinfected items.

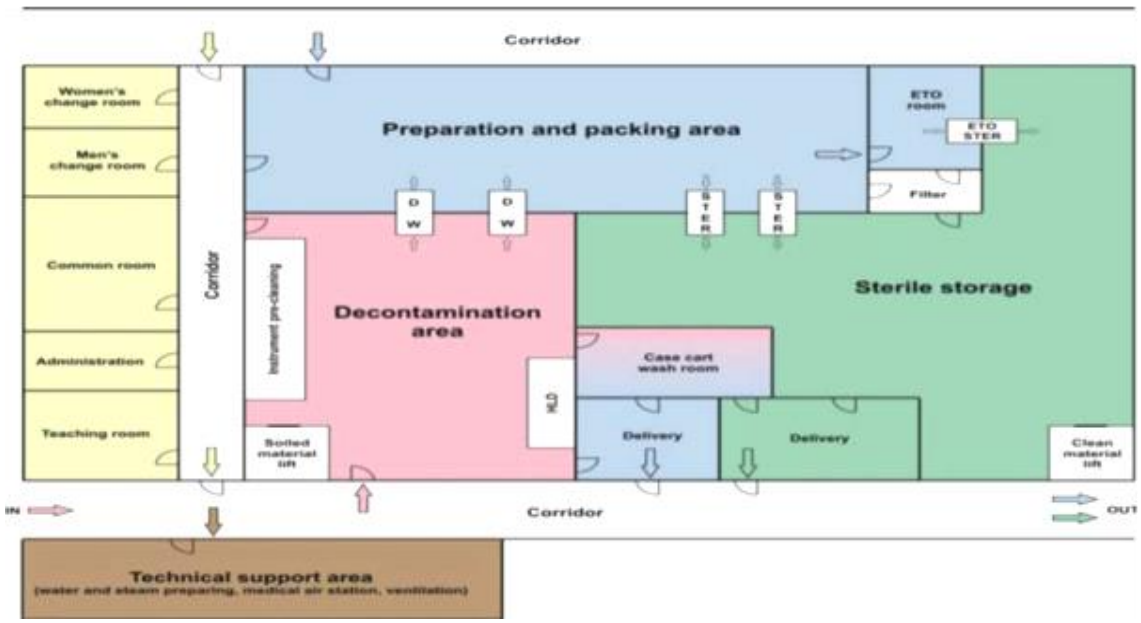
**Structure of a central sterile services department/unit**

The CSSD may be laid out in various configurations, depending on the size of the population it serves, the number of operations it has to support, and the distance from the service delivery to the point of use. It is advisable to choose the most effective and appropriate layout based level of health facility, workload, staffing and financial resources, but the basic functioning and integrity of the department must not be compromised.

**Advantages of CSSD***:*

- *Efficiency*: staff of all levels, knowledge and experience are maximized, thus improving productivity;
- *Economy*: the initial outlay for capital equipment is high, but the processing can be used optimally and improve cost effectiveness;
- *Safety*: can be upgraded and modernized, which will improve patient safety;
- *Validation:* this allows processing systems to be standardized, resulting in improved Quality Assurance programme.

## 16.1. Layout of CSSD




****NOTE:** Ideally, CSSDs should be divided into areas that are physically separated with a clear unidirectional movement.
workflow from dirty to clean.

There should be physical barriers, such as walls or double-door (pass-through) sterilizers between the packing and the sterile storage area. There should be no crossover of staff or devices unless specifically indicated, such as returning devices that have not been properly cleaned. The space shall be designed to ensure a one-way movement of staff and devices from contaminated to clean areas to minimize the bioburden and particulate contamination.

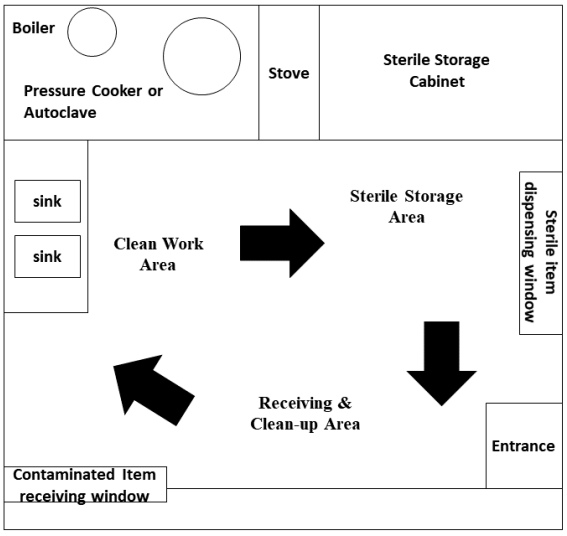
**Basic criteria are:**

- *Entrance and corridors (public areas);*
- *Gowning points for staff to don PPE prior to entering work areas;*
- *Dirty area receiving of used medical devices (dirty area);*
- *Inspection, assembly and packing [IAP] (clean);*
- *Sterilization area (sterilizers);*
- *Sterile store (cooling and short-term storage);*
- *Administration and staff rest and changing areas (essential to be away from work areas);*
- *Storage for devices, chemicals and packaging stores (raw material and SSD products);*

**Smaller specialized sterilization units**

Smaller units may be decentralized and could be located in operating theatres, endoscopy units or diagnostic departments. A theatre sterile services unit (TSSU) is no longer accepted practice unless there are specific reasons, such as remotely located operating theatre suites with limited devices, surgical trays, processing equipment and resources, including transportation. However, if such smaller units do exist, these must be well controlled with complete systems of validation in place as in larger SSDs.

**Layout of smaller sterilization units**



The CSSD is considered a semi-restricted area, so all the recommendations for traffic patterns and surgical attire described above should be followed. A CSSD consists of four areas:

1. The “dirty” receiving/clean-up area;
2. The “clean” work area;
3. The cleaning equipment storage area;
4. The sterile or high-level disinfected storage area.

The function and equipment requirements for the four areas of a typical CSSD are summarized below

**1. “Dirty” Receiving/Clean-up Area**

In this area soiled items are received, disassembled and washed, rinsed and dried. The “dirty” receiving/clean-up area should have:

- A receiving counter;
- Two sinks if possible (one for cleaning and one for rinsing) with a clean water supply;
- A clean equipment counter for drying.

**2. “Clean” Work Area**

In the clean work area, cleaned items are:

- Inspected for flaws or damage;
- Packaged (if indicated), and either sterilized or high-level disinfected;
- Sent for storage as packaged or air dried and placed in a sterile or high-level disinfected container.

The clean work area should have:

- A large work table;
- Shelves for holding clean and packaged items;
- A high-pressure steam sterilizer, a dry-heat oven, a steamer or a boiler.

**3. Cleaning Equipment Storage Area**:

Store clean equipment in this area on shelves (preferably enclosed) for storing clean equipment; have an office desk for record keeping. CSSD staff should enter the through this area.

**4. Sterile or High-Level Disinfected Storage Area**:

- Store sterilized packs and covered sterile or high-level disinfected containers in this area. This area should be separated from the central sterile supply area. Limit access to the storage area and/or store items in closed cabinets or shelves.
- Enclosed shelves or cabinets are preferred as they protect packs and containers from dust and debris. Open shelves are acceptable if the area has limited access, and housekeeping and ventilation practices are controlled.

- Keep the storage area clean, dry, dust-free and lint-free by following a regular housekeeping schedule.
- Packs and containers with sterile or high-level disinfected items should be stored 20 to 25 cm (8 to 10 inches) off the floor, 45 to 50 cm (18 to 20 inches) from the ceiling and 15 to 20 cm (6 to 8 inches) from an outside wall
- Do not use cardboard boxes for storage (Cardboard boxes shed dust and debris and may harbour insects).

Date and rotate the supplies (first in, first out). This process serves as a reminder that the package is susceptible to contamination and conserves storage space, but it does not guarantee sterility.

Packs will remain sterile as long as the integrity of the package is maintained.
Sterile or high-level disinfected containers remain so until they are opened.

- Dispense sterile and high-level disinfected articles from this area.

****NOTE:** Medical devices processed outside the CSSD cannot be controlled and are considered unsafe unless these processes are under the supervision of highly-trained staff of a similar caliber to those in the CSSD.

### 16.2. Shelf Life

The shelf life of a packaged sterile item is event-related and time-related. An event can compromise the integrity and effectiveness of the package. Events that can compromise or destroy package sterility include multiple handling, loss of package integrity, moisture penetration and airborne contamination. Sterility is lost when the package has tears in the wrapper, has become wet, has been dropped on the floor, has dust on it or is not sealed.

Factors that can destroy sterility or compromise the efficiency of the packaging material to act as a bacterial barrier are:

- Dust;
- Moisture;
- Holes, breaks, rupture of seals;
- Opening the package.

Also, sterile items stored more than 7 days are regarded contaminated even though there is no break in the package. These items should be re-sterilized.

****Note:** Share information to other staff by displaying rules and regulations of CSSD by using labels, safety signs, i.e., colour coded or zoning.

### 16.3. Handling and Transporting Instruments and Other Items before Use

- Keep clean and high-level disinfected or sterile instruments and other items separate from soiled equipment and waste items. Do not transport or store these items together.
- Transport high-level disinfected and sterile instruments and other items to the procedure or operating room in a closed container with a cover to prevent contamination.
- Remove supplies from all shipping cartons and boxes before bringing such supplies into the procedure room, the operating room or the clean work area of the CSSD.
- (Shipping boxes shed dust and harbour insects that may contaminate these areas).
- Transport soiled supplies and instruments to the receiving/clean-up area of the CSSD in leak-proof, covered waste containers.
- Transport contaminated waste to the disposal site in leak-proof, covered waste containers.

## 17.0. PROCESSING INSTRUMENTS AND EQUIPMENTS

Health worker need to consider the following issues to prevent the risk of transferring infection from instruments and equipment, which depends on the following factors:

- The presence of micro-organisms, the number and virulence of these organisms;
- The type of procedure that has been performed (invasive or non-invasive), and
- The body site where the instrument that has been used (penetrating the mucosal or skin tissue or used on intact skin).

### 17.1. Decontamination of reusable equipment according to the Spaulding classification

The risk of transmission is classified according to the site where the instrument has been used. Contact sites for instruments may be classified as:

- Critical are instruments or device that introduced directly into the blood stream or normally sterile areas of the body. This will require sterilization ie surgical instrument, implants;
- Semi critical are instruments or device that come into contact with intact mucus membrane but not penetrate the blood barrier may be either sterilized or high level disinfected. i.e., non-invasive flexible and rigid fiber optical endoscopes, endotracheal tube and anaesthesia breathing circuits;
- Non-critical. Are instruments or device that do not touch the patient or touch only intanct skin. Those items can be cleaned and then disinfected with intermediate level of disinfectant/ sanitizes with low level disinfenctants or cleaned with soap and water. Include blood pressure cuff bedpans linens furniture floors and other medical accessories.

**Spaulding classification**

| Risk category | Recommended level of decontamination | Examples of medical devices |
|---|---|---|
| *High (critical)*<br>Items that are involved with a break in the skin or mucous membrane or entering a sterile body cavity | Sterilization | Surgical instruments, implants/prostheses, rigid endoscopes,<br>syringes, needles |
| *Intermediate (semi-critical)*<br>Items in contact with mucous membranes or body fluids | Disinfection (high level) | Respiratory equipment, non-invasive flexible endoscopes, bedpans, urine bottles |
| *Low (non-critical)*<br>Items in contact with intact skin | Cleaning (visibly clean) | Blood pressure cuffs, stethoscopes |

**Source:** WHO Practical Guidelines for Infection Control in Health Care Facilities

## 17.2. Decontamination

The meaning of Decontamination According to OSHA, is “the use of physical or chemical means to remove, inactivate, or destroy blood-borne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface of an item is rendered safe for handling, use, or dispose.

**Levels of Decontamination**

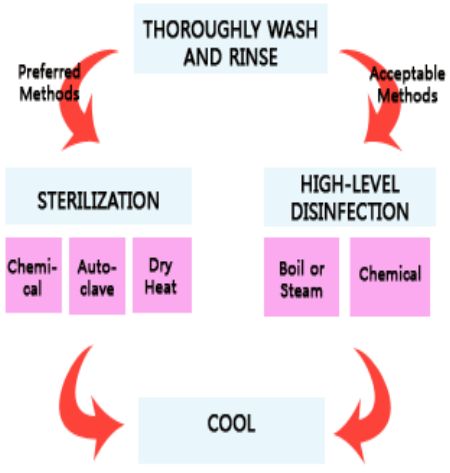
| | |
|---|---|
| **Cleaning** | The physical removal of body materials, dust or foreign material. Cleaning will reduce the number of microorganisms as well as the soil, therefore allowing better contact with the surface being disinfected or sterilized and reducing the risk of soil being fixed to the surface.<br>Removal of soil will reduce also the risk of inactivation of a chemical disinfectant and the multiplication of microorganisms. The removal of contamination from an item to the extent necessary for further processing or for intended use.<br>Cleaning is accomplished by manual cleaning with cleaning chemicals (detergent) and water, brushing or flushing, or by using ultrasonic and or washer disinfectors to remove foreign material. |
| **Disinfection** | The destruction or removal of microorganisms at a level that is not harmful to health and safe to handle. This process does not necessarily include the destruction of bacterial spores.<br>General disinfection is accomplished by wiping surfaces with disinfectant solution. |
| **High Level Disinfection** | A process that eliminates all microorganisms except some bacterial endospores from inanimate objects. Processes include boiling, steaming or the use of chemical disinfectants. |
| **Sterilization** | The complete destruction or removal of microorganisms, including bacterial spores. Sterilization validated process used to render a product free from viable microorganisms.<br>Processes include high-pressure steam (autoclave), dry heat, chemical sterilant or radiation (UV-light). |

**PROCESSING INSTRUMENTS AND OTHER ITEMS**

Clean with enzymatic detergent

**Sterilization**

- Chemical: soak in 0.3% ortho-phthalaldehyde (Cidex OPA) for 12 minutes
- Autoclave: 106 Kp(15 lbs /msq) 121 centigrade (250 F) 20 Min unwrapped or 30 min
- Dry heat: 170 C for 60 minutes



**High-Level Disinfection** Boil or steam:

- Boil or steam lead on for 20 minutes
- Chemical: soak in 0.3% ortho-phthalaldehyde (Cidex OPA) for 12 minutes

### 17.3. How to dilute Chlorine

**Preparing Dilute Chlorine Solutions from Liquid Bleach (Sodium Hypochlorite Solution)**

**Using Liquid Bleach**

Chlorine in liquid bleach comes in different concentrations. Any concentration can be used to make a dilute chlorine solution by applying the following formula:

$$\text{Total parts (TP) of water} = \frac{(\%\ \text{concentrate})}{(\%\ \text{dilute})} - 1$$

*Example1:*

To make a 0.5% chlorine solution from 3.5% bleach

$$\frac{(3.5\%)}{(0.5\%)} - 1 = 6.$$

Take 1 part concentrated solution, add 6 parts of water to make a 0.5% chlorine solution

$$\textit{Total Parts (TP) of water} = \frac{(\%\ \text{Concentrate})}{(\%\ \text{Dilute})} - 1$$

Example 2: Make a dilute solution (0.1%) from 5% concentrated solution

• Calculate TP (H2O) $= \frac{(5.0\%)}{(0.1\%)} - 1 = 50 - 1 = 49$

• Take 1 part concentrated solution and add to 49 parts boiled (filtered if necessary) water.

**Formula for Making Chlorine Solution from Dry Powder**

• Check concentration (% concentrate) of the powder you are using

• Determine grams of bleach powder needed

$$\text{Grams/Litre} = \frac{(\%\ \text{Dilute}) \times 1000}{(\%\ \text{concentrate})}$$

• Mix measured amount of bleach powder with 1 liter of water.

Example: To make a 0.5% chlorine solution from calcium hypochlorite powder containing 35% active chlorine:

$$\frac{(0.5\%)}{(35\%)} \times 1000 = 0.0143 \times 1000 = 14.3$$

Therefore, you must dissolve 14.3 grams of calcium hypochlorite powder in one litre of water to get a 0.5% chlorine solution.

****Note:** When bleach powder is used: the resulting chlorine solution is likely to be cloudy (milky)
*Source: AVSC International (1999). Infection Prevention Curriculum, Teachers Manual.* New York, pg.267.

**Preparing Dilute Chlorine Solutions from Dry Powders**
Examples of dry chlorine powders in the market and their strengths
Available Chlorine Required Concentrations Required
0.5% 0.1%?
Calcium hypochlorite (70% available chlorine) 7.1 g/L[a] 1.4 g/L
Calcium hypochlorite (35% available chlorine) 14.2 g/L 2.8 g/L
NaDCCc (60% available chlorine) 8.3 g/L 1.5 g/L
Chloramine tablets (1 g of available chlorine per tablet) 20 g/L (20 tablets/liter)d 4 g/L (4 tablets/liter) d
NaDCC-based tablets (1.5 g of available chlorine per tablet) 4 tablets/liter 1 tablet/liter

- For dry powders, read x grams per liter (example: Calcium hypochlorite – 7.1 grams mixed with 1 liter water).
- Use boiled water when preparing a 0.1% chlorine solution for HLD because tap water contains microscopic organic matter that inactivates chlorine.
- Sodium dichloroisocyanurate
- Chloramine releases chlorine at a slower rate than does hypochlorite. Before using the solution be sure the tablet is completely dissolved

*Adapted from World Health Organization, 1989.*

| **WHO Recommendations** |
| --- |
| **Soaking of instruments in 0.5% chlorine solution or any other disinfectant before cleaning is *not recommended* for the following reasons:**<br>• It may damage/corrode the metallic instruments<br>• The disinfectant may be inactivated by blood and body fluids, which could become a source of microbial contamination and formation of biofilm<br>• Transportation of contaminated items soaked in chemical disinfectant to the decontamination area may pose a risk to health-care workers and result in inappropriate handling and accidental damage<br>• May contribute to the development of antimicrobial resistance to disinfectants |

**Guidelines for Processing Instruments and Other Prevention**

| Instruments | Decontamination | Cleaning | Sterilization | High Level Disinfection |
|---|---|---|---|---|
| **Airways (Plastic)** | Soak in 0.5% chlorine solution for minutes after to cleaning and then rinse and wash immediately | Wash with soap and water rinse with clean water. Air or towel dry | *Not necessary* | *Not necessary* |
| ***Ambubag and CPR face mask*** | Wipe exposed surfaces with gauze pad soaked in 60B 90% Alcohol or 0.5% chlorine: rinse immediately | Wash with soap and water rinse with clean water. Air or towel dry | *Not necessary* | *Not necessary* |
| ***Aprons (Heavy Plastic rubber)*** | Wipe with 0.5% Chlorine solution rinse with clean water. Between each procedure or each time they are taken over | | | |

## 17.4. Cleaning during Decontamination

**Cleaning**

Cleaning is the removal of organic materials and debris from used items by washing with soap and water and friction.

- Cleaning that follows decontamination can remove up to 90% of microorganisms (bacteria, viruses, fungi and parasites) and is the best way to reduce the number of endospores, which cause tetanus and gangrene;
- Cleaning should be done under water, using liquid soap or enzymatic detergent and friction to remove all organic material from instruments;
- After cleaning, rinse items in clean water until no detergent remains;
- Air-dry items whenever possible;
- Use heavy-duty gloves for cleaning instruments;
- Wash hands after removing gloves.

**Care of all instruments**

- Those instruments with moving parts should be lubricated after drying;
- Avoid oils that may protect bacteria during autoclaving;

- Water-soluble lubricant is recommended (Karl Zsort or Olympus instrument oil);
- Never use steel wool or abrasive powders on stainless steel instruments;
- Never label surgical instruments with masking tape;
- Staining/spotting of instruments can be caused by moisture or water;
- When instruments do stain in spite of all good care taken they can be cleaned by using a commercially available rust and stain remover.

**New instruments**

- All new instruments are supplied without lubrication. It is recommended that all be carefully washed and dried and any moving part lubricated;
- Whenever cleaning, regardless of method, keep ratchets unlocked and box joints open;
- When instruments are no longer new, avoid as far as possible contact between stainless steel instruments and any of the following substances: barium chloride, aluminium chloride, bromide and iodine containing compounds.

**Manual cleaning of soiled instruments and equipment**

- When an operation is in progress do not drop instruments into a holding solution of disinfectant. If the instruments are not cleaned first, disinfectants such as chlorine act as fixatives of any organic material present, making it difficult to remove;
- Instruments should not be soaked in saline, as they will become pitted;
- Dilute detergent properly as per supplier’s directions;
- Completely dismantle all items and leave instruments open;
- Use warm water, detergent and a hard brush to completely remove the blood, tissue, food and other residue, paying special attention to small teeth of instruments and joints;
- Finally rinse with clean water to remove traces of detergent;
- Dry properly. Failure to remove water from trapped areas will cause corrosion;
- Consider the item contaminated when packaging is torn, damaged, wet, dropped on the floor and when the expiry date has passed.

### 17.5. High-Level Disinfection (HLD)

HLD is the process that eliminates all microorganisms (including bacteria, viruses, fungi and parasites), but does not reliably kill all bacterial endospores, which cause diseases such as tetanus and gas gangrene. HLD is suitable for instruments and items that come in contact with broken skin or intact mucous membranes.

***Note:** Sterilization kills all microorganisms, including bacterial endospores; it is preferable to HLD for instruments and other items that will come in contact with the bloodstream or tissues under the skin. If sterilization is not available, HLD is the only acceptable alternative*.

**HLD can be performed by:**

- Boiling;
- Soaking in chemicals;
- Steaming.

### 17.5.1. High-Level Disinfection by boiling

Step 1: Clean all items to be boiled:

- Open all hinged items and disassemble those with sliding or multiple parts;
- Completely submerge all items in the water in the pot or boiler;
- Place any bowls and containers upright, not upside-down, and fill with water.

Step 2: Cover the pot or close the lid on the boiler and bring the water to a gentle, rolling boil.

Step 3: When the water comes to a rolling boil, start timing for 20 minutes;

- Use a timer to make sure to record the time that boiling begins;
- From this point on, do not add or remove any water and do not add any items to the post or boiler.

Step 4: Lower the heat to keep the water at a gentle, rolling boil.

***Note:** If the water boils too vigorously, it will evaporate, and the items may become damaged if they bounce around the container and hit the sidewalls and other items being boiled. Lower heat also saves fuel or electricity.*

Step 5: After 20 minutes, remove the items using dry, HLD pickups (lifters, cheatle forceps). Place the items on an HLD tray or in an HLD container away from insects and dust.

Step 6: Allow to air-dry before use or storage

Step 7: Use items immediately or keep them in a covered, sterile or HLD container for up to one week.

***Note: Never leave boiled items in water that has stopped boiling; they can become contaminated as the water cools down.***

***Tips for HLD by Boiling***

- Items must be completely covered with water. Open all hinged instruments and disassemble items with sliding or multiple parts;
- Always boil for 20 minutes. Start timing when the water reaches a rolling boil. If you forget to start timing the procedure, start timing at the point at which you realize this;
- Do **not** add **anything** to or remove **anything** from the boiler once boiling begins.

### 17.5.2. High-Level Disinfection by Steaming

**After instruments and other items have been decontaminated and thoroughly cleaned, they are ready for HLD by steaming.**

Step 1: Place instruments, plastic MVA cannulas and other items in one of the steamer pans with holes in the bottom. To make removal from the pan easier, do not overfill the pan.

Step 2: Repeat this process until up to three steamer pans have been filled. Stack the filled steamer pans on top of a bottom pan containing water for boiling. A second empty pan without holes should be placed on the counter next to the heat source.

Step 3: Place a lid on the top pan and bring the water to a full rolling boil. (When water only simmers, very little steam is formed and the temperature may not get high enough to kill microorganisms).

Step 4: When steam begins to come out between the pans and the lid, start the timer or note the time on a clock and record the time in the HLD log.

Step 5: Steam items for 20 minutes.

Step 6: Remove the top steamer pan and put the lid on the pan that was below it (the pan now on top). Gently shake excess water from the pan just removed.

Step 7: Put the pan just removed onto the empty pan. Repeat until all pans are restacked on this empty pan and the top pan is covered with the lid. (This step allows the items to cool and dry without becoming contaminated).

Step 8: Allow items to air dry in the steamer pans (1 to 2 hours) before using.

Step 9: Using a high-level disinfected forceps, transfer the dry items to a dry, high-level disinfected container with a tight-fitting cover. Instruments and other items can also be stored in the stacked and covered steamer pans as long as a bottom pan (no holes) is used.

***Note: Both boiling and steaming share some advantages and disadvantages over chemical high-level disinfection, which is the only other method of HLD.***

### 17.5.3. High-Level Disinfection by Chemicals

Step 1: Clean, and thoroughly dry all instruments and other items to be processed. Water from wet items will dilute the chemical solution, thereby reducing its effectiveness.

Step 2: When using OPA solution: Prepare the 0.3% solution according to the manufacturer’s instructions. Ideally, an indicator strip should be used each time the solution is used to determine if the solution is still effective. After preparing the solution, place in a clean container with a lid. Mark the container with the date the solution was prepared and the date it expires. If using unboiled water, as described. Fresh solution should be made each day

or more often if the solution becomes cloudy. Put the solution in a clean container with a lid.

****Note:** Use chlorine solution with boiled water and not tap water

Step 3: Open all hinged items and disassemble those with sliding or multiple parts. The solution must contact all surfaces in order for HLD to be achieved. Completely submerge all items in the solution. All parts of the items should be under the surface of the solution. Place any bowls and containers upright, not upside-down, and fill with the solution.

Step 4: Cover the container and allow the items to soak for 20 minutes. Do not add or remove any instruments or other items once timing has begun.

Step 5: Remove the items from the solution using dry, HLD pickups (lifters, cheatle forceps).

Step 6: Rinse thoroughly with sterile or boiled water to remove the residue that chemicals leave on items. This residue is toxic to skin and tissue.

Step 7: Place the items on an HLD tray or in an HLD container and allow to air dry before use or storage. Use items immediately or keep in a covered, dry HLD container and use within one week.

**Tips for Chemical HLD**

- Items must be completely covered with solution;
- Open all hinged instruments and disassemble items with sliding or multiple parts;
- Soak for 20 minutes. If you forget to start timing, start at the point you remember;
- Do not add or remove anything once timing begins;
- Rinse items thoroughly with boiled water;
- Antiseptics should **never** be used for HLD.

## 17.6. Sterilization

Sterilization protects patients by eliminating all micro-organisms (bacteria, viruses, fungi, and parasites), including bacterial endospores, from instruments and other items. Sterilization is recommended for instruments and other items that will come in contact with the bloodstream or tissues under the skin, as well as on draped and some surgical attire. Sterilization can be performed using:

- dry heat (oven)
- high pressure steam (autoclaving)
- soaking in chemicals (cold sterilization)

Heat (autoclaving/steam and dry heat) is the most effective method of sterilization and reliable if monitored carefully. It is also cheaper than chemical methods. It should be considered first for all medical equipment that can withstand heat. Chemicals are the alternative where heat cannot be used, e.g., ethylene oxide and glutaraldehyde.

### 17.6.1. Sterilization by Dry Heat

Time/Temperature:

- 1 hour at 170 degrees C (340 degrees F);
- 2 hours at 160 degrees C (320 degrees F);
- 21/2 hours at 150 degrees C (300 degrees F);
- 3 hours at 140 degrees C (285 degrees F).

### 17.6.2. Sterilization by Steam

- Time 20 minutes (or 30 minutes if wrapped);
- Temperature 121 degrees C (250 degrees F);
- Pressure 106 KPA (15 lbs/sq inch).

### 17.6.3. Sterilization by Chemicals

Chemical sterilization method is used for instruments and other items that are heat-sensitive or when heat sterilization is not available.

Step 1: Clean, and thoroughly dry all instruments and other items to be sterilized. Water from wet instruments and other items dilutes the chemical solution, thereby reducing its effectiveness.

Step 2: Prepare the glutaraldehyde or other chemical solution by following the manufacturer's instructions or use a solution that was prepared previously, as long as it is clear (not cloudy) and has not expired. After preparing the solution, put it in a clean container with a lid. Always mark the container with the date the solution was prepared and the date it expires.

Step 3: Open all hinged instruments and other items and disassemble those with sliding or multiple parts, the solution must contact all surfaces in order for sterilization to be achieved. Completely submerge all instruments and other items in the solution. Place any bowls and containers upright, not upside-down, and fill with the solution

Step 4: Follow the manufacturer's instructions regarding the time necessary for sterilization to be achieved. In general, if the solution contains glutaraldehyde, cover the container, and allow the instruments and other items to soak for 10 hours. Do not add or remove any instruments or other items once time has begun.

Step 5: Remove the instruments and other items from the solution using large, sterile pickups (lifters, cheatle forceps).

Step 6: Rinse thoroughly with sterile water to remove the residue that chemicals leave on instruments and other items; this residue toxic to skin and tissues.

Step 7: Storage: Place the instruments and other items on a sterile tray or in a sterile container and allow air-drying before use. Use the instruments and other

items immediately or keep in a covered, dry, sterile container and use within one week.

Step 8: After processing, items should be used immediately or stored in such a way that they do not become contaminated. Proper storage is as important as proper processing.

## 18.0. HOUSEKEEPING

Housekeeping refers to the general cleaning of hospitals and clinics, including the floors, walls, and certain types of equipment, furniture and other surface Health care environments are important reservoirs for infectious microorganism and are critical to address. Targeted prevention effort can reduce the rate of some HAI by 70%. Healthcare personnel play a critical role in targeted prevention efforts.

**Microbe Survival**
**Survival of select pathogen on environmental surfaces**

| Pathogen | Survival Time |
|---|---|
| **Bacteria** | |
| **C. difficile** | ≥ 1 year |
| **MRSA** | 7 days – 7 months |
| **VRE** | 5 days – 4 months |
| **Viruses** | |
| **Hepatitis B** | ≥ 1 month |
| **Norovirus** | 8 hours – 7 days |

Kramer A, et al. BMC Infect Dis. 2006;6:130.

Housekeeping refers to the general cleaning of hospitals and clinics, including the floors, walls, and certain types of equipment, furniture and other surfaces. Cleaning entails the removal of dust, soil, and microbial contaminants on environmental surfaces since they are the potential source of healthcare associated infection. Effective and efficient cleaning methods and schedules are, therefore, necessary to maintain a clean and healthy environment in healthcare settings.

The purposes of general housekeeping are to:

- To reduce the number of micro-organisms that may come into contact with the health workers, clients or members of the community who visit the facility;
- To reduces the risk of incidence through prevention of accidents such as falls and so on;
- To ensures a pleasant atmosphere for both health workers and patients/clients.

In high-risk areas where heavy contamination is expected, such as toilets and latrines, or for blood or body fluid spills, collect all blood or body fluid spill, then wipe with 0.5% chlorine solution. 1% phenol should be added to the cleaning solution (SEARO 1988). Using a disinfectant in addition to soap and water is also recommended in other high-risk areas such as operating rooms, pre- and postoperative recovery areas and intensive care units (ICUs).

If the purpose of housekeeping as stated above is to be achieved, it is important that housekeeping staff be trained to perform their assigned tasks and are supervised on a regular basis.

As part of their training, it is important that housekeeping staff:

- Understand the risk of exposure to contaminated items and surfaces when performing environmental cleaning procedures;
- Follow recommended policies and guidelines, including the use of appropriate personal protective equipment.

## 18.1. Definitions

### Housekeeping

- Housekeeping Is an art of maintaining healthcare facility and management of duties involved in the running of a household, such as cleaning, cooking, home maintenance and laundry.

### Cleaning

- This is the process which removes foreign materials (such as soil, blood, body fluids and micro-organisms) from an object. Usually running water and soap are applied;
- Accumulation of dust, soil, and microbial contaminants on environmental surfaces is both aesthetically displeasing and a potential source of hospital acquired infection infections;
- Effective cleaning methods and schedules are, therefore, necessary to maintain a clean and healthy environment in healthcare settings.

### Cleaning solution

- Any combination of soap (or detergent) and water, with or without a chemical disinfectant, used to wash or wipe down environment surfaces such as floors, chairs, benches, walls and ceilings.

### Disinfectants

- Chemicals that destroy or inactivate microorganisms. Disinfectants are classified as low-, intermediate- or high-level depending on their ability to kill or immobilize some (low- or intermediate-level) or all (high-level) microorganisms (but not all spores).
- Phenols, chlorine or chlorine-containing compounds and QUATs are classes of disinfectants frequently used to clean non-critical surfaces such as floors, walls and furniture.

### Disinfectant cleaning solution

- Disinfectant cleaning solution is products that are a combination of a detergent (soap) and a chemical disinfectant. Not all detergents and

disinfectants are compatible. Several combinations are available commercially or can be prepared, such as alkaline detergents with chlorine compounds, alkaline detergents with quaternary ammonium compounds (QUATs) or other nonionic surfactants, and acid detergents with iodophors.

**Environmental controls**

- Environmental controls are standards specifying procedures to be followed for the routine care, cleaning and disinfection of environmental surfaces, beds, bedrails, bedside equipment and other frequently touched surfaces.

**Sanitizers**

- Sanitizers include chemicals that reduce the number of bacterial contaminants to safe levels on inanimate objects based on public health requirements (i.e., a chemical that kills 99.999% of the specific test bacteria in 30 seconds under the conditions of the test).

**Soaps and detergents (terms used interchangeably)**

- These are cleaning products (, liquid, leaflet or powder) that lower surface tension, thereby helping remove dirt, debris and transient microorganisms from hands. Plain soaps require friction (scrubbing) to mechanically remove microorganisms; antiseptic (antimicrobial) soaps kill or inhibit the growth of most microorganisms.

**General Principles for Cleaning Hospitals, Clinics and other Healthcare**

- Scrubbing (frictional cleaning) is the best way to physically remove dirt, debris and microorganisms.
- Cleaning is required prior to any disinfection process because dirt, debris and other materials can decrease the effectiveness of many chemical disinfectants.
- Cleaning products should be selected on the basis of their use, efficacy, safety and cost.
- Cleaning should always progress from the least soiled areas to the most soiled areas and from high to low areas, so that the dirtiest areas and debris that falls on the floor will be cleaned up last.
- Dry sweeping, mopping and dusting should be avoided to prevent dust, debris and microorganisms from getting into the air and landing on clean surfaces. Airborne fungal spores are especially important as they can cause fatal infections in immunosuppressed patients (Arnow et al., 1991).
- Mixing (dilution) instructions should be followed when using disinfectants.
  (Too much or too little water may reduce the effectiveness of disinfectants).
- Cleaning methods and written cleaning schedules should be based on the type of surface, amount and type of soil present and the purpose of the area.
- Routine cleaning is necessary to maintain a standard of cleanliness.

- Schedules and procedures should be consistent and posted

***Source:*** Tietjen, L., D. Bossemeyer and N. McIntosh. (2003) *Infection Prevention - Guidelines for Healthcare Facilities with Limited Resources.* JHPIEGO Corporation. Baltimore, Maryland, p. 16-2.

### 18.2. How to Select Disinfectants and Cleaning Product

When selecting a disinfectant or other cleaning product, consider manufactural instructions need to be closely followed master label provide more details about product including pathogen targeted, required contact time including safety precautions.

**Selecting disinfectants**

Not all products target the same pathogens or required the same contact times, and safety organisms. Different product might need to be used to optimize disinfection. Disinfectants should be selected based on an institutions current needs and situation.

**Preparing disinfectants**

To optimize safety and efficacy, the manufacturers label should always be followed when preparing and using disinfectants, common used formulations include concentrates and premoistened wipes:

- Concentrates require adding water and are most often used by environmental services;
- Premoistened wipes are ready to use and are most commonly used by direct care providers;
- Personnel should never mix disinfectants together to try to target a broader spectrum of pathogen this practice does not improve efficacy;
- Contact time it takes for disinfectants to kill a particular pathogen, which occurs when the surface is wet and the pathogen is in direct contact with disinfectants;
- Products have varying contact times, ranging from 1 to 10 minutes;
- Agent that targets necessary pathogens and has a contact time matching the process and cleaning time available should be selected;
- If products with no longer contact times pose a challenge, contact time is affected by dry time, which is the time it takes for disinfectants to evaporate from the surface;
- If a product requires a long contact time but dries quickly, repeat applications might be needed. (CDC Guideline for disinfection and sterilization in Healthcare facilities 2008).

Different types of cleaning products are available. liquid soap and detergents, disinfectants, combinations (detergent and disinfectant) and sanitizers. Each type has different properties.

**An ideal cleaning product should accomplish the following:**

- Suspension of fats (suspend fats in water);
- Saponification of fats (make fats water-soluble);
- Surfaction (decrease surface tension of water and allow greater penetration of the agent into the dirt or soil);
- Dispersion (break up of soil into small particles);
- Protein destruction (break up protein);
- Softening the water (removal of calcium and magnesium).

**How to Prepare Disinfectant Cleaning Solution**

Although chlorine-containing solutions are excellent, inexpensive disinfectants. They should not be mixed with cleaning solutions containing an acid, ammonia or ammonium chloride. Doing so will release chlorine gas and other by products that can be toxic. 0.5% chlorine solution is ideal for cleaning purpose. Alternatively, 1–2% phenols or 5% carbolic acid can be used as disinfectant for the purpose of cleaning. Adding enough detergent to these disinfectants will make a mild, soapy cleaning solution.

Most commonly used supplimental technologies for healthcare environment disinfection are “no-touch” technologies:

- **Ultraviolet germicidal irradiation** which kills pathogens by exposing them to ultraviolet irradication;
- **Hydrogen peroxide systems** which kill pathogens by exposing them to vaporised (HP).

****NOTE:** cleaning a healthcare environment should not be considered the same as cleaning house, all personel need to have a basic understanding of healthcare cleaning /disinfection and the techniques involved. Use of experts should be maximized, whether to address questions or to educate about product or process. Personnel should be engaged in initiatives to promote a desire to learn more, known more and be better.

## 18.3. Cleaning Methods

Cleaning should start with the least soiled area and move to the most soiled area and from high to low surfaces. Common methods of cleaning are briefly described below.

**Logical Pattern of Cleaning, From Cleanest to Dirtiest**

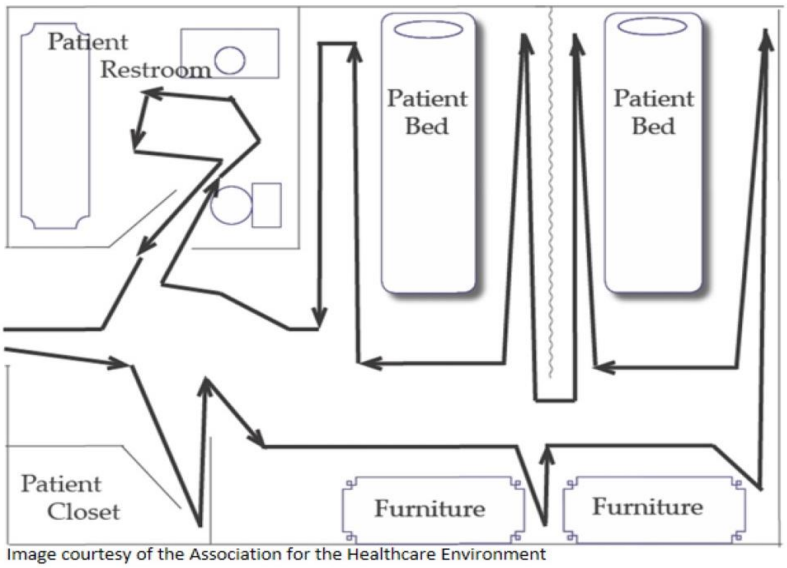



Image courtesy of the Association for the Healthcare Environment

Pattern is specific to private or semi-private rooms, but approach can be applied to any setting

**Wet mopping is the most common and preferred method to clean floors.**

- Single-bucket (basin) technique: One bucket of cleaning solution is used. The solution must be changed when dirty. (The killing power of the cleaning product decreases with the increased load of soil an organic material present);
- Double-bucket technique: Two different buckets are used, one containing a cleaning solution and the other containing rinse water.
- The mop is always rinsed and wrung out before it is dipped into the cleaning solution.
- The double-bucket technique extends the life of the cleaning solution (fewer changes are required), saving both labour and material costs;
- Triple-bucket technique: The third bucket is used for wringing out the mop before rinsing, which extends the life of the rinse water.

Flooding followed by wet vacuuming is recommended in the surgical suite, if possible. This process eliminates mopping, thus minimizing the spread of microorganisms, and increases the contact time of disinfectants with the surface to be cleaned. But it is necessary to leave the floor wet for several minutes. (Flooding is best done at night or at times when foot traffic is minimal).

**Dusting is most commonly used for cleaning walls, ceiling, doors, windows, furniture and other environmental surfaces.**

- Clean cloth or mops are wetted with cleaning solution contained in a basin or bucket;

- The double-bucket system minimizes the contamination of the cleaning solution;
- Dry dusting should be avoided, and dust cloths and mops should never be shaken to avoid the spread of microorganisms;
- Dusting should be performed in a systematic way, using a starting point as a reference to ensure that all surfaces have been reached.

****Note:** *When doing high dusting (ceiling tiles and walls), check for stains that may indicate possible leaks. (Leaks should be repaired as soon as possible because moist ceiling tiles provide a reservoir for fungal growth).*

**Principles for Cleaning:**

- Scrubbing is the best way to remove dirt and micro-organisms, hence always use it;
- It is important to always wear gloves while cleaning, especially heavily contaminated areas such as toilets and areas with blood and body fluids spills;
- Use a damp cloth for walls and floors;
- Dry sweeping should be avoided as the particles spread dust, debris and micro-organisms;
- Use separate equipment like cloths and brushes for cleaning high risk environment and others for low risk environment;
- Change cleaning solutions when absolutely dirty;
- Clean and dry the mops, dusters, cloths and other cleaning equipment after cleaning is over;
- When washing walls, wash from top to bottom and when cleaning surfaces clean from less dirty to very dirty areas;
- When using disinfectants, follow the manufacturer's instructions about diluting the chemicals, their storage and disposal.

**Equipment and Essential Materials for Cleaning**

| Equipment and supplies used for cleaning | Materials used for cleaning |
|---|---|
| • Basins<br>• Dusting buckets<br>• Trolley<br>• Stepping ladder<br>• Hard broom Squeezer<br>• Soft brush<br>• Long sponge sweeper<br>• Gloves<br>• Cobweb remover<br>• Boots | • Soap and disinfectant<br>• Water<br>• Detergent<br>• Paper roll<br>• Disinfectant |

| | |
|---|---|
| • Hazard signs<br>• Apron<br>• Mop bucket and handle | |

**Cleaning Procedure for Different Departments in HCF**

**Procedure of routine cleaning of patient room:**

- Assessment
  - Check for additional precautions signs and follow the precautions
  - Check through room to determine what needs to be replaced (e g, toilet paper, paper towels, soap, alcohol-based hand rub (ABHR), gloves, sharps container) and whether any special materials are required; this may be done before or during the cleaning process
- Assemble supplies
  - Ensure an adequate supply of clean cloths is available
  - Prepare fresh disinfectant solution according to manufacturer's instructions
  - Clean hands, dry and put on gloves
- Procedure for Clean the Room:
  - Working from clean to dirty and high to low areas of the room;
  - Use fresh duster for cleaning each patient's bed;
  - If a bucket is used, do not 'double-dip' duster(s);
  - Do not shake out duster(s);
  - Change the cleaning duster when it is no longer saturated with disinfectant and after cleaning heavily soiled areas such as toilet and bedpan cleaner;
  - If there is more than one patient bed space in the room, use fresh duster(s) for each and complete the cleaning in each bed space before moving to the next;
  - Start by cleaning doors, door handles, push plate and touched areas of frame;
  - Check walls for visible soiling and clean if required;
  - Clean light switches and thermostats;
  - Clean wall mounted items such as alcohol-based hand rub dispenser and glove box holder;
  - Check and remove fingerprints and soil from low level interior glass partitions, glass door panels, mirrors and windows with glass cleaner;
  - Check privacy curtains for visible soiling and replace if required;
  - Clean all furnishings and horizontal surfaces in the room including weighing scales, chairs, window sill, television, telephone, computer keypads, night table and other tables or desks;
  - Lift items to clean the tables;

  - Pay particular attention to high-touch surfaces;
  - Wipe equipment on walls such as top of suction bottle, intercom and blood pressure manometer as well as drip stand;
  - Clean bedrails, bed controls and call bell;
  - Clean floors;
  - Clean bathroom/ shower.

- Disposal
  - Place soiled duster in designated container for laundering;
  - Check sharps container and change when ¾ full (do not dust the top of a sharps container);
  - Remove soiled linen if bag is full;
  - Place obvious waste in receptacles.

- Remove Waste
  - Remove gloves and wash hands with soap and water;
  - Replace supplies as required (e g , gloves, Alcohol base hand rub, soap, paper towel);
  - Clean hands with Alcohol base hand rub.

- Cleaning of Bathrooms and Toilets
  - Run all taps for at least 5 minutes and sign the record sheet;
  - Fill buckets with cold water;
  - Put out hazard signs at entrances;
  - Put on disposable gloves and apron;
  - Pull flush of toilet to ensure clean water in base;
  - Using the toilet brush push water backwards down the U-bend to reduce the amount of water in pan;
  - Spray around the rim and bowl of the toilet with disinfectant leave to activate for a few minutes;
  - Damp dust walls/tiles starting from the highest point to the lowest point;
  - Damp dust all surfaces, fixtures and fittings, including doors and door handles;
  - Spray inside of sink and bath with disinfectant, leave to activate for a few minutes;
  - Clean under sink with brush;
  - Clean inside toilet bowl with toilet brush;
  - Damp a clean piece of paper roll and wipe flush handle, toilet seat base and rim;
  - Pull flush cleaning toilet brush and holder in the running water, dry holder;
  - Pull flush again;
  - Empty bin and clean frame;
  - Mop floor with bucket and mop;
  - Remove utility gloves;
  - Clean out all buckets and dry thoroughly;

  - Remove disposable gloves and wash hands thoroughly;
  - Put on clean gloves remove mop head and place in clear bag and put out for laundry;
  - Remove disposable gloves, apron and wash hands thoroughly;
  - When the floor is dry return the hazard signs to the cleaning cupboard.

- Cleaning Sluice Room:
  - Fill buckets with cold water and detergent;
  - Put mop head onto mop handle;
  - Put out hazard signs at entrances;
  - Wash hands and dry;
  - Put on apron, disposable gloves and utility;
  - Pull flush of sluice pan to ensure clean water in base;
  - Spray around the rim and bowl of the sluice pan with disinfectant leave to activate;
  - Damp dust walls/tiles starting from the highest point to the lowest point;
  - Clean sink removing all body fats;
  - Clean under sink well;
  - Clean sides of macerator with white paper roll;
  - Clean inside sluice pan with toilet brush;
  - Dampen a clean piece of paper roll and wipe flush handle, base and rim;
  - Pull flushes again;
  - Empty bin and clean frame;
  - Remove utility;
  - Mop floor with bucket and mop handle;
  - Remove mop head and place in clear bag;
  - Clean out all buckets and dry thoroughly;
  - Remove disposable gloves and apron and wash hands thoroughly;
  - When the floor is dry return the hazard sign to the cleaning cupboard.

- Consultation/Clinicians Rooms and Corridors
  - Fill damp dusting buckets with cold water and detergent;
  - Fill mop bucket with warm water and detergent;
  - Put clean mop handle;
  - Put out hazard signs at entrances;
  - Put on disposable gloves;
  - Damp dust all walls fixtures, fitting and ledges starting from the highest point;
  - Damp dust tops of desk on nurses station;
  - Damp dust outside of any cupboards;
  - Empty bin if necessary;
  - Mop floors giving extra attention to the corners and edges;
  - Wet mop half the corridor at a time ensuring that there is a dry walkway for pedestrian to use;

– Clean out buckets and leave clean and dry;
– Remove mop head and place into clear bag put into yellow bin or laundry collection area;
– Remove dirty mop from handle and place in black bag;
– Remove gloves and wash hands thoroughly;
– Put hazard signs into cleaning cupboard.

## PART IV: PREVENTING INFECTIONS IN SPECIAL SETTINGS

### 19.0. PREVENTING NOSOCOMIAL INFECTIONS

Nosocomial infections, or hospital-acquired infections, are those that a patient develops within 24 hours of admission in a hospital, or infections that a patient is incubating at the time he or she comes to the hospital. Healthcare Associated Infection are a significant problem throughout the world and are increasing (Alvarado 2000). Although the exact data for the transmission of Healthcare Associated Infection in Tanzanian health facilities are yet to be determined, these infections are important contributors to morbidity and mortality. Healthcare Associated Infection are an important focus of infection prevention in all countries, but especially in developing countries.

The most important Healthcare Associated Infection are:

- Maternal and new-born infections;
- Infections following surgery;
- Infections related to intravascular interventions;
- Urinary tract infections;
- Pneumonia;
- Infectious diarrhoea.

The organisms causing most Healthcare Associated Infection usually come from the patient's own body (endogenous flora). They also can come from contact with staff (cross-contamination), contaminated instruments and needles, and the environment (exogeneous flora). Key contributing factors are:

- Inadequate standards and practices for operating blood transfusion services;
- Increasing use of invasive medical devices (e.g., mechanical ventilators, urinary catheters and central intravenous lines) without proper training or laboratory support use of contaminated intravenous fluids, especially in hospitals making their own IV solutions;
- Antibiotic resistance due to overuse of broad spectrum antibiotics;
- Unsafe and frequently unnecessary injections;
- Increasing numbers of people in healthcare facilities, overcrowding in wards sharing beds;
- More frequent impaired immunity (age, illness and treatments);
- New microorganisms, such as HIV, SARS and Ebola.

### 19.1. Impact of Nosocomial Infections

Healthcare Associated Infection add to functional disability, emotional stress and may, in some cases, lead to disabling conditions that reduce the quality of life. In addition, Healthcare Associated Infection have now become one of the leading causes of

death (Ponce-de-Leon, 1991). The impact of Healthcare Associated Infection takes on even more significance in resource-poor countries, especially those affected most by HIV/AIDS; recent findings strongly suggest that unsafe medical care may be an important factor in transmitting HIV (Gisselquist et al., 2002).

Healthcare Associated Infection increase the cost of healthcare in the countries least able to afford it through increased:

- Length of hospitalization;
- Treatment with expensive medications (e.g., antiretroviral drugs for HIV/AIDS and antibiotics);
- Use of other services (e.g., laboratory tests, X-rays and transfusions).

## 19.2. Preventing Nosocomial Infections

**Isolation Precaution Guidelines for Hospitals**
Isolation Guidelines issued by CDC in 1996 involved a two-level approach:

1. **Standard Precautions**
   These apply to all clients and patients attending healthcare facility;
2. **Transmission-Based Precautions**
   These apply primarily to hospitalized patients.

****Note:** *In all situations, whether used alone or combined, Transmission-Based Precautions must be used in conjunction with Standard Precautions. (Garner and HiCPA, 1995)*

### 19.2.1. Airborne Precautions

Airborne precautions are designed to reduce the nosocomial transmission of particles that can remain in the air for several hours and be widely dispersed. They are used in addition to Standard Precautions for a patient known or suspected to be infected with microorganisms transmitted by the airborne route, such as tuberculosis.

### 19.2.2. Droplet Precautions

Droplet precautions reduce the risks for nosocomial transmission of pathogens spread by droplets. Examples of pathogens include viruses such as influenza, and rubella (german measles) and mumps, and bacteria such as Mycoplasma pneumoniae, Corynebacterium diphtheriae (diphtheria), Hemophilus pertussis (whooping cough), Pasteurella pestis (pneumonic plague) and Streptococcus pharyngitis sometimes causing scarlet fever.

****Note:** *Droplet infections are simpler to prevent than airborne precautions, because the particles remain in the air for a short time, and travel only a few feet. Therefore, contact with the source must be close for a susceptible host to become infected.*

### 19.2.3. Air borne precaution

Airborne transmission occurs by dissemination of either airborne droplet nuclei or

small particles in the respirable size range containing infectious agents that remain infective over time and distance (e.g., spores of *Aspergillus* spp, and *Mycobacterium tuberculosis*). Microorganisms carried in this manner may be dispersed over long distances by air currents and may be inhaled by susceptible individuals who have not had face-to-face contact with (or been in the same room with) the infectious individual.

Preventing the spread of pathogens that are transmitted by the airborne route requires the use of special air handling and ventilation systems (e.g., AIIRs) to contain and then safely remove the infectious agent. Infectious agents to which this applies include *Mycobacterium tuberculosis*, rubeola virus (measles), and varicella-zoster virus (chickenpox). In addition, published data suggest the possibility that variola virus (smallpox) may be transmitted over long distances through the air under unusual circumstances and AIIRs are recommended for this agent as well; however, droplet and contact routes are the more frequent routes of transmission for smallpox. In addition to AIIRs, respiratory protection with NIOSH certified N95 or higher level respirator is recommended for healthcare personnel entering the AIIR to prevent acquisition of airborne infectious agents such as *M. tuberculosis*.

For certain other respiratory infectious agents, such as influenza and rhinovirus and even some gastrointestinal viruses (e.g., norovirus and rotavirus) there is some evidence that the pathogen may be transmitted via small-particle aerosols, under natural and experimental conditions. Such transmission has occurred over distances longer than 3 feet but within a defined 19.

## 19.3. Prevention and control of hospital-acquired human infection with influenza A (H7N9) virus

These technical guidelines are developed to guide the health care providers to improve the prevention and control for hospital acquired human infection with influenza A (H7N9) virus, lower the risk of H7N9 nosocomial infections, and standardize the behaviours and services of medical staff.

**Basic requirements**

- The health care providers should establish early-warning system and develop emergency preparedness plan and workflow based on the following considerations:
  - The source of infection;
  - Pathways of transmission;
  - Susceptible population;
  - The local real conditions.
- The health care providers should provide relevant training for the medical staff, so as to improve:
  - early detection,
  - early diagnosis,

  - early isolation, and
  - early report;
- The health care providers should enhance their monitoring for hospital-acquired infections.
- The health care providers must standardize their disinfection, isolation and protection policies to provide sufficient, necessary and qualified disinfection and protection equipment to the medical staff, so as to ensure that all the disinfection, isolation, and personal protection measures are sufficiently and efficiently implemented;
- The health care providers must properly clean and disinfect the medical equipment, contaminated items, item surface and ground in accordance with the Technical Specifications for Implementing Disinfection in Hospitals.(refer the chapter on instrument processing)
- The medical wastes from the diagnosis and treatment of patients with human H7N9 virus infection should be properly managed and disposed according to the Medical Waste Management

**Source of infection**

The source of infection remains unclear. According to the previous experiences and the epidemiological investigations for the cases, birds carrying H7N9 avian influenza virus as well as their secretions or excretions may be the source of infections.

**Route of transmission**

The virus may be transmitted through the respiratory tract or by exposing to the secretions or excretions of the infected birds. Direct exposure to the virus can also result in infection. There is apparently no evidence of human-to-human transmission.

**Susceptible populations**

No definitive evidence has demonstrated that human is susceptible to influenza A (H7N9) virus. All the confirmed cases were adults.

**High-risk populations**

Currently the high-risk populations include individuals who are involved in the slaughter, processing, and sale of poultry products and those who have exposed to birds one week before disease onset. (Refer chapter on waste management).

### 19.3.1. Prevention and control of hospital-acquired infections

**Fever clinic**

- A workflow consisting of isolation, transfer, and management of the suspected and confirmed cases should be established. The building layout and workflow design should meet the relevant requirements of the Best Medical Management Practices for Isolation. Adequate hand-washing facilities must be provided at the entry and exit to a fever clinic;

- The medical staff should follow the standard prevention principles during the diagnosis. They must wear surgical masks when contacting each patient and implementing strict hand hygiene measures. When contacting a suspected or confirmed patient, the medical staff must wear medical protective masks;
- The medical staff must be aware of the epidemiology and clinical features of human infection with influenza A (H7N9) virus and are able to take immediate isolation measures for the suspected or confirmed patients and timely report every case. After a patient is transferred out, terminal disinfection should be performed according to the Technical Specifications for Implementing Disinfection in Hospitals;
- Medical staff must put on or take off protective equipment correctly as required when entering or leaving a fever clinic;
- The patients' caregivers and patients (if their conditions allow) must wear surgical masks.

**Emergency**

- Triage system must be established. A contingency plan covering the transfer-out and rescue of the critically ill patients should be established and updated, and then strictly implemented;
- A specific isolation zone should be established to allow the in-site isolation and management of the suspected/confirmed patients;
- The medical staff must carry out personal protection and hospital environment management in strict accordance with the standard prevention principles;
- The diagnosis and treatment zones must have good ventilation conditions and be cleaned and disinfected regularly.

**General wards**

- Contingency isolation rooms should be available in the general wards for the isolation and management of the suspected/confirmed cases, and relevant working policies and workflow should be established. Sufficient disinfection facilities and personal protective equipment for managing acute respiratory infections should be available in these rooms;
- When a suspected or confirmed case is found in the ward, the relevant contingency plans and workflow must be initiated immediately to provide timely and effective isolation and secure for the patient;
- The suspected or confirmed patient should be managed and cared by a special team of medical staff. Medical staff who are not directly involved in the management should be restricted from entering the ward. If condition allows, the patients should be treated in negative pressure rooms or transferred to a special hospital with appropriate isolation or treatment capabilities.

- After a patient is transferred out, terminal disinfection should be performed according to the Technical Specifications for Implementing Disinfection in Hospitals.

**Special wards for patients with suspected or confirmed human infection with influenza A (H7N9) virus:**

- The building layout and workflow design should meet the relevant requirements of the Best Medical Management Practices for Isolation;
- All the suspected or confirmed patients should be immediately isolated, and the suspects and cases should be placed in separated rooms. The suspects should be isolated in a single room. The etiologically confirmed patients with the same disease type can be placed in the same room;
- According to the transmission pathways of influenza A (H7N9) virus, contact or droplet precautions should be taken in addition to the standard preventive measures. These measures may include:
  - Medical staff must put on or take off protective equipment correctly according to the Best Medical Management Practices for Isolation when entering or leaving an isolation ward;
  - In principle, the patients' activities should be restricted within the isolation wards. If a patient needs to leave the isolation ward or isolation zone, he/she must take appropriate protective measures (e.g., wearing a surgical mask) to avoid cross-infection;
  - Stethoscope, thermometer, blood pressure monitors, and other medical devices for the suspects and cases must be used in a patient-specific manner. If the medical devices are not used in a patient-specific manner, they must be thoroughly cleaned and disinfected;
  - The visiting policies must be strictly implemented. In principle, no caregiver is allowed.

**Protection of medical staff**

- The medical staff should take contact and droplet precautions based on the transmission pathways of the infection in accordance with the standard protection principles;
- The personal protective equipment used by the medical staff meet the relevant criteria issued by the Chinese government;
- The medical staff must timely perform hand hygiene before and after each contact with the patients in accordance with the Standard for Hand Hygiene for Healthcare Workers;
- The medical staff must take appropriate protective measures according to the level of risk for infection:

- The medical staff must wear non-sterile gloves when contacting blood, other body fluids, secretions, excretions, and vomit of the patients and the contaminated items and wash their hands after taking off the gloves;
- When there is a risk of spraying/splattering of blood, other body fluids, excretions or secretions, the medical staff must wear surgical masks (or respirators), goggles, and gowns;
- When performing endotracheal intubation for the suspects or cases, the medical staff must wear medical protective masks, goggles, and gowns;
- The individual protective equipment such as surgical masks, medical protective masks, goggles, and gowns that have been contaminated by the patients' blood, other body fluids, and/or secretions must be timely changed;
- The individual protective equipment should be properly put on or taken off. After taking off the gloves or gowns, the medical staff must wash or disinfect hands immediately;
- The medical staff must be protected from being accidently stabbed by sharps;
- The used medical equipment and instrument must be properly cleaned and disinfected according to the Technical Specifications for Implementing Disinfection in Hospitals.

**Patient management**

- The suspects and cases must be timely isolated, and be specifically guided to enter the isolation wards via the assigned route;
- If the condition allows, the patients must wear surgical masks. The patients should be instructed to cover nose and mouth with a tissue when coughing or sneezing. After contacting respiratory secretions, the patients must wash hands with regular detergent or disinfect hands with hand disinfectant;
- After a patient is discharged or transferred out, terminal disinfection should be performed according to the Technical Specifications for Implementing Disinfection in Hospitals;
- The corpses of deceased patients must be timely handled. The corpse should be bounded with a double-layer fabric, wrapped into a double-layer plastic bag, and then sent directly by a special vehicle to a designated place for cremation. If cremation is not feasible due to ethnic or religious concerns, the corpses should be buried deep as required after having been handled as described above. Contact Precautions:
- Contact precautions reduce the risk of transmission of organisms from an infected or colonized patient through direct or indirect contact. They are indicated for patients infected or colonized with enteric pathogens. Examples include herpes simplex and haemorrhagic fever virus (Ebola) and multi-drug (antibiotic) resistant bacteria;

- Use in addition to Standard Precautions for a patient known or suspected to be infected or colonized with microorganisms transmitted by direct contact with the patient or indirect contact with environmental surfaces or patient care items.

## 20.0. PREVENTING MATERNAL AND NEWBORN INFECTIONS

Pregnant women in developing countries are at a much higher risk for acquiring Healthcare Associated Infection following delivery than their counterparts in developed countries. The rate of postoperative infection after Caesarean Section is high (15 – 60%). With the emergence of HIV, up to 12% of pregnant women have been found to be HIV sero positive. As a result pregnant women in developing countries are at a higher risk for acquiring Healthcare Associated Infection following delivery.

Other than maternal tetanus toxoid immunization during pregnancy, and treatment to prevent congenital syphilis, few other preventive measures to protect the foetus and new-born are routinely available. For example, with the exception of prenatal HIV testing and antiretroviral treatment in a few countries, screening and treatment for infectious diseases (e.g., gonorrhoea and Chlamydia) are not available because of the cost and lack of laboratory capability.

### 20.1. Definitions

**Endometritis**

- Acute postpartum infection of the lining (endometrium) of the uterus with extension into the smooth muscle wall (myometrium). Clinical features include fever, usually developing on the first or second postpartum day, uterine tenderness, lower abdominal pain and foul-smelling vaginal discharge (lochia).

**Episiotomy**

- Surgical cut made in the perineum just prior to delivery. The purpose is to facilitate delivery of the presenting part and minimize the risk of injury to the perineal area.

**Intra-amniotic infection syndrome (IAIS) also referred to as amnionitis orchorioamnionitis**

- Acute detectable infection in the uterus and its contents (foetus, placenta and amniotic fluid) during pregnancy. It is usually related to colonization of the uterine cavity with organisms present in the cervix and vagina after prolonged ruptured membranes and obstructed labour.

**Invasive group B streptococcal sepsis**

- Newborn infection characterized by bacteremia, pneumonia, meningitis and death in up to 25% of infants with the infection. It occurs most commonly following IAIS.

**HealthCare Associated infection in newborns**

- Infection occurring after birth but excluding those infections known to have been transmitted across the placenta such as congenital syphilis,

cytomegalovirus, rubella, varicella (chicken pox) and the protozoan parasite, Toxoplasmosis gondii.

**HealthCare Associated infection in obstetrical patients**

- Infection that is neither present nor incubating at the time the patient is admitted to the hospital. Most urinary tract infections and endometritis are nosocomial even though the causative organism may be endogenous (i.e., present in the maternal lower genital tract prior to delivery).

**Septic pelvic thrombophlebitis**

- Thrombosis (blockage) of the deep pelvic veins due to inflammation and blood clots. Predisposing factors include caesarean section after prolonged labour, premature rupture of membranes, difficult delivery (forceps or vacuum extraction), anaemia and malnutrition.

## 20.2. Epidemiology

### 20.2.1. Maternal Infections

Caesarean section is the most important factor contributing to both the frequency and severity of postpartum infection. Patients who have cesarean sections are at least 10 times more likely to become infected than patients who deliver vaginally (Minkoff and Schwarz, 1980).

Predisposing factors for wound infection; Intra-partum factors (factors during delivery)

- Women who:
  - Have bacterial vaginosis (Gardnerella vaginalis) isolated from the endometrium.
  - Have a Caesarean Section during the second stage of labour
- Maternal factors
  - Diabetes mellitus
  - Malnutrition
  - Immunodeficiency
  - Anaemia
  - Infection of the foetal membranes (chorioamnionitis) diagnosed prior to delivery (Mead 1993).
- Other obstetrical infections including:
  - Nosocomial urinary tract infections
  - Episiotomy infections
  - Nosocomial pneumonia
  - Septicemia
  - Breast infection (mastitis) in postpartum nursing women

### 20.2.2. Foetal and Newborn Infections

Foetal and newborn infections are classified based on whether they were acquired in *utero* (transplacentally), during passage through the birth canal (vertical transmission) or in the neonatal period (i.e., during the first 28 days following birth).

Strictly speaking, only newborn infections acquired during passage through the birth canal or in the neonatal period are considered nosocomial. Determining whether an infection is nosocomial or was present or incubating prior to admission to the hospital is extremely difficult – and often not useful.

## 20.3. Microbiology

### 20.3.1. Causes of Maternal Infections

Most postpartum infections are caused by endogenous flora – microorganisms that are normally present in the genital tract but usually cause no disease until labour, delivery or postpartum. Nearly 30 types bacteria have been identified as being present in the lower genital tract (vulva, vagina and cervix) at any time (Faro 1990). While some of these, including several fungi, are considered nonpathogenic under most circumstances at least 20, including *E. coli, Staphylococcus aureus, Proteus mirabilis and Klebsiella pneumoniae*, are pathogenic.

### 20.3.2. Colonization and Infection in Newborns

Most infants are delivered from a sterile environment inside the uterus. During and after birth, however, they are rapidly exposed to numerous microorganisms that colonize their skin, nasopharynx and gastrointestinal tract. Sick newborns, subjected to multiple invasive procedures (e.g., endotracheal tubes or umbilical artery catheters) may be colonized at multiple sites with numerous other organisms, particularly gram-negative bacteria.

The skin of the newborn is a major initial site of bacterial colonization, particularly for *S. aureus*, which is most often acquired from within the nursery rather than from the mother.

Any break or cut in the skin provides an opportunity for infection to develop with this pathogenic organism. Therefore, to minimize the risk of infection in the newborn period, all sites must be cared for using aseptic technique.

Although severe infection in a full term infant is uncommon, when it occurs it often is secondary to group *B. streptococci, E. coli, Listeria monocytogenes, Citrobacter diversus,* salmonella, chlamydia, herpes simplex virus (HSV) or enteroviruses. All of these organisms can be transmitted to other infants in the nursery on the hands of hospital staff unless Standard Precautions are strictly followed, especially those for handwashing (or use of antiseptic hand rub) and gloves.

## 20.4. Preventing Foetal and Newborn Infectious Diseases

Prevention against most foetal and newborn infectious diseases has been achieved through improved maternal immunization, antenatal treatment of maternal conditions and prophylactic use of medications, e.g., postnatal eye drops to prevent conjunctivitis and, recently, the use of antiretroviral drugs to prevent mother-to-child transmission of HIV.

**Reducing the Risk of Maternal and Newborn Infections**
To minimize the risk of exposure to HIV and other blood-borne viruses during labor, childbirth and resuscitation of the baby, strict use of Standard Precautions, especially hand washing and use of gloves, face shields and plastic or rubber aprons, is mandatory.

**Factors Increasing the Risk of Infection during Labor and Vaginal Childbirth**
Vaginal deliveries are associated with a number of factors that increase a woman's risk of endometritis or urinary tract infection. These include:

- Prolonged ruptured membranes (more than 18 hours)
- Trauma to the birth canal (episiotomy, vaginal or perineal lacerations and urethral tears)
- Manual removal of the placenta due to retained placenta or placental fragments
- Prolonged labour

### 20.4.1. Decreasing the Risk of Infection during Vaginal Childbirth

Steps that can be taken to decrease the risk of maternal infection **before** and **during** childbirth include:

Step 1: Make sure the following items are available:

- Two pairs of surgical gloves
- Pair of clean gloves for washing the perineum
- Basin of clean warm water, soap, a face cloth and clean dry towel
- Plastic or rubber apron and face shield (or a mask and goggles)
- Waterless, alcohol-based antiseptic hand rub or antiseptic solution (e.g., 2%
- Chlorhexidine gluconate or 10% povidone-iodine)
- High-level disinfected or sterile blunt scissors (Mayo)
- High-level disinfected or sterile cord clamp or cloth to tie off the cord
- Injectable oxytocin (with or without egormetrine)
- Sterile syringe and needle
- Sterile urinary catheter
- Package of gauze squares

- Clean basin for the placenta
- Clean drape or cloth for wrapping the baby
- Second Clean drape or cloth for wrapping the baby
- Clean perineal pads
- Light source (a flashlight or lamp) if needed
- Puncture-resistant sharps container (within arm's reach if possible)
- Plastic bag or a leak-proof, covered waste container for disposal of contaminated waste items.

**Prior to Childbirth**

Step 2: Wear protective equipment including a plastic or rubber apron and face shield (or a mask and goggles) because splashing of blood and blood-tinged amniotic fluid can be expected.

Step 3: Once the patient is positioned for childbirth, put examination gloves on both hands and wash the perineal area (vulva, perineum, and anal region) with soap and clean water.

- use a downward and backward motion when washing the perineal area so that fecal organisms will not be introduced into the vagina
- clean the anal area last and place the washcloth or towel in a plastic container
- shaving perineal (pubic) hair prior to delivery is discouraged since it increases the risk of infection (Landry and Kilpatrick, 1997)

Step 4: Immerse both gloved hands in 0.5% chlorine solution, remove gloves by inverting, and place them in the plastic bag or leak-proof, covered waste container.

Step 5: Thoroughly wash hands, especially between the fingers, and forearm up to the elbows with soap and clean water and dry with a clean, dry towel or air dry.

Step 6: Put sterile (or HLD) surgical gloves on both hands.

**During Childbirth**

**If resuscitation of the infant is required**, use a Dee Le mucus trap or mechanical suction if available to avoid backflow of newborn secretions.

**If manual removal of the placenta is required,** use elbow length gloves if available, or improvise by using a second pair of fingerless surgical gloves, which should be used to avoid contaminating the forearm with blood.

**After Childbirth**

Step 7: Before removing gloves, put the placenta in the clean basin and place all waste items (e.g., blood-stained gauze) in the plastic bag or leak-proof, covered waste container.

Step 8: If an episiotomy or vaginal or perineal tears require surgical repair, use forceps to hold suture needle and then place sharps (suture needles) in the puncture-resistant sharps container.

## 20.5. Minimizing the Risk of Infection during Caesarean Section

Caesarean Sections should be performed using the same standards as for any general surgical procedure. In addition, the following procedures are observed:

- The surgeon and assistant should wear a face shield (or mask and goggles) and a plastic or rubber apron over their scrub suits because splashing of blood and blood-tinged amniotic fluid can be expected;
- Double gloving is recommended;
- Prophylactic antibiotics should be given before caesarean section when infection is suspected;
- The health worker receiving the infant should wash her/his hands and put on clean examination gloves before handling the baby;
- The baby should be placed on a clean towel after being passed to the health worker caring for the infant;
- Change surgical gloves before manually removing the placenta. (If available, use elbow-length surgical gloves or a combination of fingerless gloves and a new pair of surgical gloves.);
- With prolonged ruptured membranes or with documented intra-amniotic infection syndrome (chorioamnionitis), avoid spillage of amniotic fluid into the abdominal cavity;
- Do not explore the peritoneal cavity unless absolutely necessary, and then only after closure of the uterine incision and surgical gloves have been changed;
- To minimize postoperative wound infections:
  - Patients should not be shaved prior to surgery (if it is necessary to remove pubic or abdominal hair, clip the hair with scissors just prior to surgery);
  - Make sure skin incision is done with a scalpel rather than with electrocautery;
  - Whenever possible, do not place drains in the subcutaneous layer;
  - Apply a sterile dressing and care for the wound.

## 20.6. Postpartum Care of the Mother following Caesarean Section

Minimizing the risk of nosocomial infection in mothers during the postpartum period includes the following:

- Ensure urine is flowing and the urine collection system is intact;
- Follow the “Tips for Preventing Infections”;
- Remove the catheter as soon as possible within 24 hours.

## 20.7. Postnatal Care of the New-born

Minimizing the risk of nosocomial infection in the new-born involves the following:

- Wash hands before holding or caring for the infant. Alternatively, a waterless, alcohol-based antiseptic hand rub can be used;
- Wear gloves and plastic or rubber apron when handling the infant until blood, meconium or amniotic fluid has been removed from the infant’s skin;
- Careful removal of blood and other body fluids using a cotton cloth, not gauze, soaked in warm water followed by drying the skin may minimize the risk of infection;
- Bathing or washing the newborn should be delayed until the baby’s temperature has stabilized (usually about 6 hours);
- Cover gowns or masks are not required when handling infants;
- The following general instructions for cord care can be applied:
  - Wash hands, or use an antiseptic hand rub, before and after cord care;
  - Keep the cord stump clean and dry;
  - Do not cover the cord stump with a dressing or bandage;
  - Fold the diaper or baby napkin below the cord stump;
  - If the cord stump gets soiled or dirty, gently wash it with boiled soapy water, and rinse with boiled water and dry with a clean cloth;
  - Explain to the mother that if the cord stump becomes red or is draining pus of blood she should bring the baby to a clinic or hospital equipped to care for new-borns as soon as possible.

## 20.8. Management of Outbreaks in the Nursery or NICU

If an epidemic or outbreak of a particular disease such as diarrhoea is suspected, the first step is to assess it promptly and carefully to:

- Identify the source of the diarrhoea (e.g., patients, staff or visitors) and the means of transmission (e.g., contamination via hands of staff, parents or visitors);
- Decide on the type of control measures required to prevent the spread of the infection and determine the need for laboratory or epidemiologic studies (if available).

## 21.0. PREVENTING SURGICAL SITE INFECTIONS

Despite improvements in operating room practices, instrument sterilization methods, better surgical technique and the best efforts of infection prevention practitioners, surgical site infections (SSIs) remain a major cause of Healthcare Associated Infection and rates are increasing globally (Alvarado 2000).

To reduce the risk of nosocomial SSIs in developing countries, a systematic but realistic approach must be applied with awareness that this risk is influenced by characteristics of the patient, the operation, the healthcare staff and the hospital.

Among surgical patients, SSIs are the most common nosocomial infection, accounting for about a third of all such infections. On average, having an SSI increases a patient's hospital stay by 7-10 days, with organ/space and deep incisional SSIs accounting for the longest stays and highest costs.

Exogenous sources of SSI pathogens are occasionally responsible. These include the following;

- Organisms from members of the surgical team (e.g., hands, nose or other body parts);
- Contaminated surfaces in the operating room, even the air;
- Contaminated instruments, surgical gloves or other items used in the surgery.
- Exogenous organisms are primarily aerobic staphylococci or streptococci species (with the exception of tetanus endospores).

### 21.1. Definitions

**Surgical Site infections (SSI):** Either an incisional or organ/space infection occurring within 30 days after an operation or within 1 year if an implant is present.

**Superficial SSI:** involves only the incised body wall.

**Organ/Space SSI:** Any part of the body other than the incised body wall parts that were opened or handled during an operation.

### 21.2. Classification of Surgical Wounds

The surgical wound classification system includes four categories:

**Class 1 – Clean**
Uninfected operative wound with no inflammation and in which the respiratory, gastrointestinal (GI), genital and urinary tracts were not entered. Clean wounds are closed at surgery and, if necessary, drained with closed drainage;

**Class II – Clean-contaminated**
Wound in which the respiratory, GI, genital or urinary tract was entered under controlled conditions but without unusual contamination or spillage of contents;

**Class III – Contaminated**
Open, fresh accidental wound or an operation with a major break(s) in aseptic technique (e.g., open cardiac massage) or gross spillage from the GI tract. Also included are incisions in which acute, non-purulent inflammation is found;

**Class IV – Dirty or infected**
Old wounds with dead tissue and those that involve existing clinical infection or a perforated bowel, suggesting that the pathogens causing the postoperative infection were present in the wound before the surgery.

## 21.3. Pathogenesis

By the end of an operation, bacteria and other microorganisms contaminate all surgical wounds, but only a small number of patients actually develop a clinical infection. Infection does not develop in most patients because their defence mechanisms effectively eliminate the contaminating organisms at the surgical site. Whether a potential infection occurs depends on several factors. The most important include the following:

- Number of bacteria entering the wound;
- Type and virulence (ability to cause infection) of the bacteria;
- Host defence mechanisms (e.g., effectiveness of inflammatory response and status of the immune system);
- External factors, such as being in the hospital several days before surgery or the operation lasting more than 4 hours.

## 21.4. Predisposing Factors

**Obesity** increases risk substantially when the subcutaneous abdominal fat layer exceeds 3cm (1.5inches) (Nystorm et al 1987). The risk is increased by the need for a larger incision, decreased circulation to the fat tissue or the technical difficulty of operating through a large fat layer;

**Infection at another site** may increase the risk of spreading infection through the bloodstream;

**Immunocompromised patients** (e.g., those with HIV/AIDS, those with chronic corticosteroid use such as occurs with asthma and heavy smokers or users of other tobacco products) are at significantly greater risk of SSIs;

**Malnutrition** may or may not be a contributing factor. Unfortunately, most studies have not been conducted in developing countries where severe malnutrition is more common;

**Age, race, socioeconomic status and chronic diseases**, such as diabetes and malignancy, are difficult to assess because they are frequently associated with other factors that independently contribute to risk. For example, age over 70 may be

accompanied by decreased defence mechanisms, poor nutrition and anaemia.

***Note:** When possible, the effects of conditions that might complicate surgical recovery should be corrected or stabilized preoperatively.*

**Remember:** Wash hands or use an antiseptic hand rub, before putting on gloves and after taking them off to avoid exposure to blood and other potentially infected body fluids and to decrease the risk of cross contamination.

### 21.5. Other Factors

These factors, coupled with the experience and skill of the surgeon and assistant, are known to reduce the risk of SSIs:

- **Prolonged preoperative hospitalization** exposes patients to hospital flora, including multidrug-resistant organisms. Completing pre-surgical evaluations and correcting underlying conditions before admission to the hospital decreases this risk. Also, performing elective surgery, where feasible, in ambulatory surgery centers rather than acute care hospitals decreases the risk of exposure to hospital flora;
- **Preoperative hair removal** should be avoided if it is unnecessary. If hair must be removed, clip it with scissors just before the surgery. Shaving is a proven risk factor for SSIs (Cruse and Foord, 1980);
- **Wide prepping of the proposed incision site** with antiseptic solution preoperatively helps keep microorganisms from migrating into the wound (breakthrough) if the site towels or drapes become wet during surgery;
- **Good surgical technique** minimizes tissue trauma, controls bleeding, eliminates dead space, removes dead tissue and foreign bodies, uses minimal sutures and maintains adequate blood supply and oxygenation. Specifically, it is important to:
  - Handle soft tissue gently to avoid crushing that can result in tissue death (necrosis);
  - Use electrocautery sparingly to control bleeding because it leaves behind dead tissue that is more likely to become infected;
  - Use absorbable sutures whenever possible because permanent sutures, especially silk sutures, reduce the number of bacteria necessary to cause infection (James and MacLeod, 1961);
  - Use closed suction drains that exit through a separate stab wound to help prevent accumulation of tissue fluid in the dependent portion of the wound; preventing this is especially important in obese patients and may reduce SSIs (Fry, 2003). (Passive drains, such a Penrose drain, exiting through the bottom of the incision should not be used);
- **Increased length of surgical procedures** is associated with increased risk of SSIs. It is estimated that the infection rate nearly doubles with each hour of surgery (Cruse and Foord, 1980);

- **Prompt discharge postoperatively**, provided patients are able to return to home care, reduces the risk of infection as well.

***Note:** Putting topical antibiotic ointments on closed skin incisions does not decrease the risk of SSIs (Fry 2003). Healthy tissue growth is damaged when dry gauze is removed; moisten the dry gauze with sterile normal saline before removing it.*

## 21.6. Antibiotic Prophylaxis in Surgery

The use of antibiotics preoperatively can reduce the rate of infection, particularly wound infections, after certain operations. The benefit, however, must be weighed against the risks of toxic and allergic reactions, the emergence of resistant bacteria, drug interactions, super infection and cost (Nichols, 2001). For example, it is estimated that 5% of patients receiving an antibiotic will have a serious reaction to the drug. In general, antibiotic prophylaxis is recommended only for procedures with high infection rates and those in which the consequences of infection are especially serious.

## 21.7. Guidelines for Choosing a Prophylactic Antibiotic

Ideally the prophylactic drug(s) should be directed against the most likely infecting organisms but need not kill or inactivate all pathogens.

Due to frequent development of resistance of drugs the following are recommended:

- Use drugs with a moderately long half-life;
- Use drugs with broad spectrum activity;
- Avoid the use of drugs for prophylaxis when it is in use for post-op treatment;
- Use drugs according to the sensitivity pattern of the area or health facility.

In most instances, a single intravenous (IV) dose of an antibiotic completed 30 minutes or less before the skin incision provides adequate tissue levels throughout the operation. If surgery is prolonged (more than 4 hours), or if major blood loss occurs or an antibiotic with a short half – life is used, one or more additional doses should be given during the procedure.

## 22.0. PREVENTING INFECTIONS RELATED TO USE OF INTRAVASCULAR DEVICES

The use of intravascular devices, both venous and arterial, to deliver sterile fluids, medications and nutritional products, as well as for central monitoring of blood pressure and other hemodynamic functions, has dramatically increased during the past decade, creating a large population at risk for local and systemic blood stream infections.

Intravascular devices inserted into the venous or arterial bloodstream bypass the normal skin defence mechanism, and provide a way for microorganisms to enter the bloodstream from:

- the device at the time of insertion;
- subsequent contamination of the device or attachments (e.g., tubing connected to the blood monitoring apparatus or the fluids being administered);
- pathogens on the skin surrounding the insertion site;

### 22.1. Microbiology

Both gram-negative bacteria and staphylococci are primary causes of catheter-related infection; however, with the advent of the HIV/AIDS epidemic, infections with fungi are increasingly being reported (Jarvis and Hughes, 1993). Some microorganisms, especially coagulase-negative *Staphylococcus aureus* and pseudomonas and acinetobacter species, adhere to the fibrin film that forms on the inside of catheters within days after insertion. As a consequence, infection with these organisms is quite common, especially if the infection occurs within 10 days of insertion (Raad et al., 1993). For devices left in place longer than 30 days (e.g., tunnelled CVCs), bloodstream infections are more likely due to the contamination of the hub of the catheter, especially if frequent handling of the hub occurs (Schaberg, Culver and Gaynes, 1991).

#### 22.1.1. Risk Factors

**Individual related factors:**

- Burns;
- Surgical wounds;
- Malnutrition;
- Immuno compromises (by HIV/AIDS or chronic corticosteroid treatment).

**Person-to-person contact-related factors:**

- Cross-contamination with other infected areas of the patient’s body either by the patient or on the hands of the health worker;
- Cross-contamination from another patient via the hands of the health worker;

- Cross-contamination from the patient when the health worker comes in contact with the patient's blood during insertion, care of the insertion site or removal of the catheter;
- Poor insertion or dressing change technique.

**Device-related factors:**

Before insertion:

- Cracks in infusion bottles;
- Punctures in plastic containers;
- Contaminated infusion fluid or additives;
- Leaky IV administration sets with multiple connections;
- Non-sterile preparation of intravenous infusion fluid.
- During use:
- Multiple changes of IV fluid containers while using the same IV administration set;
- Multiple injections and irrigations of the system;
- Central venous pressure measurement apparatus.

## 22.2. Reducing the Risk of Healthcare Associated Infection with Intravascular Devices

### 22.2.1. Hand hygiene and gloves:

- Wash hands thoroughly with soap and running water before touching any of the IV set components;
- Examination gloves should be put on just before touching the insertion site or the hub of the needle or catheter;
- Wash hands with soap and running water after removing gloves.

### 22.2.2. Site Care and Dressings:

- If the site for inserting the catheter is dirty, wash it with soap and clean water and dry it before applying the skin antiseptic;
- If using povidone-iodine (PVI) as the antiseptic agent, allow it to dry after applying or wait at least 2 minutes before insertion;
- Transparent, adherent dressings allow inspection of the site;
- Dressings can be left in place for up to 72 hours if they are kept dry. (They should be changed immediately if they get wet, soiled or loose);
- Gauze and tape dressings need to be changed if an inspection of the site is necessary;
- The catheter or needle site should be gently palpated daily for tenderness;

- The insertion site should be inspected if the patient develops tenderness or fever without an obvious cause (CDC and HICPAC 1996).

## 22.3. Peripheral Catheters (Venous and Arterial)

### 22.3.1. Site Selection and Change

- For adults, hand veins are preferred over arm veins, and arm veins over leg and foot veins. (Needles and catheters inserted in leg and foot veins are more likely to cause inflammation at the insertion site, or phlebitis);
- Changing sites at 72 – 96 hours will reduce phlebitis and local infection. “Cannulas” are preferred over steel needles because they are less apt to perforate the vein with movement;
- If only short-term (less than 48 hours) IV infusion is planned, straight or butterfly needles are less irritating than plastic catheters and have lower rates of infection;
- Because straight and butterfly needles frequently infiltrate, they should not be used with solutions that could cause tissue necrosis.

### 22.3.2. Central Venous Catheters

Site Care and Dressings:

- If the site for inserting the catheter is dirty, wash it with soap and clean water and dry it before applying the skin antiseptic;
- Use 2% chlorhexidine gluconate, 10% PVI or 60 – 90% alcohol for skin preparation;
- Insertion should be done using full barrier precautions (sterile gloves, gown, mask and site drape) in a procedure area, not at the bedside.

### 22.3.3. Changing Fluids and Infusion Sets

- Change infusion bottles or plastic bags with parenteral solutions every 24 hours;
- Change infusion bottles or plastic bags with lipid emulsion given alone within 12 hours;
- Infusion (administration) sets should be changed whenever they are damaged and at 72 hours routinely. If the tubing becomes disconnected, wipe the hub of the needle or plastic catheter with 60 – 90% alcohol and connect it to a new infusion set;
- Tubing used to administer blood products or lipid emulsions should be replaced within 24 hours (CDC and HICPAC 1996).

## 22.4. Insertion, Maintenance and Removal of Peripheral Venous Lines

### 22.4.1. Insertion Procedure for Establishing an Intravenous (IV) Line

Step 1: Make sure all items are available:

- IV solution bag or bottle;
- Straight or butterfly needle or plastic catheter (steel needle inserter covered with soft plastic tubing that is left in place after the needle is withdrawn);
- Antiseptic solution (e.g., 2% chlorhexidine, 60 – 90% alcohol or 10%;
- povidone–iodine) and sterile or clean gauze squares (2 x 2 or cotton swabs);
- Surgical tape or transparent dressing;
- Clean tourniquet;
- Clean arm board;
- Towel to place under patient's hand or forearm;
- IV pole (drip stand);
- Clean pair of single-use examination gloves;
- Basin of clean warm water, soap, face cloth and clean dry towel;
- Plastic bag or leak-proof, covered waste container for disposal of contaminated items.

Step 2: Explain the procedure to the patient;

Step 3: Prior to starting the procedure, identify the best vein(s) for inserting IV needle or plastic catheter;

Step 4: If the venepuncture site is dirty, first wash it with soap and clean water and dry with a clean cloth before applying a skin antiseptic;

Step 5: Wash hands with soap and clean water and dry with a clean dry towel;

Step 6: Check the IV solution (bottle or plastic bag) to be sure it is the correct infusion;

Step 7: Open the infusion set and assemble the parts using aseptic technique (e.g., don't touch the ends of tubing);

Step 8: Insert the infusion set into solution bottle or bag;

- Remove the protective cover from the solution bottle or bag without touching the opening.
- Remove the protective cap covering the insertion spike without touching the spike and insert the spike into the stopper of the IV bottle or opening of the IV bag.

Step 9: Fill the infusion tubing.

- Compress the drip chamber and release.

- Remove the protective cover of the IV tubing and release the roller clamp to allow fluid to fill the tubing; close the roller clamp and replace the protective cover. (Check to be sure tubing is clear of air bubbles.)

Step 10: Put clean examination gloves on both hands.

Step 11: Cleanse insertion site with antiseptic solution using a circular motion outward from the insertion site. (If using povidone-iodine, allow it to dry, about 2 minutes, because it releases free iodine, the active antiseptic agent, slowly).

Step 12: Insert the needle or catheter with the bevel up using the dominant hand. Look for blood return in the tubing and carefully advance the needle or butterfly until the hub rests at the veinpuncture site. (With catheters, after getting blood return, advance the needle about 1 cm (1/2 inch), withdraw the inner insertion needle and then advance the plastic catheter to the hub.)

Step 13: While stabilizing the needle or catheter, release the tourniquet and roller clamp to permit a rate of flow sufficient to keep the IV line open.

Step 14: Secure the needle or catheter by placing a narrow piece of tape (1 cm or 1/2 inch) under the hub with the adhesive side up and cross tape it over the hub. Then place a second piece of narrow tape directly across the hub of the needle or catheter.

Step 15: Place a sterile gauze square (2 x 2) over the veinpuncture site and secure it with two pieces of tape. (Alternatively, place a transparent dressing over the venepuncture site.)

Step 16: Prior to removing gloves, place any blood-contaminated waste items (cotton or gauze squares) in a plastic bag or leak-proof, covered waste container.

Step 17: Remove gloves by inverting and place them in a plastic bag or waste container.

Step 18: Wash hands or use antiseptic hand rub as above.

Step 19: Secure the wrist or forearm to the arm board by applying two strips of tape directly across wrist or forearm. (To minimize discomfort when removing the arm board, attach a shorter piece of tape to the longer piece, adhesive side to adhesive side, that will cover the wrist or arm.)

Step 20: Adjust the flow rate to the correct number of drips per minute.

### 22.4.2. Maintenance of IV Lines

Step 1: Check the line every 8 hours for phlebitis or evidence of infection;

Step 2: Change the infusion site at 72-96 hours, when practical, to reduce the risk of phlebitis and local infection;

Step 3: The infusion (administration) sets (including the piggybacks) should be changed whenever they are damaged and at 72 hours routinely;

Step 4: If the tubing becomes disconnected, wipe the hub of the needle or the plastic catheter with 60 – 90% alcohol and connect to a new infusion set;

Step 5: Mark the site on the plaster with time and date of insertion of the I.V. line and make sure the site is dry.

### 22.4.3. Removal Procedure

Step 1: Make sure all items are available:

- Clean pair of examination gloves;
- Antiseptic solution (2% chlorhexidene gluconate, 60-90% alcohol or 10% povidone-iodine);
- Gauze squares (2x2) and surgical tape or a sterile, wide (1 inch) band aid;
- Puncture-resistant sharps container within arm's reach if a straight or butterfly needle was used;
- Plastic bag or leak-proof, covered waste container for disposing of the contaminated items;

Step 2: Wash hands with soap and running water.

Step 3: Stop the infusion by closing the roller clamp.

Step 4: Put clean examination gloves on both hands.

Step 5: Remove the dressing and discard it in a plastic bag or leak-proof, covered waste container.

Step 6: Check the patient's hand or wrist for phlebitis or evidence of an infection (an area of swelling, redness, warmth and tenderness of the skin around the site where the intravascular catheter comes out of the skin, the exit site). If phlebitis is associated with other signs of infection, such as fever or pus coming from the exit site, it is classified as a clinical exit site infection.

Step 7: Carefully remove the needle or the plastic catheter with one hand and with the other hand cover the insertion site with a sterile gauze square (2x2).

Step 8: Press firmly for about a minute, or alternatively place two pieces of narrow tape, about 1cm or 1/2-inch-wide, directly across the gauze square. Or alternatively, after pressing on the gauze square, remove it and cover the insertion site with a sterile band-aid.

Step 9: Prior to removing gloves, discard the needle or plastic catheter in a sharps container and place the IV tubing and any blood-contaminated waste items (cotton/gauze square) in a plastic bag or leak-proof covered waste container.

Step 10: Remove gloves by inverting and place them either in a plastic bag or a leak-proof, covered waste container.

Step 11: Wash hands with soap and running water.

## 22.5. Injection Safety - Best Practices

A safe injection does not harm the client or patient, does not expose the healthcare provider to any avoidable risk and does not result in any waste that is dangerous for other people.

Eliminating unnecessary injections is the highest priority towards preventing injection associated infections. When injections are medically indicated they should be administered safely. The following best practices are measures that have been determined through scientific evidence or expert consensus to effectively protect patients, healthcare providers and communities.

### 22.5.1. Use Sterile Injection Equipment

- Use a sterile syringe and needle for each injection and to reconstitute each unit of medication;
- Use new, quality-controlled disposable syringes and needles;
- Inspect packaging for breaches in barrier integrity, and discard a needle or syringe if the package has been punctured, torn or damaged by exposure to moisture;
- Use single-use syringes and needles.

### 22.5.2. Prevent Contamination of Injection Equipment and Medication

- Prepare each injection in a clean designated area where blood or body fluid contamination is unlikely;
- Use single dose vials rather than multi-dose vials;
- If multi-dose vials must be used, always pierce the septum with a sterile needle. Avoid leaving a needle in place in the stopper of the vial;
- Select pop-open ampoules rather than ampoules that require the use of a metal file to open them;
- If using an ampoule that requires a metal file to open, protect fingers with a clean barrier (e.g., small gauze pad) when opening the ampoule;
- Inspect medications for visible contamination or breaches of integrity (e.g., cracks, leaks); if any are found, discard the medication;
- Discard a needle that has touched any non-sterile surface.

### 22.5.3. Prevent Needle-Stick Injuries to Healthcare Providers

- Anticipate and take measures to prevent sudden patient movement during and after injection;
- Avoid recapping and other hand manipulations of needles;
- Collect used syringes and needles at a point of use in a sharps container that is puncture and leak-proof and can be sealed when 3/4 full.

### 22.5.4. Prevent Access to Used Needles

- Seal sharps containers for transport to a secure area in preparation for disposal. After closing and sealing sharps containers, do not open, empty, reuse, or sell them;
- Manage sharps waste in an efficient, safe, environment-friendly way to protect people from voluntary and accidental exposure to used injection equipment.

### 22.5.5. Other Practice Issues

**Provider's hand hygiene and skin integrity**
Perform hand hygiene (wash or disinfect hands) prior to preparing injection material, and after injections. The need for hand hygiene between each injection will vary based on blood or body fluids. Avoid giving injections if skin integrity is compromised by local injection or skin condition (e.g., weeping dermatitis, skin lesions, and cuts). Cover any small cuts.

**Gloves**
Gloves are not needed for injections. Single-use gloves may be indicated if excessive bleeding is anticipated.

**Swabbing of vial tops or ampoules**
Swabbing of vial tops or ampoules with antiseptic or disinfectant is not necessary. If swabbing with an antiseptic is done, use a clean, single-use swab and maintain product-specific recommended contact time. Do not use cotton balls stored wet in a multi-use container.

**Skin preparation prior to injection**
Wash skin that is visibly soiled or dirty. Swabbing of the clean skin prior to giving an injection is not necessary. If swabbing with an antiseptic is done, use a clean, single-use swab and maintain product-specific recommended contact time. Do not use cotton balls stored wet in a multi-use container.

**Engineered technology**
Whenever possible, use devices designed to prevent needle-stick injuries that have been shown to be effective for patients and healthcare providers. Auto-disable (AD) syringes should be used to prevent reuse of injection equipment including immunization services.

## 23.0. PREVENTING NOSOCOMIAL PNEUMONIA

Pneumonia is a complex infection that is often difficult to distinguish from other lung diseases, especially adult respiratory distress syndrome, bronchitis, emphysema and congestive heart failure. Most commonly accepted criteria for nosocomial pneumonia include fever, cough, decreased breath sounds or dullness in a specific area of the lungs and production of purulent (infected) sputum in combination with X-ray evidence suggestive of an infection.

Nosocomial pneumonia is the infection most likely to be fatal and is the most expensive to treat.

Most nosocomial pneumonias occur by aspiration of bacteria growing in the back of the throat (oropharynx) or stomach. Intubation and mechanical ventilation greatly increase the risk of infection because they:

- Block the normal body defence mechanisms – coughing, sneezing and the gag reflex;
- Prevent the washing action of the hair (cilia) and mucus-secreting cells lining the upper respiratory system provide a direct pathway for microorganisms to get into the lungs;
- Other procedures that may increase the risk of infection include oxygen therapy, intermittent positive pressure breathing (IPPB) treatment and endotracheal suctioning.

Most nosocomial pneumonias occur after surgery, especially if mechanical ventilation is needed postoperatively, and most reported cases of nosocomial pneumonia are due to bacteria. The combination of severe illness, the presence of multiple invasive devices (IVs, urinary catheters and mechanical ventilators) and frequent contact with the hands of personnel often leads to cross-contamination.

### 23.1. Risk Factors

Many risk factors for nosocomial pneumonias are not alterable, e.g., age over 70, chronic lung disease, severe head injuries with loss of consciousness, other serious medical conditions, such as end-stage renal disease, cirrhosis, cigarette smoking, alcoholism, obesity, major cardiovascular or pulmonary surgery and patients with endotracheal tubes or on ventilators. Although it is impossible to change these risk factors, knowing about them is valuable in terms of anticipating problems and limiting the use of invasive devices (e.g., intravenous lines and urinary catheters) as much as possible.

### 23.2. Reducing the Risk of Nosocomial Pneumonia

**Pre-operative Pulmonary Care**
Healthcare workers should:

- limit the use of narcotics (for a short duration);

- prevent colonization and infection with new organisms;
- prevent transfer organisms among hospitalized patients;
- prevent cross-contamination from healthcare staff to patients;
- teach patients about:
  - deep breathing, moving in bed and frequent coughing;
  - early ambulation.

**Minimizing contamination of respiratory therapy equipment**
To minimize cross-contamination when suctioning patients on ventilators:

- Wash hands or use an alcohol-based antiseptic hand rub before putting on gloves;
- Wear clean examination gloves and a protective face shield or mask;
- Remove gloves immediately after therapy and discard them in a plastic bag or leak- proof, covered waste container;
- Suction catheters should be decontaminated, cleaned and high-level disinfected by boiling or steaming.

***Note:** Mechanical ventilation should be used only when necessary and only for as long as necessary.*

To reduce the risk of contamination and possible infection from mechanical respirators and other equipment:

- Drain and discard any fluid in the tubing, taking care not to allow the fluid to drain toward the patient;
- Use small nebulizer bulbs because they produce aerosols that can penetrate deep into the lungs (large volume nebulizers are associated with gram-negative pneumonia and they should not be used);
- Decontaminate, clean and high-level disinfect breathing circuits by steaming or soaking in a chemical high-level disinfectant;
- Reprocess resuscitation devices, such as Ambu bags, promptly

### 23.3. Preventing Gastric Reflux

- Avoid prolonged use of nasal gastric tubes for feeding;
- Feed small, frequent amounts rather than large amounts;
- Raise the patient's head on the bed so that the patient in a semi-sitting position.

### 23.4. Postoperative Management

Surgical units should have effective plans for:

- Optimizing the use of pain medication to keep the patient comfortable enough to cough effectively;

- Regularly moving and exercising patients;
- Encouraging deep breathing in the immediate postoperative period and for the next few days.

## 24.0. PREVENTING URINARY TRACT INFECTIONS

Urinary Tract infections (UTIs) are the most common type of nosocomial infections, accounting for 40% of all infections in hospitals per year (Burke and Zavasky, 1999). In addition, several studies have reported that about 80% of nosocomial UTIs occur following instrumentation, primarily catheterization (Asher, Oliver and Fry, 1986). Because nearly 10% of all hospitalized patients are catheterized, preventing UTIs is a major factor in decreasing nosocomial infections.

Organisms attacking any portion of the urinary system cause urinary tract infections: the kidneys (pyelonephritis), bladder (cystitis), prostate (prostatitis), urethra urethritis) or urine (bacteriuria). Once bacteria infect any site, all other areas are at risk.

### 24.1. Microbiology

Most nosocomial UTIs are caused by gram-negative coliform bacteria, particularly *Escherichia coli*, pseudomonas species, and organisms from the Enterobacter group.

Collectively they account for more than 80% of culture-positive UTIs (Haley et al., 1985).

While the most common organism is *E. coli*, infections with fungi, such as the candida species, have increased with the advent of HIV/AIDS and widespread use of broad-spectrum antibiotics.

Factors that can lead to bacteriuria and UTIs include:

- Passage of organisms from the urine bag to the bladder (retrograde contamination) that occurs in patients with indwelling catheters (i.e., those left in place for several days or weeks);
- Ability of some organisms to grow on the outside or inside of the tubing and even in the urine itself.

### 24.2. Reducing the Risk of Nosocomial Urinary Tract Infections

Except for the end of the urethra or penis, the urinary system is normally sterile. The ability to completely empty the bladder is one of the most important ways the body has to keep the urine sterile and prevent UTIs. If the bladder empties completely during the voiding process, bacteria do not have the chance to infect tissue or grow and multiply in the bladder. Therefore, the normal defences against a UTI are an unobstructed urethra, the voiding process and normal bladder mucosa. The insertion of a catheter, however, bypasses these defences, introduces microorganisms from the end of the urethra or penis, and provides a pathway for organisms to reach the bladder.

Organisms may reach the bladder in two ways: through the inside of a catheter (i.e., the backward flow of urine) or by traveling up the space between the outer surface of the catheter and the urethral mucosa. Therefore, once the catheter is inserted, any back-and-forth movement of the catheter (e.g., raising the collection bag above the

level of the bladder), or allowing urine to be collected in an open drainage system (bag or container) should be avoided because each of these activities potentially enables organisms to enter the bladder.

- **The first way (backward flow of urine in the catheter)** is the more common infection in men.
- **The second (organisms migrating into the bladder along the outside of the catheter)** is more common in women in part because of their shorter urethra. As a consequence, women are more likely to develop a UTI from organisms located in the vagina (Garibaldi et al., 1980).

Placement of an indwelling catheter should be performed only when other methods of emptying the bladder are not effective, and it is particularly important to limit the duration as much as possible.

Other methods for management of urinary tract problems include: intermittent catheterization using a sterile straight catheter, condom catheters for male patients, adult diaper pads, bladder retraining and the use of drugs to stimulate urination. Loss of control (incontinence) or inability to void (retention) may be managed better by straight (in and out) catheterization several times daily rather than by putting in an indwelling catheter.

## 24.3. Procedures for Insertion, Removal, and/or Replacement of Urinary Catheters

Before inserting a catheter, check to be sure that it is being inserted for the right reason. For example, if a catheter is being inserted because of urinary retention, ask the patient if she/he has voided, the time of voiding, and measure the height of the bladder. Also, before removing a catheter, check to be sure the doctor’s orders are correct to avoid an error.

### Indications for Catheterization

The indications for catheterization include but are not limited to the following:

- For short-term (days) management of incontinence (the ability to control urination) or retention (the inability to pass urine) not helped by other methods;
- To measure urine output over several days in critically ill patients;
- To instil medications;
- For treatment of urinary outlet obstruction (blockage of the tube leading from the bladder to the outside, the urethra);
- For postoperative management of surgical patients with impaired bladder function (the most common routine use).

### Insertion Procedure

Step 1: Make sure that all of the following items are available:

- A sterile indwelling urinary catheter with a closed continuous drainage system, or a high-level disinfected or sterile straight catheter and a clean urine collection container;
- Sterile syringe filled with boiled or sterile water for blowing up the balloon of an indwelling catheter;
- Pair of sterile gloves;
- Antiseptic solution (2% Chlorhexidene gluconate or 10% Povidone-Iodine);
- Sponge holding forceps with gauze squares (2x2) or large cotton applicators;
- Single-use packet of lubricant;
- Light source (flashlight or lamp) if needed;
- Basin of clean warm water, soap, a face cloth and paper towel;
- Plastic bag or leak-proof covered waste container for disposal of contaminated items.

Step 2: Prior to starting the procedure:

- Have women separate their labia and gently wash the urethral area and inner labia have men retract their foreskin and gently wash the head of the penis and foreskin

Step 3: Wash hands with soap and clean water and dry with a clean dry paper towel. Apply about 1 teaspoonful, of a waterless, alcohol-based antiseptic hand rub to both hands and vigorously rub the hands and between the fingers until dry.

Step 4: Put surgical gloves on both hands.

Step 5: Use a small a catheter as consistent with good drainage.

Step 6: For health workers who are right-handed (dominant hand) stand on the patient's right side (and on the left side if left-handed).

Step 7: For women: separate and hold the labia apart with the non-dominant hand and prep the urethral area two times with an antiseptic solution using either cotton applicators or sponge forceps with gauze squares.

Step 8: For men: push the foreskin and hold the head of the penis with the non-dominant hand; then prep the head of the penis and urethral opening two times with an antiseptic solution, using cotton applicators or a sponge forceps with gauze squares.

Step 9: If inserting a straight catheter, grasp the catheter about 5cm (2 inches) from the catheter tip with the dominant hand and place the other end in the urine collection container.

Step 10: For women, gently insert the catheter until urine flows. For children insert only about 3cm (1.5inches).

Step 11: For men, gently insert the catheter about 18-22cm (7-9 inches) or until urine flows. For children insert only about 5-8cm (2-3 inches).

Step 12: If inserting an indwelling catheter, push another 5cm (2inches) after urine appears and connect to the urine collection tubing if not using a closed system.

Step 13: For an indwelling catheter: inflate the balloon, pull out gently to feel resistance and secure the indwelling catheter properly to the thigh or lower abdomen.

Step 14: For straight (in and out) catheterization, allow the urine to slowly drain into the collection container and then gently remove the catheter.

Step 15: Place soiled items, including the straight catheter if it is to be disposed of, in a plastic bag or leak- proof, covered waste container.

Step 16: Alternatively, if a straight catheter is to be reused, place it in 0.5% chlorine solution and soak it for 10 minutes for decontamination.

Step 17: Remove gloves by inverting and place them either in a plastic bag or waste container.

Step 18: Wash hands or use an antiseptic hand rub as above.

**Removal and or Replacement**

Step 1: Make sure all items are available (as step 1 above if replacing an indwelling catheter):

- Pair of examination gloves;
- Empty sterile syringe for removing the fluid from the catheter balloon;
- Sponge holding forceps with gauze square (2x2) or large cotton applicators;
- Plastic bag or leak-proof, covered waste container for disposal of contaminated items.

Step 2: Have the patient wash the urethral area (women) or the head of the penis (men) or do it for them wearing a pair of clean examination gloves.

Step 3: Wash hands with liquid soap and running water.

Step 4: Put clean single examination gloves on both hands.

Step 5: With the empty syringe, remove the water from the catheter balloon.

Step 6: For women, separate and hold the labia apart with the non-dominant hand, then prepare the urethral area twice with antiseptic solution using cotton applicators or a sponge forceps with gauze squares, and gently remove the catheter.

Step 7: For men, push back the foreskin and hold the head of the penis with the non dominant hand, then prepare the head of the penis and the area around the catheter two times with an antiseptic solution, using cotton applicators or sponge holding forceps with gauze squares and gently remove the catheter.

Step 8: If you are just removing the catheter, then follow steps 15, 17 and 18 of the Insertion Procedure.

Step 9: If you are replacing the indwelling catheter, follow steps 4 through 18 of the Insertion Procedure.

### 24.3.1. Tips for Preventing Infections in Catheterized Patients

- Remove the catheter as soon as possible within 24 hours;
- The catheter collection system should remain closed and not be opened unless absolutely necessary for diagnostic or therapeutic reasons;
- Caution the patient against pulling on the catheter;
- Urine flow through the catheter should be checked several times a day to ensure that the catheter is not blocked;
- Avoid raising the collection bag above the level of the bladder;
- If it becomes necessary to raise the bag above the level of the patient's bladder during transfer of the patient to a bed or stretcher, clamp the tubing;
- Before the patient stands up, drain all urine from the tubing into the bag;
- The urine drainage (collection) bags should be emptied aseptically; touching the tip of the emptying tube to the side of the collection bag or permitting the tip to touch the urine in the vessel should be avoided. Replace bags with new or clean containers when needed;
- If the drainage tubing becomes disconnected, do not touch the ends of the catheter or tubing. Wipe the ends of the catheter and tubing with an antiseptic solution before reconnecting them;
- Wash the head of the penis and urethral opening (men) or the tissue around the urethral opening (women) after a bowel movement or if the patient is incontinent;
- If frequent irrigation is required, the catheter should be changed;
- Never re-use disposable catheter materials.

## 25.0. INFECTION PREVENTION FOR HAEMODIALYSIS PATIENTS

Infections (including those affecting the bloodstream) are the second leading cause of death among haemodialysis patients. Infections acquired in dialysis units can kill, disable, hospitalize, and/or prolong illness in patients while disrupting lives and increasing the cost of treatment.

Dialysis-related infections can occur in many body locations including the bloodstream, bones, lungs, and skin. There are many reasons why patients receiving dialysis have a high risk of infections, including the close distance of patients to each other, the fast patient turn-over between dialysis sessions, and poor health of the person receiving dialysis.

The immune system of patients with chronic kidney disease often does not work well, which impairs their ability to fight infection. Some of the medicines may also affect the immune system, which can increase the risk of getting an infection. Frequent admissions to a hospital may also expose patients to infections such as central line-associated bloodstream infections (CLABSI), Methicillin-Resistant *Staphylococcus Aureus* (MRSA), and catheter-associated urinary tract infections (CAUTI).

**What patients can do**

- Clean fistula site with soap and water before every dialysis treatment;
- Clean hands with soap and water or waterless alcohol-based sanitizer before you start your dialysis session and after you leave;
- If you have a catheter, wear a mask while the nurse is hooking you up to the dialysis machine to prevent germs from your mouth from falling or spraying onto the catheter;
- If you don’t have a permanent fistula, but will need dialysis for your lifetime, discuss the early placement of a fistula with your doctor, before the need for dialysis;
- Get the flu vaccine every year;
- Get the hepatitis B vaccine. If you or a loved one must visit a dialysis center to receive hemodialysis (a method that removes waste from the blood when the kidneys do not work properly), there are some important things you need to know to prevent infections;

- Prevention and Management of HIV Infection. Routine testing of hemodialysis patients for HIV infection for infection control purposes is not necessary or recommended. However, patients with risk factors for HIV infection should be tested so that, if infected, they can receive proper medical care and counselling regarding preventing transmission of the virus. Infection control precautions recommended for all haemodialysis patients are sufficient to prevent HIV transmission between patients. HIV-infected patients do not have to be isolated from other patients or dialyzed separately on dedicated machines. In addition, they can participate in dialyzer reuse programs. Because HIV is not transmitted efficiently through occupational exposures, reprocessing dialyzers from HIV-positive patients should not place staff members at increased risk for infection (CDC,2001);
- Patients infected with HTLV-III/LAV can be dialyzed by either haemodialysis or peritoneal dialysis and do not need to be isolated from other patients. The type of dialysis treatment (i.e., haemodialysis or peritoneal dialysis) should be based on the needs of the patient;
- Clean your fistula site with soap and water before every dialysis treatment;
- Clean your hands with soap and water or waterless alcohol-based sanitizer before you start your dialysis session and after you leave;
- If you have a catheter, wear a mask while the nurse is hooking you up to the dialysis machine to prevent germs from your mouth from falling or spraying onto the catheter;
- If you don’t have a permanent fistula, but will need dialysis for your lifetime, discuss the early placement of a fistula with your doctor, before the need for dialysis;
- Get the flu vaccine every year;
- Get the hepatitis B vaccine. The cornerstone of preventing HBV infection and its sequelae is vaccination, which is recommended for all patients undergoing chronic haemodialysis and the healthcare providers who care for them;
- In addition to Standard Precautions, isolation (separate room) for HBsAg positive patients is standard of practice in haemodialysis facilities;
- Tetanus: a dose of dT which contain diphtheria toxoid (D) and tetanus toxoid (T) in combination with other antigen should be given every 10 years; a single dose of dT with acellular pertussis vaccine;
- Tetanus, Diphtheria, Pertussis (Tdap) can be substituted for those under 65 years of age. This assumes the patient has completed a primary series. If not, this should be done;
- It is critical to ensure that screening for latent TB infection in patients with renal failure occurs at a very early stage. CDC recommends (and CMS requires) that all haemodialysis patients be screened for TB at baseline and whenever exposure is suspected;

- If you will receive intravenous fluids, request that they do not use the bag for other patients or set up the intravenous tubing until they are ready to administer fluid to you;
- Notify a nurse or doctor if the area around the central line is painful or inflamed, secreting (pus), or if the bandage becomes wet or unclean;
- Seek medical attention immediately if you develop symptoms such as fever, uncommon fatigue, loss of appetite, nausea, vomiting, and/or changes in mental activity. Sometimes patients on dialysis do not develop a fever when they have an infection, so all symptoms are important;

**What patients can ask:**

- Ask for a hepatitis C blood test before starting dialysis treatment, and then on a routine basis. Infection control techniques to prevent HCV transmission in dialysis centers have been primarily centered on safe injection practices, use of hand hygiene and adequate cleaning of environmental surfaces and equipment between patients. Isolation of patients with HCV infection, as has been done with patients with HBV infection, is not recommended by the CDC or Kidney Disease Outcomes Quality Initiative (KDOQI);
- Before receiving an injection, ask if the needle and syringe have been newly opened for you since syringes and needles must be used one time only;
- Ask doctors and nurses to explain why a central line is required, how long you will need to have it in, and if you can use a fistula or graft for dialysis treatment;
- Ask if the dialysis staff put a new external (transducer) filter on the dialysis machine for every patient and replace the filter when it is soaked with blood. This prevents blood from contaminating the inside of the dialysis machine and prevents patient exposure to contaminants;
- Ask if the water used for dialysis is routinely tested for bacteria and if there is a policy in case levels are higher than acceptable;
- Ask if your dialysis caregiver has received the flu vaccine this year;

**What patients should observe:**

- Check to see if dialysis staff have cleaned their hands before and after they touch you or your dialysis machine;
- Make sure your nurse wears a mask during the initiation and discontinuation of the treatment with a catheter;
- Observe if the dialysis staff cleans the skin of your fistula well with an antiseptic before hooking you up to the dialysis machine;
- Observe if the chair, table, and machine are cleaned between each patient use;
- What family members or other visitors can do:

- Wash hands or use an alcohol-based hand sanitizer before and after touching you;
- Wear gloves and a clean cover gown to prevent contamination of clothing:
- Keep wounds covered with a bandage:
- Avoid sharing personal items and clothing;
- If you will receive intravenous fluids, request that they do not use the bag for other patients or set up the intravenous tubing until they are ready to administer fluid to you;
- Notify a nurse or doctor if the area around the central line is painful or inflamed, secreting (pus), or if the bandage becomes wet or unclean;
- Seek medical attention immediately if you develop symptoms such as fever, uncommon fatigue, loss of appetite, nausea, vomiting, and/or changes in mental activity. Sometimes patients on dialysis do not develop a fever when they have an infection, so all symptoms are important;

**What family members or other visitors can do:**

- Wash hands or use an alcohol-based hand sanitizer before and after touching you;
- Wear gloves and a clean cover gown to prevent contamination of clothing;
- Keep wounds covered with a bandage;
- Avoid sharing personal items and clothing.

**What HCWs should do:**

There are certain products and principles which are recommended in order to optimize environmental cleaning in healthcare settings, including HD facilities. These include the following tasks which are typically performed by the dialysis nurse or technician:

- Store cleaner/disinfectant separately from skin antiseptics/patient supplies (separate shelves and below patient supplies to avoid potential contamination);
- Perform hand hygiene before and after cleaning the patient station;
- Don gloves when using cleaner/disinfectants;
- Use one set of cleaning cloths or disposable germicidal wipes for each patient station;
- Use microfiber cloths and mops if possible (more effective cleaning products than regular cotton cleaning cloths);
- Clean all frequently touched or “high touch” surfaces in the “patient zone” between patient treatments (chair, armrests, counters, drawer/cupboard handles, exterior surface of the HD machine)—please note that some of these

high touch surfaces may be right outside the patient zone (e.g., computer stations), and must also be cleaned between patient treatments;

- Clean the top of an object first and work down to avoid soiling surfaces just cleaned. If using cleaning cloths instead of disposable germicidal wipes:
- When using a disinfectant cleaner, wet the surface, use friction to clean, and allow to air dry;
- Fold the cleaning cloth in a series of squares to provide a number of potential cleaning surfaces. A wadded cloth does not clean efficiently;
- Replace cloth as needed. More than one cloth may be required for a patient station;
- Never use the same cleaning cloth for more than one patient unit;
- Never re-dip used cloth into clean disinfectant solution;
- Additional cleaning functions, typically performed by housekeeping staff in haemodialysis facilities, should include at the end of the day:
  - Wet mop the floor;
  - Clean patient/staff bathrooms and restock paper products/hand hygiene supplies;
  - Check and refill all hand hygiene product dispensers in nursing stations and at patient stations (soap, paper towels, lotion, alcohol-based hand sanitizer);
  - On a routine basis, walls and high dusting should be performed;
  - Cleaning and disinfection of these surfaces (patient zone/high touch surfaces) should be performed between all patient treatments, no matter;
  - Key principles related to equipment cleaning/disinfection that should be adhered to in order to reduce the risk of cross-contamination in haemodialysis settings follow;
  - Items taken into an individual haemodialysis patient station should be disposed of after use, dedicated for use on a single patient, or cleaned and disinfected before being taken to a common clean area or used on another patient;
- Non-disposable items that cannot be comprehensively cleaned and disinfected (e.g., adhesive tape, cloth covered blood pressure cuff s) should be dedicated for use on a single patient;
- External venous and arterial pressure transducer filters/protectors should be changed after each patient treatment, and should not be reused. Internal transducer filters do not need to be changed routinely between patients;
- When reprocessing or disposing of dialyzers, dialyzer ports should be capped and tubing clamped. The used dialyzer should be placed in a leak proof container for transport from the patient station to the reprocessing area. Gloves should be worn at a minimum. Gowns are required if there is any risk of contamination of clothing;

- All equipment, including the front of the dialysis machine, should be considered contaminated after a patient dialysis session;
- Non-disposable instruments (scissors, hemostats, clamps, etc.) which have no contact with sterile tissue or mucous membranes may become contaminated during the procedure. To facilitate thorough cleaning of the hinges and joints, these instruments should be fi rst submerged and cleaned (e.g., with enzymatic detergent, rinsed thoroughly, then soaked in an appropriate disinfectant according manufacturer's instructions— typically low level disinfectant unless visibly contaminated with blood—then tuberculocidal disinfectant);
- The alternative would be to send the instruments to the Sterile Processing Department, if available, for reprocessing. Wiping with a cloth saturated with disinfectant may not be adequate to thoroughly clean hinged or jointed instruments;
- Interior Disinfection of Dialysis Machine;
- Disinfection of the internal pathways of the dialysis machine between patient uses is not required. Dialysis machines are engineered so that the pathways segregate blood and dialysate;
- The exception is if a blood leak event occurs. In the event of a blood leak outside of the blood pathway, the CDC recommends internal disinfection before the dialysis machine is used on a successive patient;

NB; consult the *Haemodialysis guidelines* for detail

## 26.0. VIRAL HAEMORRHAGIC FEVERS

Ebola and Marburg Viral Haemorrhagic Fevers (VHFs) are zoonotic diseases that can cause a severe and life-threatening viral diseases including haemorrhagic syndrome in humans. They have been widely reported in parts of Africa, South America, the Middle East and Eastern Europe. Among an estimated 2.5 billion people at risk globally, about 60% reside in Sub- Saharan Africa. The East and Central Africa states of Sudan, Uganda and Democratic Republic of Congo, which neighbour Tanzania, have reported cases since 1976. Given its geographical location, level of sanitation, and high mobility of people, Tanzania will continue to have these threats of Ebola and Marburg disease outbreaks.

### 26.1. Prevention and control

Good outbreak control relies on applying a package of interventions, namely case management, surveillance and contact tracing, a good laboratory service, safe burials and social mobilisation. Community engagement is key to successfully controlling outbreaks. Raising awareness of risk factors for Ebola infection and protective measures (including vaccination) that individuals can take is an effective way to reduce human transmission. Risk reduction messaging should focus on several factors:

**Reducing the risk of wildlife-to-human transmission** from contact with infected fruit bats or monkeys/apes and the consumption of their raw meat. Animals should be handled with gloves and other appropriate protective clothing. Animal products (blood and meat) should be thoroughly cooked before consumption.

**Reducing the risk of human-to-human transmission** from direct or close contact with people with Ebola symptoms, particularly with their bodily fluids. Gloves and appropriate personal protective equipment should be worn when taking care of ill patients at home. Regular hand washing is required after visiting patients in hospital, as well as after taking care of patients at home.

**Reducing the risk of possible sexual transmission**, based on further analysis of ongoing research and consideration by the WHO Advisory Group on the Ebola Virus Disease Response, WHO recommends that male survivors of Ebola virus disease practice safe sex and hygiene for 12 months from onset of symptoms or until their semen tests negative twice for Ebola virus. Contact with body fluids should be avoided and washing with soap and water is recommended. WHO does not recommend isolation of male or female convalescent patients whose blood has been tested negative for Ebola virus.

**Outbreak containment measures,** including prompt and dignified safe burial of the dead, identifying people who may have been in contact with someone infected with Ebola and monitoring their health for 21 days, the importance of separating the healthy from the sick to prevent further spread, and the importance of good hygiene and maintaining a clean environment.

**Controlling infection in health-care settings**

Health-care workers should always take standard precautions when caring for patients, regardless of their presumed diagnosis. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment (to block splashes or other contact with infected materials), safe injection practices and safe burial practices.

Health-care workers caring for patients with suspected or confirmed Ebola virus should apply extra infection control measures to prevent contact with the patient's blood and body fluids and contaminated surfaces or materials such as clothing and bedding. When in close contact (within 1 metre) of patients with EBV, health-care workers should wear face protection (a face shield or a medical mask and goggles), a clean, non-sterile long-sleeved gown, and gloves (sterile gloves for some procedures).

Laboratory workers are also at risk. Samples taken from humans and animals for investigation of Ebola infection should be handled by trained staff and processed in suitably equipped laboratories.

**WHO response**

WHO aims to prevent Ebola outbreaks by maintaining surveillance for Ebola virus disease and supporting at-risk countries to developed preparedness plans. The document provides overall guidance for control of Ebola and Marburg virus outbreaks:

Ebola and Marburg virus disease epidemics: preparedness, alert, control, and evaluation

When an outbreak is detected WHO responds by supporting surveillance, community engagement, case management, laboratory services, contact tracing, infection control, logistical support and training and assistance with safe burial practices.

WHO has developed detailed advice on Ebola infection prevention and control: Infection prevention and control guidance for care of patients with suspected or confirmed Filovirus haemorrhagic fever in health-care settings, with focus on Ebola

## 26.2. Use Standard Precautions with All Patients

Establish routine precautions for infection control. Use Standard Precautions consistently, especially handwashing before and after examining patients with fever. This section describes how to:

- Consider every person (patient regardless of their infection status or staff) as potentially infectious and susceptible to infection;
- Establish safe handling and disposal of used needles and syringes;
- Be prepared to intensify Standard Precautions and include VHF Isolation Precautions;

- Identify a VHF Coordinator to oversee and coordinate activities associated with VHF Isolation Precautions;
- Use appropriate hand hygiene techniques including hand washing, hand antisepsis and antiseptic hand rub;
- Wear Personal Protective Equipment (PPE) including gloves, masks, goggles, caps, gowns, boots and aprons;
- Appropriately handle sharps, patient care and resuscitation equipment, linen, and appropriately manage patient placement and patient environmental cleaning;
- Safely dispose of infectious waste materials to protect those who handle them and prevent injury or spread to the community;
- Process instruments by cleaning and then either sterilization or high-level disinfection (HLD) using recommended procedures.

### 26.3. Identify Suspected Cases of VHF

Common signs and symptoms of VHF and the immediate precautions to take when a VHF is suspected in an outbreak situation. This section describes how to:

- In a non-outbreak situation, suspect VHF in patients with fever, severe illness, and signs of unexplained bleeding;
- Alert relevant health facility staff and begin VHF Isolation Precautions as soon as VHF is suspected;
- Report the suspected case to designated health authorities.
- If confirmed the patient has VHF the house of the patient should be decontaminated and all his/her clothes should be burnt.
- Tracing of contact persons should start immediately and isolate them for 21 days.

However, health workers should be aware of the possibility for suspecting a VHF in a non-outbreak situation. As soon as a VHF is suspected, VHF Isolation Precautions should begin. This will help reduce the number of people exposed to the VHF.

### 26.4. Isolate the Patient:

Get recommended supplies and set up an isolation area. This section describes how to:

- Gather supplies to set up an isolation area;
- Make a substitute item from available materials whenever are commended item is not available;

Select a site for the VHF isolation area and set up:

- The patient’s room;

- A changing room for other health facility staff to use near their work area;
- A family entrance, if necessary;
- Restrict patient access to health facility staff trained to use VHF Isolation Precautions;
- Establish a barrier between the VHF patient and uninfected patients, other health facility staff, and visitors;
- A security barrier around the entire isolation area;
- Counsel family members about patient care;

Make sure the selected site has:

- An isolated toilet: If a toilet is not next to the patient's room, select and isolate a toilet near the isolation area. Use it to receive the patient’s disinfected waste and other liquid waste;
- If a toilet is not available, prepare a latrine for disposal of the patient’s and other liquid waste;
- Adequate ventilation: The isolation room should have adequate ventilation because chlorine disinfectants will be used. To prevent airborne or droplet transmission of infectious agents, avoid rooms with air conditioning;
- Screened windows: If windows are left open for cooling, screen them to prevent transmission of mosquito- and other insect-borne diseases.

**Wear Protective Clothing:** the protective clothing that should be worn when VHF is present in the health facility and select appropriate items when recommended clothing is not available.

**All who attend VHF cases as described below should wear Protective Clothing:**

- All doctors, nurses, and health care workers who provide direct patient care to suspected VHF patients;
- All support staff who clean the isolation room, handle contaminated supplies and equipment, launder reusable supplies, and collect and dispose of infectious waste from VHF patients;
- All laboratory staff who handle patient specimens and body fluids from suspected VHF cases;
- Laboratory support staff who clean and disinfect laboratory equipment used to test VHF specimens;
- Burial teams who remove bodies of deceased VHF patients and prepare them for burial;
- Family members who care for VHF patients.

**When a VHF case is suspected in the health facility, the following protective clothing should be worn in the isolation area:**

- A scrub suit or inner layer of clothing (old shirt and trousers brought from home);
- A pair of thin gloves;
- Rubber boots or overshoes;
- A gown or outer layer of clothing (surgical or disposable gown with long sleeves and cuffs);
- A plastic apron worn over both layers of clothes;
- A second pair of thin or thick gloves. Wearing a second pair of gloves provides an added measure of safety during patient care and when handling contaminated supplies;
- A HEPA-filter (high-efficiency particulate air respirator) or other biosafety mask (or surgical mask if HEPA-filter or other biosafety mask is not available);
- Head covering;
- Clear eyeglasses or non-fogging goggles.

### 26.5. How to put on (Donning) the PPE in chronological order:

Make sure the changing room (and the changing area for cleaning and other staff) contains a supply of protective clothing:

- Before entering the changing room, remove jewellery, wallets and other valuables. Store them safely outside the changing room;
- Remove street clothes and hang them on a hook. Put on the scrub suit or set of old clothes.

***Scrub suit or inner layer:*** Wear a scrub suit or a set of old clothes brought from home (such as a loose-fitting shirt and trousers). Avoid wearing long skirts to prevent contact between clothing and spills of infectious waste on the floor.

***Thin gloves:*** These permits fine-motor function when examining or caring for patients. They can be latex, vinyl, or surgical gloves; they do not need to be sterile. The gloves must reach well above the wrist, preferably 10 cm to 15 cm long (4inches to 6 inches), measuring from the wrist up along the arm.

***Boots:*** Boots or over boots must be worn over street shoes when infectious waste is on the floor. Common rubber boots are recommended. The sides of the boots should be at least 30 cm (12 inches) high and have textured soles. If boots are not available, wear two layers of plastic bags.

**Put on the first pair of gloves.**

- Look at your hands for cut or broken skin. If the skin is cut or broken, refrain from direct patient contact;

- Put on one glove at a time. If the scrub suit or set of old clothes has long sleeves, place the edge of each glove under the cuff;
- When only one pair of gloves is worn, place the edge of the glove over the cuff or gown.

**Put on the outer gown.**

- Pick up the gown from the inside. Place arms through the armholes. Tie the gown in back. Or, ask another health care worker to tie the gown.

**Put on the plastic or rubber apron.**

**Put on the second pair of gloves:**

- Place the edge of the second pair of gloves over the cuff of the gown;
- If using plastic bags, place the second layer of plastic bags over the first. Close ends of the bags with plastic tape or elastic bands;
- Health facility staff who do cleaning, laundering, disinfecting, waste disposal or handling the body should wear thick/utility gloves as the second pair of gloves.

**Put on the mask.**

- Tie it at the back of the neck and towards the top of the head.

**Put on a head cover.**

**Put on the protective eyewear.**

- Attach the eyeglasses or goggles behind the head with string or cord to prevent the eyewear from falling off when working with patients in the isolation ward.

**Remember!** Make sure the mask, head cover and eyewear fit comfortably. Once gloved hands have touched a patient, do not touch the mask, head cover and eyewear

### 26.6. How to Put Off (Doffing) the PPE

The steps for removing protective clothing include disinfection with bleach solutions and washing hands with soap and water. Outer gloves and boots are likely to have the most contact with infectious body fluids during patient care or while conducting other duties in the isolation unit.

**Before leaving the patient's room:**

- Disinfect the outer pair of gloves;
  - Wash the gloved hands in soap and water;
  - Dip the gloved hands in 0.5% bleach solution for 1 minute.
- Disinfect the apron;
  - Spray or wipe it with 0.5% bleach solution.

- Disinfect the boots.
  - Use a sprayer containing 0.5% bleach/chlorine solution to spray boots OR
  - Hold the foot over a pan or basin and ask another health worker to pour 0.5% bleach solution over the boots OR
  - Step into a shallow pan containing 0.5% bleach solution and wipe boots on a bleach-drenched cloth.

  ****Note:** The soles of rubber boots are difficult to clean because they are textured. Disinfect them carefully and make sure to reach all surfaces of the textured soles.

**After leaving the patient's room:**

- Remove the outer pair of gloves.
  - If two pairs of gloves are worn:
  - Pull the edge of the glove back over the gloved hand so that the glove turns inside out as it is being pulled back.
- Remove the apron and outer gown.
  - Put the apron in a laundry container or hang it for reuse (if it will be reused).
  - Remove the outer gown. Hang it on a hook for reuse. Make sure it is hung inside out.
  - If the gown needs laundering, place it in the laundry container.
- Disinfect the gloved hands
  - After contact with apron and outer gown:
  - Rinse the gloved hands in 0.5% bleach solution. Then wash them in soap and water;
  - Dry the gloved hands with a one-use towel.
- Remove the eyewear, head cover and mask.
  - If eyewear is heavily soiled, wash the eyeglasses in soapy water and wipe them clean. Store them in a drawer or shelf with the clean supply of eyeglasses;
  - Remove the head cover and, if unsoiled, store it with the cleaned eyewear. If it is soiled, discard it in the bucket for disposal of contaminated waste;
  - Remove the mask and hang it on a hook or store it for reuse;
  - A HEPA-filter or other biosafety mask can be reused by the same health care worker as long as it is not soiled.
- Remove the boots.
  - Place a towel that has been soaked in 0.5% bleach solution on the floor for health facility staff to stand on when removing boots;
  - Use a boot remover to take off the rubber boots. Avoid touching the boots with bare or gloved hands;

  - Store boots safely until next use. For example, store them in a plastic sack or on a covered shelf.
- Remove the inner pair of gloves.
  - Remove the first glove with the other gloved hand. Pull the edge of the first glove back over the gloved hand so that the glove turns inside out as it is being pulled back;
  - Place the inside-out glove in the palm of the gloved hand;
  - Reach inside the glove to a clean area. Pull the glove back over the hand so that only the inside of the glove is exposed and covers the glove held in the palm;
  - Discard the gloves in a bucket for disposal of contaminated waste;
  - Wash un gloved hands with soap and water.
- Remove inner layer of clothes and dress in street clothes.
  - If the inner layer is not soiled, store the clothing for reuse;
  - If soiled, place the clothing in the laundry container;
  - If personal shower facilities are available, shower before dressing in street clothes;
  - If skin has contact with soiled material, follow guidelines for accidental exposure;
  - Put on street clothes;
  - Wash hands with soap and clean water before leaving the changing room.

## 26.7. Ambulance transport of a suspected VHF case

### Preliminary Considerations

- A suspected case can potentially be a source of VHF transmission;
- Sick patients can be irritable and difficult to manage;
- Sick patients must be treated with dignity and respect;
- Full IPC precautions and PPE must be used while transporting a suspected case;
- Depending on the country, the transport of a patient can be directly managed by the RRT or by a partner;
- The coordinator of the RRT remains the guarantee for good practices and the application of SOPs during the transport of a patient.

### Specific requirements for an ambulance which transport a suspected case

- Physical separation between the cockpit and the rear of the vehicle;
- Rear of the vehicle long enough to transport a lying patient (don’t use double cabin pick-up);
- Rear of the vehicle with a minimum of equipment to facilitate cleaning and disinfection.

**The standard ambulance escort**

- If the ambulance escort is part of the RRT:
  - A driver;
  - A nurse;
  - 2 bearers.
- If the ambulance escort is NOT part of the RRT:
  - Same as above plus an infection prevention and control expert

**Transport in ambulance of an EVD suspected case in 8 steps**

- Mobilisation of the RRT and ambulance escort once an EVD suspected case alert is received
- Preparing vehicles and equipment before dispatch
- Arrival at the EVD suspected case alert location
- Removal of the EVD suspected case
- Disinfection and doffing of the PPE ambulance team (except the nurse accompanying the patient)
- Departure of the ambulance
- Arrival of the ambulance at the Ebola Treatment Center
- Waste management and disinfection of the ambulance.

**Disinfect Reusable Supplies and Equipment at the VHF isolation**

VHF Isolation Precautions during patient care and when disinfecting and cleaning contaminated surfaces, supplies and equipment. *What to Disinfect:* Disinfection kills almost all bacteria, fungi, viruses, and protozoa. It reduces the number of microorganisms to make equipment and surfaces safer for use. When VHF is suspected in the health facility, all medical, nursing, laboratory and cleaning staff should disinfect:

- Hands and skin after contact with a VHF patient or infectious body fluids;
- Gloved hands after contact with each VHF patient or after contact with infectious body fluids (when gloves cannot be changed);
- Thermometers, stethoscopes and other medical instruments after use with each VHF patient;
- Spills of infectious body fluids on the walls and floors;
- Patient excreta and containers contaminated by patient excreta;
- Reusable supplies such as protective clothing and patient bedding;
- Used needles and syringes.

**Prepare Bleach Solutions**

In a central place in the health facility, prepare solutions:

- 2% bleach solution is a strong solution used to disinfect excreta and bodies;
- It is also used to prepare the 0.5% for decontamination of table tops, mattresses and
- 0.05% bleach solution hand washing and birthing. 0.05% bleach solution is also used to disinfect:
  - Surfaces;
  - Medical equipment;
  - Patient bedding;
  - Reusable protective clothing before it is laundered.

It is also recommended for:

- Rinsing gloves between contacts with each patient;
- Rinsing gloves, apron, and boots before leaving the patient's room;
- Disinfecting contaminated waste for disposal.

*Bleach solutions must be prepared daily*. They lose their strength after 24 hours. Anytime the odour of chlorine is not present, discard the solution.

***Note:*** 0.5% bleach solution is caustic. Avoid direct contact with skin and eyes. Prepare the bleach solutions in a well-ventilated area.

**Disinfect Reusable Medical Instruments**

In the isolation room, each time health care workers wash their hands between patients, they should also disinfect thermometers and stethoscopes they have used to examine the patient.

**To disinfect thermometers and stethoscopes with alcohol**:

- Use rubbing alcohol (70% Isopropyl);
- Place the alcohol in a covered container and put it in the patient's room. Change the alcohol at least once a week;
- Use a clean cloth or paper towel and dip it in the alcohol solution;
- Carefully wipe the thermometer with the alcohol solution and hold the cloth around it for 30 seconds. Discard the cloth. Let the thermometer air-dry;
- Use another clean cloth and dip it in the alcohol solution;
- Carefully wipe the metal part of the stethoscope and hold the cloth against the surface for 30 seconds. Let it air-dry;
- Discard the cloth in the laundry container. Discard paper towels in the bucket for waste to be burned;

**To disinfect thermometers and stethoscopes with bleach solution:**

- Place a covered container of 0.5% bleach solution in the isolation room. Change the bleach solution each day;
- Use a clean cloth or paper towel and dip it in the bleach solution. Never dip a soiled cloth back into the bleach solution. Use a cup or dipper to pour the bleach solution on a soiled cloth;
- Wipe the thermometer with the cloth soaked in bleach solution. Or, soak the thermometer for 10 minutes in the bleach solution. Let the thermometer air-dry;
- Use a clean cloth or new paper towel and dip it in the bleach solution;
- Wipe the metal part of the stethoscope with 0.5% bleach solution. Let it air-dry;
- Discard the cloth in the laundry container. Discard paper towels in the bucket for waste to be burned.

**Disinfect Bedpan or Waste Bucket:**

- Cover the contents with 2% bleach. Empty the bedpan contents directly into the isolated toilet or latrine;
- Clean the bedpan with soap and water to remove solid waste. Pour into toilet or latrine. Rinse the bedpan in 0.5% bleach solution and return it to patient's room.
- If a family member is responsible for carrying out this task, make sure the family member wears protective clothing.

**Disinfect Patient's Utensils:**

If families will assist with patient care, provide 0.05% bleach solution and soap and water so the family member can wash the patient's eating utensils. After washing the utensils, rinse them in 0.05% bleach solution, and let them air-dry.

**Disinfect Reusable Supplies and Equipment**

**Disinfect Spills of Infectious Body Fluids**

Place a bucket containing 0.5% bleach solution in the isolation area.

***To disinfect spills of infectious body fluids:***

- Use absorbent materials to cover the spill;
- Collect the spill and then cover the area completely with 0.5% bleach solution for 10 minutes. Take care to prevent drops or splashes of the contaminated body fluid from reaching anyone when pouring bleach solution on the spill;
- Pour 2% of chlorine at the heavy spill;
- Remove the disinfected blood or spilled material with a cloth soaked with 0.05% bleach solution;

- Discard any waste in the container for collecting disposable infectious waste or in the isolated latrine or toilet;
- Wash area as usual with soap and clean water.

***To clean the walls or other surfaces:***

Surfaces such as table tops, sinks, walls and floors are not generally involved in disease transmission. However, in a VHF patient's room, if walls are visibly soiled with blood or other body fluids, clean them as follows:

- Use a sprayer or mop to wash the walls with 0. 5% bleach solution.
- Rinse the mop in a fresh supply of 0.5% bleach solution. (If using a sprayer, apply the spray close to the surface to minimize splashing and aerosols.)
- Wash the wall as usual with soap and clean water to remove visible soil.
- Discard any waste in container for collecting infectious waste or in the isolated latrine or toilet.

**Disinfect Infectious Waste and Non-Reusable Supplies for Burning**

Place a bucket or other container containing 0.5% bleach solution in the patient's room. Use it to collect infectious waste, contaminated items, and non-reusable supplies that will be burned.

**Clean and Disinfect Protective Clothing**

Set aside a special part of the laundry or cleaning area for laundry from suspected VHF patients. Make sure health facility staff who handle contaminated laundry wear protective clothing, including thick gloves as the second pair of gloves:

- Transfer laundry as soon as possible to area set aside for VHF laundry;
- Carefully move the laundry to a bucket with fresh 0.05% bleach solution;
- Soak laundry in 0.05% bleach solution for 20 minutes. Be sure that all items are completely soaked;
- Remove items from the bleach solution and place in soapy water;
- Soak overnight in soapy water;
- Scrub thoroughly to remove stains. Rinse and line-dry;
- Use a needle and thread to repair any holes or torn areas;
- The clean clothing is now ready for use. It can be ironed although this is not necessary. (It is not necessary to wear protective clothing when ironing cleaned clothing);
- Items that are very worn out should be discarded or used as cleaning rags.

**Clean and Disinfect Boots**

Place a sprayer or pan with 0.5% bleach solution at the exit of the patient's room. Change the pan often. Steps for disinfecting boots

**Clean and Disinfect Patient's Bedding**

***For plastic sheeting:***

- If the plastic sheeting becomes soiled during its use with the same patient, remove liquid or solid waste with absorbent towels;
- Discard them in the container for collecting infectious waste for burning. Then, wash the plastic sheeting with 0.5% bleach solution;
- Change the plastic sheeting between patients;
- If the plastic sheeting cannot be changed between patients, wash it with 1% bleach solution after each patient.

***For patient's sheets:***

- Remove sheets from bed. Put them in a container (plastic bag or bucket) in the patient's room;
- Take the container directly to the laundry area;
- Soak in 0.05% bleach solution for 20 minutes. Be sure all items are completely soaked.
- Remove items from the bleach solution and place them in soapy water;
- Soak overnight;
- Scrub thoroughly to remove stains. Rinse and line-dry.

***Mattresses***

If a mattress is heavily soiled, remove it from the isolation area to the outdoors and burn it. Make sure health facility staff wear protective clothing and gloves when touching and carrying the soiled mattress.

If mattresses must be reused:

- Pour 0.5% bleach solution directly on the mattress. Let the solution soak through completely to the other side;
- Flood the soiled area with soapy water and rinse with clean water;
- Let the mattress dry in the sun for several days;
- Turn the mattress often so it dries on both sides.

**Mobilize the Community and Conduct Community Education**

Provide guidance for involving the community in disease prevention and control activities when VHF is suspected. It also describes how to choose a VHF Coordinator.

When VHF is suspected:

- Make sure that the community knows about the VHF outbreak and how it is transmitted;

- Involve the community in identifying the source of the epidemic and controlling it;
- Reduce fear and rumours in the population;
- To develop community education in an urgent situation;
- Describe the extent of the current health problem;
- Identify and mobilize key community members who will plan and lead the education efforts;
- Describe the target population and develop health messages;
- Plan and conduct activities to communicate messages;
- Conduct ongoing evaluation of the activities and make improvements as needed.

**Make Advanced Preparations to Use VHF Isolation Precautions**

Use VHF Isolation Precautions. Advance preparations when a VHF is suspected, the supplies. When advance preparations are not possible, VHF Isolation, Precautions must be implemented in an emergency situation.

When a VHF case is suspected, VHF Isolation Precautions must begin immediately. All efforts must be focused on meeting patients' needs. There is no time to give initial training in VHF Isolation Precautions.

Being prepared for an emergency can ultimately save lives. Health care workers will know how to use VHF Isolation Precautions, and adequate supplies will already be available. Disease prevention in the health facility setting will be more effective.

This section describes how to prepare for VHF Isolation Precautions.

**Identify a VHF Coordinator to Oversee Preparations**

Someone in the health facility may already serve as a coordinator for emergency situations. This person can also serve as the VHF Coordinator. If the emergency coordinator cannot assume the VHF activities, select a staff person with authority who can serve as the VHF Coordinator. If the emergency coordinator cannot assume the VHF activities, select a staff person with authority who can serve as VHF Coordinator. The tasks of the coordinator:

- Oversee all the preparations for VHF Isolation Precautions;
- Serve as the focal point for information and leadership when a VHF case is suspected;
- Inform all health facility staff about VHFs and the risks associated with them;
- Organize training in VHF Isolation Precautions for medical, nursing, and laboratory staff who will work directly with VHF patients or infectious body fluids;

- Assign responsibility to medical, laboratory, and cleaning staff for ensuring that all the necessary precautions, treatment protocols and clean up procedures are carried out within their areas;
- Hire or reassign and train additional cleaning staff for work with disinfection of waste, clothing, and equipment;
- Make sure that teams are trained to prepare and transport bodies for burial;
- Routine handwashing practices should be part of the minimum level of Standard Precautions used with all patients in the health facility;
- To reinforce consistent handwashing practices, regularly monitor the practices and improve them as needed. For example:
  - Has handwashing been identified as a routine practice in the health facility?
  - Do all staff wash their hands after contact with each patient, especially new patients with fever?
  - Are there reliable supplies of liquid soap and running water or buckets with clean water available in areas where health workers should use them?
  - Are posters reminding health workers to wash their hands placed in areas where health workers can see them?

When a VHF case is suspected, the health facility will immediately take steps to limit its transmission. These include steps to:

- Create an isolation room for VHF patients;
- Limit contact with VHF patients to a small number of specially trained staff and, in some areas, a family member who has received information and training in VHF Isolation Precautions;
- Limit the use of invasive procedures as much as possible in treatment of VHF patients;
- Use protective clothing for all staff who have contact with VHF patients or their body fluids;
- Use safe disinfection and waste-disposal methods.

### 26.8. Procedures for Accidental Exposures

Provide information about how to respond when accidental exposures occur. These procedures are detailed in *the National Guidelines on Post-Exposure Prophylaxis Following Occupational and Non-Occupational Exposures to Blood and Other Body Fluids (2014).*

Standard Precautions aim to reduce the risk of disease transmission in the health care setting, even when the source of infection is not known. Standard Precautions are designed for use with all patients who present in the health care setting and apply to:

- Blood and most body fluids whether or not they contain blood;
- Broken skin;
- Mucous membranes.

To reduce the risk of disease transmission in the health care setting, use the following Standard Precautions.

- Wash hands immediately with soap and water before and after examining patients and after any contact with blood, body fluids and contaminated items — whether or not gloves were worn. Soaps containing an antimicrobial agent are recommended;
- Wear clean, ordinary thin gloves anytime there is contact with blood, body fluids, mucous membrane, and broken skin. Change gloves between tasks or procedures on the same patient;
- Before going to another patient, remove gloves promptly and wash hands immediately, and then put on new gloves;
- Wear a mask, protective eyewear and gown during any patient-care activity when splashes or sprays of body fluids are likely. Remove the soiled gown as soon as possible and wash hands;
- Handle needles and other sharp instruments safely. Do not recap needles;
- Make sure contaminated equipment is not reused with another patient until it has been cleaned, disinfected, and sterilized properly;
- Dispose of non-reusable needles, syringes, and other sharp patient-care instruments in puncture-resistant containers;
- Routinely clean and disinfect frequently touched surfaces including beds, bed rails, patient examination tables and bedside tables;
- Clean and disinfect soiled linens and launder them safely. Avoid direct contact with items soiled with blood and body fluids;
- Place a patient whose blood or body fluids are likely to contaminate surfaces or other patients in an isolation room or area;
- Minimize the use of invasive procedures to avoid the potential for injury and accidental exposure. Use oral rather than injectable medications whenever possible;
- When a specific diagnosis is made, find out how the disease is transmitted. Use precautions according to the transmission risk.

**Give First Aid for Accidental Exposures**

***Accidental needle stick injury:*** Assume any needle stick injury is a suspected contact for VHF whether or not a break in the skin can be seen. If an accidental needle stick injury occurs, treat the exposure site:

- Immerse the exposed site in 70% alcohol for 20 to 30 seconds, and wash with soap and clean water;
- Flush the site in running water for 20 to 30 seconds;
- If needed, cover with a dressing;
- Report the incident to a supervisor or the physician-in-charge;
- The purpose of notifying the physician-in-charge is:
  - To identify what caused the problem
  - To take corrective action to solve the problem and prevent accidental transmission
  - To provide appropriate care for the possible case of VHF.

Remind the health facility staff that accidents do happen even when every precaution to prevent them has been taken. Reassure health facility staff that reporting the accidental exposure will have no negative consequences. Explain that reporting the accidental exposure is essential for protecting themselves, their families, other health workers and patients.

***Accidental contact with infectious body fluids:*** An accidental contact can occur if there is unprotected contact between infectious body fluids and broken skin or the mouth, nose or eye.

For example, vomit may run under a glove, a patient might cough blood which runs into the health care worker's eye, or coughed blood may run underneath a health care worker's mask and get into the mouth. Treat any accidental contact as a suspected contact with VHF. As soon as the contact occurs:

- Flush the area in the most appropriate manner with soap and clean water. If a splash occurs in the eye, flush it with clean water;
- Leave the isolation area and remove the protective clothing as recommended;
- Take a shower and put on street clothes;
- Report the exposure to a supervisor or the physician-in-charge. Complete the necessary forms.

***Follow up accidental exposures:***

- Monitor the condition of the health facility staff. Take a measured temperature two times per day;
- If a fever occurs -- temperature is 38.5oC (101oF) or higher –the health facility staff should not do patient care activities.

Treat as a suspected case of VHF if the health facility staff’s signs and symptoms meet the case definition.

**Isolation of the Patient**

Isolating the VHF patient will:

- Restrict patient access to health facility staff trained to use VHF Isolation Precautions;
- Establish a barrier between the VHF patient and uninfected patients, other health facility staff, and visitors.

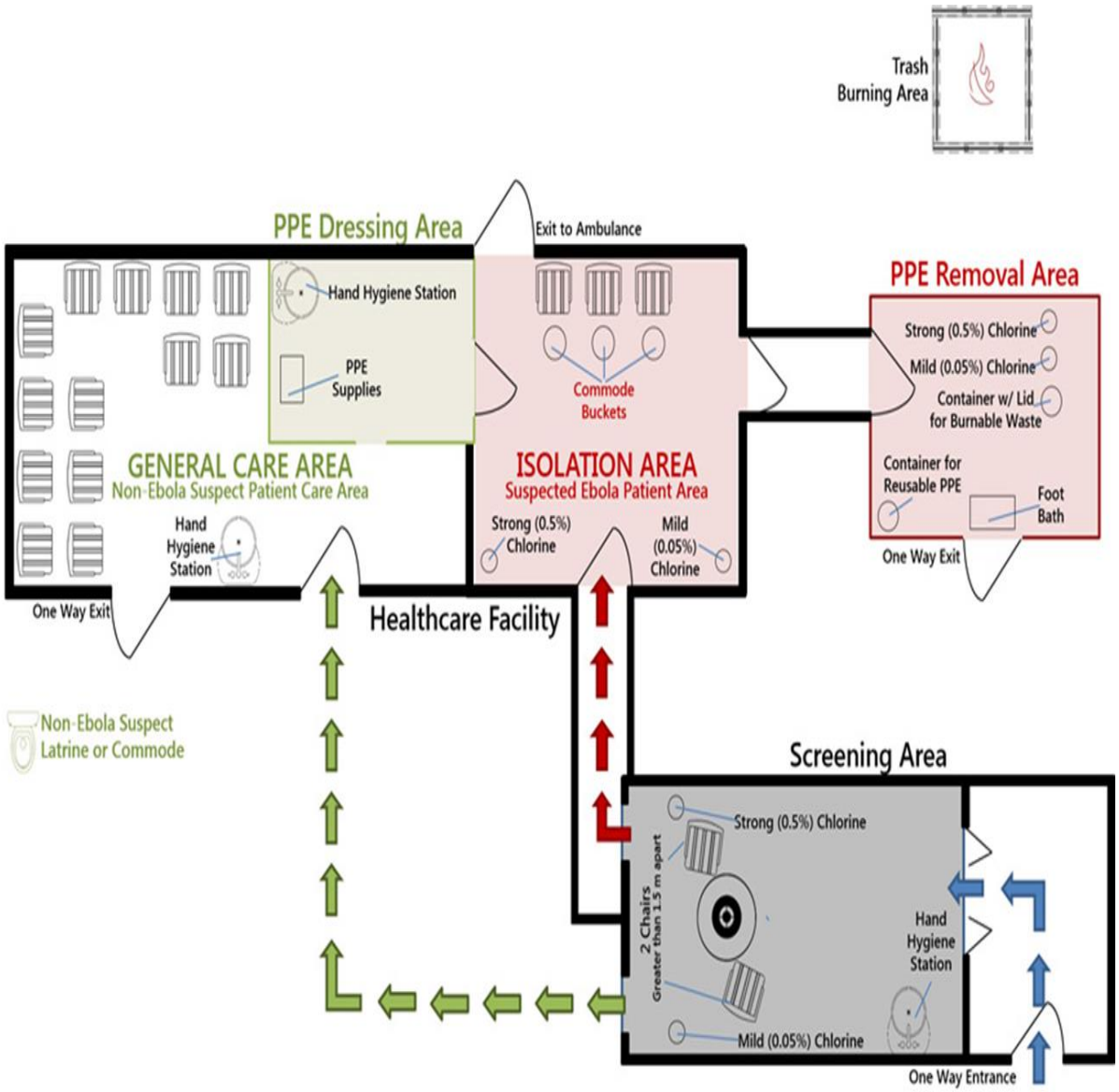
**Select Site for the Isolation Area**

Ideally, an isolation area should already be available to admit patients requiring isolation. If an isolation area is not available or if advance preparations have not been done, and VHF is suspected, immediately identify and set aside:

- A room with an adjoining toilet or latrine;
- A separate building or ward that can be used with VHF patients only (especially if Ebola haemorrhagic fever is suspected, or if there is a large number of patients);
- An area in a larger ward that is separate and far away from other patients in the ward;
- An uncrowded corner of a large room or hall;
- Any area that can be separated from the rest of the health facility (TB rooms, isolation ward for infectious diseases, private or semiprivate rooms).

Make sure the selected site has:

- An isolated toilet: If a toilet is not next to the patient's room, select and isolate a toilet near the isolation area. Use it to receive the patient’s disinfected waste and other liquid waste.
- If a toilet is not available, prepare a latrine for disposal of the patient’s and other liquid waste.
- Adequate ventilation: The isolation room should have adequate ventilation because chlorine disinfectants will be used. To prevent airborne or droplet transmission of infectious agents, avoid rooms with air conditioning.
- Screened windows: If windows are left open for cooling, screen them to prevent transmission of mosquito- and other insect-borne diseases.
- Restrict access. Tie a rope or line around the area outside the window to restrict the area and prevent entry through the window.
- Make use of the available space and design of the health facility to arrange the isolation area. The diagram below shows an example of arrangement for an isolation area




**Dispose of Waste Safely:** step-by-step procedures for disposal of VHF-contaminated waste and detailed instructions for building an incinerator from available material. Direct, unprotected contact during disposal of infectious waste can result in accidental transmission of VHF. For this reason, all contaminated waste produced in the care of the VHF patient must be disposed of safely. All non-reusable items should be destroyed in the isolation area so they cannot be used again. Burning should be carried out at least daily.

***What Needs Disposal***

When VHF is suspected, disinfect and dispose of:

- Infectious blood and other body fluids such as urine, faeces, and vomitus;
- Disposable needles and syringes and disposable or non-reusable protective clothing;
- Treatment materials and dressings;

- Non-reusable gloves;
- Laboratory supplies and biological samples;
- Used disinfectants.

***Recommended Disposal Methods:*** Liquid waste, including patient excreta, can be disposed of in an isolated latrine or toilet set aside for VHF cases. Burning is the recommended method for disposal of other VHF-contaminated waste. A safe and inexpensive disposal system can be made by using an incinerator or a pit for burning.

- A latrine or toilet that joins the patient's isolation room can be used to receive the disinfected bedpan contents from the VHF patient. The latrine or toilet should be isolated. Access should be restricted to health facility staff trained to work in the VHF isolation area.
- Incinerators are containers with holes for ventilation to allow air to enter and exit the container. This allows the fire to reach temperatures high enough to completely destroy all biological materials. Use flammable fuel (such as diesel fuel) to speed the burning process and keep the temperatures high.
- Incineration is recommended for disposal of:
  - Needles and syringes;
  - Used treatment materials and dressings;
  - Non-reusable protective clothing;
  - Laboratory supplies.
- When an incinerator is not available, burn waste in a pit.
- Use fuel to accelerate the burning and ensure that all waste is completely destroyed.
- Use a pit to dispose of:
  - Disinfected body fluids such as urine, faeces, and vomitus when no designated latrine or toilet is available. Used disinfectants. If it is not possible to dispose of used disinfectants in a latrine or toilet, burn the used disinfectant together with flammable items (disposable gowns or masks, for example). Burning with the flammable items will help keep the temperature of the fire hot enough to boil off the liquids.

****Note**:* All staff who are likely to handle infectious material should know and use VHF Isolation Precautions. Reinforce with all health facility staff the importance of handling infectious waste safely.

Select a person with authority who will:

- Oversee all the disposal procedures, including preparation of the incinerator and pit;
- Train and supervise the staff who carry out waste disposal;
- Make a schedule for collecting and burning disposable waste;
- Supervise the collection and burning to make sure it is carried out safely.

## 26.9. Use dignified Safe Burial Practices: how to prepare bodies of deceased

VHF patients safely for burial and how to prevent disease transmission through contact with the deceased patient. There is risk of transmission in the health facility when a VHF patient dies because the bodies and body fluids of deceased VHF patients remain contagious for several days after death. Family and community members are also at risk if burial practices involve touching and washing the body.

### Prepare the Body Safely

Burial should take place as soon as possible after the body is prepared in the health facility. Health facility staff should:

- Be aware of the family's cultural practices and religious beliefs. Help the family understand why some practices cannot be done because they place the family or others at risk for exposure;
- Counsel the family about why special steps need to be taken to protect the family and community from illness. If the body is prepared without giving information and support to the family and the community, they may not want to bring other family members to the health facility in the future. They may think that if the patient dies, the body will not be returned to them;
- Identify a family member who has influence with the rest of the family and who can make sure family members avoid dangerous practices such as washing or touching the body.

### To prepare the body in the health facility:

- Wear protective clothing as recommended for staff in the patient isolation area. Use thick rubber gloves as the second pair (or outer layer) of gloves;
- Spray the body and the area around it with 0.5% bleach solution;
- Place the body in a "body bag" (mortuary sack) and close it securely. Spray the body bag with 0.5% bleach solution;
- If body bags are not available, wrap the body in two thickness of cotton cloth and soak with 0.5% bleach solution. Then wrap the body in plastic sheeting. Seal the wrapping with plastic tape. Spray the body bag as in:
  - Place the body in a coffin if one is available;
  - Transport the body to the burial site as soon as possible;
  - Assign a health officer or health facility staff person to accompany the body to ensure that the safety precautions remain secure during the journey.

### Transport the Body Safely

VHF Isolation Precautions should remain in force when the body is being transported to the burial site:

- Plan to take the shortest route possible for security purposes and to limit any possibility of disease transmission through accidental contact;
- Any health facility staff who must touch or carry the body during transport should wear the same protective clothing as is worn in the isolation area. Note: The driver does not need to wear protective clothing if there is no contact with the body;
- Take a closed container or sprayer with 1:10 bleach solution in the event of any accidental contact with the body or infectious body fluids. Also use it to clean up spills in the transport vehicle.

**Prepare Burial Site**

- The grave should be at least 2 meters deep;
- Explain to the family that viewing the body is not possible;
- Help them to understand the reason for limiting the burial ceremony to family only.

**Disinfect the Vehicle after Transporting the Body**

- The staff person who disinfects the vehicle must wear protective clothing;
- Rinse the interior of the vehicle where the body was carried with 0.5% bleach solution.
- Let it soak for 10 minutes;
- Rinse well with clean water and let the vehicle air-dry. Be sure to rinse well because the solution is corrosive to the vehicle.

## 27.0. PREVENTING NOSOCOMIAL DIARRHEA

Controlling the spread of nosocomial diarrhoea from contaminated food is an ongoing concern in hospitals and nursing homes. Frequently this is due to poorly trained food- handling staff using unsafe practices involving the storage, preparation and handling of raw meat, chicken, fish, fresh eggs and vegetables.

## 27.1. Definitions

Nosocomial diarrhoea: On at least 2 consecutive days having at least three loose or watery stools with the onset more than 72 hours after admission to the hospital (or more days than the incubation period if the agent is known).

## 27.2. Causes of Diarrheal

Outbreaks of diarrhoea in hospitals, nursing homes and NICUs have been associated with a wide variety of organisms including Salmonella, Shigella, *Clostridium difficile,* Vibrio (cholera), *Candida albicans*, *Staphylococcus aureus,* Cryptosporidium, Rotavirus and other enteroviruses.

Some of the most common bacterial and viral agents causing infectious diarrhoea, their incubation period and most prominent clinical characteristics are listed below.

## 27.3. Common Agents

**Salmonella:** Salmonellosis is a common cause of diarrhoea secondary to food poisoning. The incubation period is less than 72 hours (3 days) when large doses of organisms are eaten in contaminated food or drinks.

**Rotavirus:** Is the causative agent of sudden onset of vomiting and diarrhoea within 2-3 days after exposure. It is the commonest cause of diarrhoea in children under five years.

The virus may be present in sputum or other secretions and survives well on inanimate surfaces. It may become endemic in hospitals.

## 27.4. Risk Factors

Risk factors for nosocomial diarrhoea include the following:

- Patients with burns;
- Trauma;
- Decreased immunity;
- Decreased gastric acidity;
- Altered flora in the stomach and gut occurring with antibiotic treatment;
- Lack of hand hygiene, especially by food handlers;
- Non-compliance with glove use

**Important Considerations**

For staff in diarrhoea wards:

- Clean and wipe bedpans and bathroom equipment that are regularly handled by patients and staff with a disinfectant (0.5% chlorine solution) daily and whenever they have been used;
- Immediately disinfect and clean all soiled articles if soilage occurs;
- Staff who sort linen should wear utility or heavy-duty gloves. Also, soiled linen should be bundled so that leakage does not occur, and all linen should be handled as if faecal contamination were present;
- Wear gloves when handling linen soiled with moist body substances, used diapers or toilet paper, and place in a plastic bag or leak-proof, covered waster container.

**For food service personnel**

Food handlers with diarrhoea should be immediately removed from handling foods. They should not return to food handling or work with immuno-compromised patients or intensive care patients or patients undergoing transplant until all symptoms are over for 24-48 hours.

**For patients with diarrhoea**

- Patients with diarrhoea from any cause should be managed according to Standard Precautions with Transmission-Based Precautions;
- Other precautions include moving roommates to another room in the hospital if faecal contamination is likely;
- Infants born to mothers with diarrhoea should not enter the regular nursery. In addition, rooming-in should be provided for mother and infant. The mother and other caretakers should be taught good hygiene.

## 28.0. OUTBREAK MANAGEMENT FOR DIARRHOE CONDITIONS: PREVENTION AND CONTROL OF CHOLERA OUTBREAKS

### 28.1. Diagnosis

The presence of *V. cholerae* in stools is confirmed through laboratory procedures. However, a new rapid diagnostic test (RDT), now available, allows quick testing at the patient's bedside. WHO is currently in the process of validating this RDT, to be able to include it on the list of its pre-qualified products.

In the meantime, WHO suggests that all samples tested positive with the RDT are re-tested using classic laboratory procedures for confirmation. Not all cases fitting the WHO clinical case definition need to be tested. Once an outbreak is confirmed, a clinical diagnosis using WHO standard case definition is sufficient[1], accompanied by sporadic testing at regular intervals.

### 28.2. Prevention

Measures for the prevention of cholera mostly consist of providing clean water and proper sanitation to populations who do not yet have access to basic services. Health education and good food hygiene are equally important. Communities should be reminded of basic hygienic behaviours, including the necessity of systematic hand-washing with soap after defecation and before handling food or eating, as well as safe preparation and conservation of food. Appropriate media, such as radio, television or newspapers should be involved in disseminating health education messages. Community and religious leaders should also be associated to social mobilization campaigns.

In addition, strengthening surveillance and early warning greatly helps in detecting the first cases and put in place control measures. Conversely, routine treatment of a community with antibiotics, or *mass chemoprophylaxis*, has no effect on the spread of cholera, can have adverse effects by increasing antimicrobial resistance and provides a false sense of security.

### 28.3. Control

Among people developing symptoms, 80% of episodes are of mild or moderate severity. The remaining 10%-20% of cases develop severe watery diarrhoea with signs of dehydration. Once an outbreak is detected, the usual intervention strategy aims to reduce mortality - ideally below 1% - by ensuring access to treatment and controlling the spread of disease. To achieve this, all partners involved should be properly coordinated and those in charge of water and sanitation must be included in the response strategy. Recommended control methods, including standardized case management, have proven effective in reducing the case-fatality rate.

The main tools for cholera control are:

- Proper and timely case management in cholera treatment centres;

- Specific training for proper case management, including avoidance of nosocomial infections;
- Sufficient pre-positioned medical supplies for case management (e.g. diarrhoeal disease kits);
- Improved access to water, effective sanitation, proper waste management and vector control;
- Enhanced hygiene and food safety practices;
- Improved communication and public information.

### 28.4. Case management

Efficient treatment resides in prompt rehydration through the administration of oral rehydration salts (ORS) or intravenous fluids, depending of the severity of cases. Up to 80% of patients can be treated adequately through the administration of ORS (WHO/UNICEF ORS standard sachet). Very severely dehydrated patients are treated through the administration of intravenous fluids, preferably Ringer lactate. Appropriate antibiotics can be given to severe cases to diminish the duration of diarrhoea, reduce the volume of rehydration fluids needed and shorten the duration of *Vibrio cholerae* excretion. For children up to five years, supplementary administration of zinc2 has a proven effective in reducing duration of diarrhoea as well as reduction in successive diarrhoea episodes. In order to ensure timely access to treatment, cholera treatment centres should be set up among the affected populations whenever feasible

### 28.5. Use of antibiotics for Cholera

- Appropriate antibiotics can reduce the volume of diarrhoea due to cholera;
- WHO recommends to give antibiotics only to cholera cases with severe dehydration;
- Careful and regular laboratory monitoring of the antibiotic sensitivity of circulating strains is recommended.

Rapid and appropriate rehydration is the main management intervention for treating cholera cases, either orally for moderate cases, or intravenously for severe cases

Appropriate antibiotics can reduce the volume of diarrhoea due to cholera, reduce the volume of rehydration fluids needed, and shorten the duration of *Vibrio cholerae* excretion. The current WHO recommendation is to give antibiotics only to cholera cases with severe dehydration. Children under 12 years of age should be given a 3-day course of erythromycin (12.5 mg/kg – 4 times a day). Children under 5 years of age should also be given zinc for 10 days (10 mg per day under 6 months, 20 mg per day above 6 months). For older children and adults, a 3-day course of tetracycline (12.5 mg/kg – 4 times a day) or a single dose of doxycycline (300 mg) is recommended.

Careful and regular laboratory monitoring of the antibiotic sensitivity of circulating strains is recommended in all settings, including during an outbreak, to guide treatment. O1 and O139 *Vibrio cholerae* strains that are resistant to antibiotics such as cyclines and quinolones have been isolated from all regions.

### 28.6. Antibiotic prophylaxis for the prevention of Cholera

The wide-scale use of antibiotics encourages selection and spread of antibiotic-resistant pathogenic bacteria. Two aspects should therefore be considered: (i) the risk that antibiotic resistant strains of *Vibrio cholerae* may emerge; (ii) the risk that other organisms may develop resistance, compromising the use of that antibiotic in the management of other infectious diseases. Antibiotic resistance in *Vibrio cholerae* O1/O139 is well documented, together with conclusions that the use of antibiotics for cholera has contributed to the spread of such resistance.

Rapid development of resistance to tetracycline and doxycycline has been observed when these antibiotics were used on a large scale for prophylaxis during cholera outbreaks in Africa in the 1970s and 1980s, and in South America in the 1990s. WHO has previously stated that “mass antibiotics prophylaxis is not recommended because it has not been shown to be effective and because it contributes to the emergence of resistance”.

Selective prophylaxis of household contacts of cholera cases (i.e. considered at high risk of being infected with *Vibrio cholerae*) has been implemented in the past with difficulties related to the identification of contacts, timely delivery of drugs, non-compliance and side effects. A recent literature review concluded that this strategy may have a protective effect among household contacts of people with cholera but impact on cholera transmission could not be demonstrated.

Overall, there is no evidence that the provision of antibiotics to staff or travellers coming from cholera endemic transmission areas (i.e. considered at risk of being infected with / carriers of *Vibrio cholerae*) before travel would decrease or prevent the risk of cholera introduction into non-endemic countries. Moreover, this strategy would contribute to the emergence of resistance and provide a false sense of security.

Antibiotic prophylaxis specifically targeting carriers of *Vibrio cholerae* would require the systematic screening of people. However, no effective (sensitive and specific) screening methods for carriers are currently available, and such measures would likely be costly, difficult to implement and ineffective in detecting carriers of *Vibrio cholerae*.

WHO does not advise requiring prophylactic administration of antibiotics or proof of such administration for travellers coming from or going to a country affected by cholera.

## 28.7. Cholera vaccines

There are two WHO prequalified oral cholera vaccines (OCV) currently available on the market. These vaccines were proven safe, effective and well accepted and are available for individuals aged one year and above. They are administered in two doses given at least 7 days apart. Overall, more than 1.6 million doses of WHO prequalified OCVs have been deployed in mass vaccination campaigns since 1997. WHO official recommendations for the use of OCV have been issued, and state that:

- The OCV should always be used as an additional public health tool and should not replace usually recommended control measures such as improved water supplies, adequate sanitation and health education. It needs also to be linked to strengthened surveillance and early warning;
- Pre-emptive vaccination campaigns with OCV should be used in areas where the disease is endemic, including during humanitarian crises, as an additional means for cholera prevention and control, but should not replace usually recommended control measures such as improved water supply, adequate sanitation, food safety, and health education. In such settings, vaccination should be targeted at high-risk areas and high risk population groups, such as displaced populations in camps with precarious living conditions, underserved populations in resource poor settings, etc.;
- Mass vaccination campaigns may be organized on a reactive basis, as part of the response to a cholera outbreak which has already commenced, to reduce mortality and limit the spread of the disease. However, vaccination should not disrupt the provision of other high-priority health interventions to control or prevent cholera. Considering the lack of experience with implementing reactive vaccination against cholera, the feasibility and impact of vaccination in halting on-going outbreaks should be documented and results widely disseminated.

The use of the parenteral cholera vaccine has never been recommended by WHO due to its low protective efficacy and the high occurrence of severe adverse reactions

## 28.8. WHO recommendations to unaffected neighbouring countries

Countries neighbouring an area affected by cholera should implement the following measures:

- Improve preparedness to rapidly respond to an outbreak, should cholera spread across borders, and limit its consequences;
- Improve surveillance to obtain better data for risk assessment and early detection of outbreaks, including establishing an active surveillance system.

However, the following measures should be avoided, as they have been proven ineffective, costly and counter-productive:

- Routine treatment of a community with antibiotics, or mass chemoprophylaxis, has no effect on the spread of cholera, can have adverse effects by increasing antimicrobial resistance and provides a false sense of security;
- Restrictions in travel and trade between countries or between different regions of a country;
- Set up a cordon sanitaire at borders, a measure that diverts resources, hampers good cooperation spirit between institutions and countries instead of uniting efforts.

Healthcare providers should take precautions to prevent the spread of cholera in clinical settings:

- Chemoprophylaxis with antibiotics is not indicated for healthcare providers;
- Hand washing with soap and clean water should be done before and after each patient contact;
- If no water and soap are available, use an alcohol-based hand cleaner (with at least 70% alcohol);
- Several chlorine solutions can be used for disinfection (solution calculations are based on using unscented household bleach with 5–6 % active chlorine):
  - **2% Chlorine:** made by mixing 3 parts water and 2 parts bleach used for disinfecting vomit, faeces, and corpses
  - **0.5% Chlorine:** made by mixing 9 parts water and 1 part bleach used for foot baths, cleaning floors, bedding, latrines
  - **0.05% Chlorine:** made by mixing 9 parts water and 1 part 0.5% chlorine solution used for bathing soiled patients, handwashing, rinsing dishes, laundry

## 28.9. Design of a Care and Treatment Clinic

### Selection criteria

When establishing a cholera treatment centres, the following should be considered when selecting a site:

- Proximity to the affected area;
- Easy accessibility for patients and supplies;
- Protected from winds (there should be wind breaks);
- Adequate space;
- Compatibility with adjacent existing structures and activities;
- Availability of adequate potable/safe water supply within a minimum distance to avoid contamination;
- Good drainage from the site;
- Provision of waste management facilities (clinical and general waste);

- Availability of sanitary facilities (temporary);
- Provision for extension of CTC (basing on estimation given by epidemiologist).

**Setting up a camp**

**Site management**

There are different recommendations for different situations/circumstances:

*In urban settings and refugee camps:*

- **CTC + several Oral Rehydration Points (ORPs)**

  Ideally the CTC should be located inside the existing hospital premises but clearly separated and isolated from the other departments to avoid spread of infection to non-cholera patients. If the hospital premises are not suitable, another site must be found. In urban/camp settings, It is preferable to have one single CTC and several ORPs rather than setting up multiple CTCs, thereby increasing potential sources of infection. When affected areas are too far from the CTC, access can become a problem. Ambulances can be provided for referral, or a CTU may be established as an intermediate structure. Use of taxis/buses should be discouraged given the high contamination risk during the journey.

*In rural settings:*

- **Establish Cholera Treatment Units (CTU)**

  The CTU should be located inside the health facility, or close to it. If this is not possible, other existing structures may be used. CTUs may paralyses routine health services as adequate case management is labor-intensive and other health services may suffer from staff shortage. In areas that are far from any treatment facility, it may be possible to decentralize the CTU to the level of the affected villages.

- **Oral rehydration Points (ORPs)**

  ORS points have two objectives: to treat patients, and to screen off and refer severely dehydrated patients to CTC/CTU(s). They reduce pressure on overburdened CTCs or CTUs. They can be decentralized to the community level. The community health worker should receive quick training and regular supplies, to be able to achieve given objectives.

**Setting up a temporary cholera treatment camp**

- In setting up a cholera camp, you can use an existing building or set up tents;
- It is important to consider safety of patients and ventilation as high temperatures contribute to dehydration of the patients;
- The cholera camp should operate 24 hours a day independently of the other health facilities and therefore the necessary staff has to be recruited;

- It should be supplied with the necessary medical material specifically for the centre;
- An enclosure or other form of acceptable screen should be provided around the cholera camp;
- The various workstations should be clearly labelled and directions provided;
- The CTC must be a “closed system” where contamination is introduced through patients and must be destroyed inside the structure. Under no circumstances should any contamination come out (through patients, water, material, solid and liquid waste etc.).

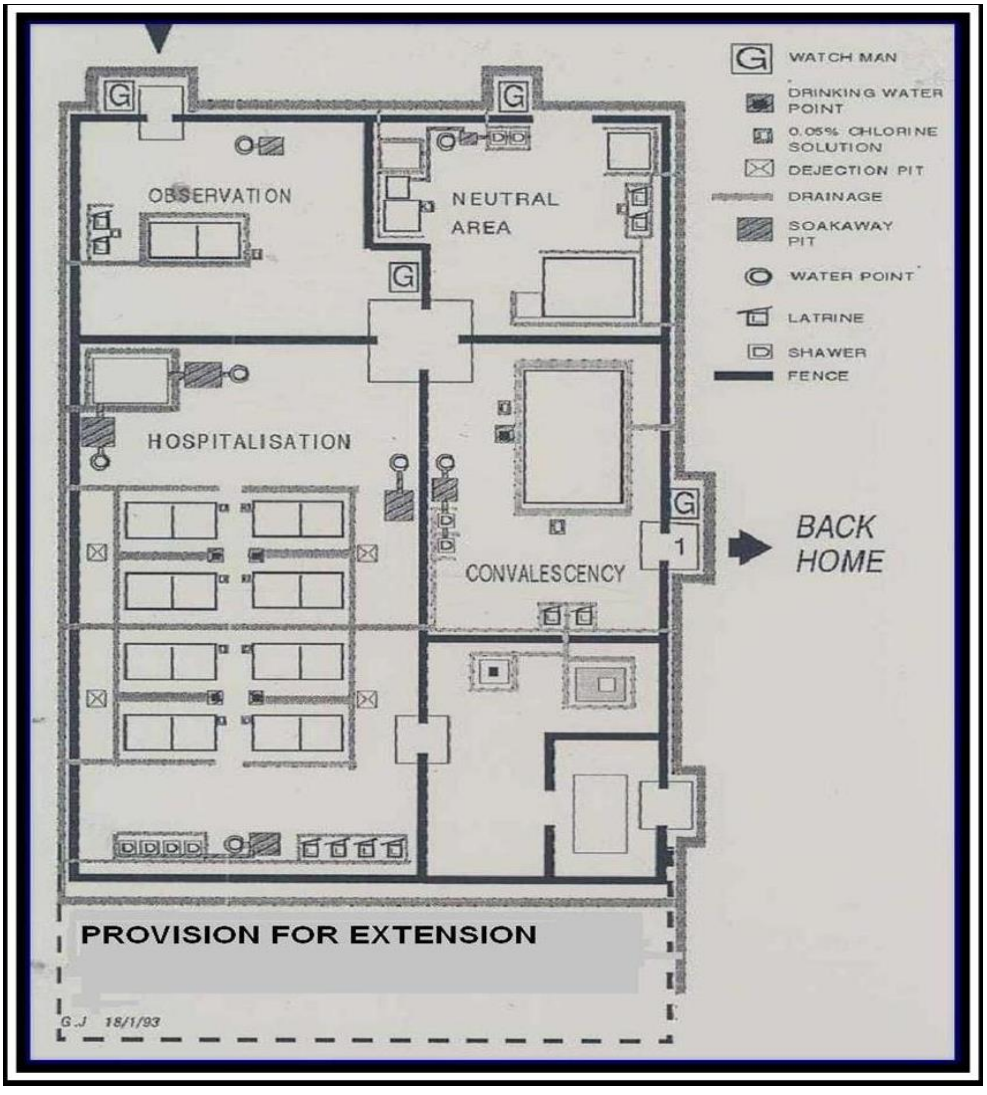
**General rules for a good design:**

- Strict necessary movement for staff and patient;
- Each zone is a “closed box”;

**Systematic disinfection between zones:**

- Discipline and mutual control for the patient, attendant and staff on hygiene;

**NOTE:** *Other details are in National Guidelines for Prevention and Control of Cholera*



## 29.0. HEALTH LABORATORY

Health laboratory personnel, especially the staff of microbiology, work with infectious organisms and materials that do or may contain microorganisms. Some of these organisms are pathogenic and potentially dangerous.

Avoidance of infection is thus an essential element of the professional expertise of the workers. It is necessary to protect not only themselves but also to protect their materials from possible cross-contamination that may invalidate their work by giving false results. Health laboratory workers are also at risk of chemical, fire and radiation hazards.

The World Health Organization has given guidance regarding hazards of infective microorganisms by risk group, and thus laboratories are designated by level according to their design features, construction and containment facilities (safety precautions and equipment) as Basic Biosafety Level 1, Basic Biosafety Level 2, Containment – Biosafety Level 3 and Maximum Containment – Biosafety Level 4. Depending on the laboratory level, the health worker is referred to the WHO safety guidelines (Biosafety Level (BSL) guidelines).

### 29.1. Definitions

**Biological safety cabinets (BSCs)** are devices that provide protection for personnel, the agent being processed and the environment. They range in complexity from Level I (general research cabinets for use with low- to moderate-risk microorganisms) to Level III (totally enclosed cabinets with gas-tight construction that provide maximum protection to workers and the environment).

**Laboratory-acquired infections** are Healthcare Associated Infection resulting from the performance of laboratory activities by staff, regardless of how they occurred.

### 29.2. Types of Exposure Resulting in Laboratory Acquired Infections

**Inhalation.** Mixing, grinding or blending an infectious agent or flaming a transfer loop can generate aerosols that can be inhaled by unprotected workers.

**Ingestion**. Workers may be exposed through:

- Unconscious hand-to-mouth actions;
- Placing contaminated articles (pencils) or fingers (when biting fingernails) in the mouth;
- Eating, drinking or smoking in the laboratory or failing to use proper hand hygiene (neglecting to wash hands or to use a waterless, alcohol-based antiseptic hand rub before and after eating);
- Pipetting (13% of accidental laboratory-acquired infections are associated with mouth pipetting).

**Puncture wounds.** Accidental injury with sharps (suture needles, scalpel blades and

contaminated broken glassware) is the leading cause of laboratory-acquired infections.

**Contamination of skin and mucous membranes.** Splashes and sprays of contaminated fluids onto mucous membranes of the mouth, nasal cavity and conjunctivae of the eyes, and hand-to-face actions can lead to the transmission of pathogenic organisms.

### 29.3. Biosafety Level (BSL) Guidelines.

A combination of primary and secondary containment and safety guidelines are designed for use in microbiology laboratories and bacteriology research units functioning at four levels (BSL-1 to BSL-4) of increasing risk.

- **BSL-1** is the lowest level of containment and microbiologic safety guidelines and is entirely based on standard laboratory practices. These guidelines are recommended for those working with microorganisms, such as Bacillus subtilis, that are not known to cause infections in healthy adults.
- **BSL-2** is generally applied in bacteriology laboratories working with agents (e.g., Samonella species) associated with human diseases of varying severity. When standard microbiologic practices are applied, the agents may be handled on open benches, especially if personal protective equipment, such as facemasks, gowns and examination gloves are used when appropriate. The use of biologic safety cabinets and safety centrifuges may be necessary.
- **BSL-3** is aimed at containing hazardous microorganisms primarily transmitted by the airborne route (aerosols and droplets), such as tuberculosis or varicella (chicken pox). Laboratory staff who work in these situations must be trained in the use of appropriate equipment, including suitable ventilation systems and the use of BSCs.
- **BSL-4** is designed for use where agents causing life-threatening or untreatable diseases that can affect the laboratory worker via the airborne route are present, such as haemorrhagic fever viruses. Trained workers using Level III BSCs or wearing full-body, air-supported positive pressure suits must perform all procedures in these laboratories. In addition, the facility itself must be totally isolated from other laboratories and have specialized ventilation and waste management systems.

#### 29.3.1. General Biosafety and Infection Prevention Guidelines

- Wear new examination gloves when handling blood, body fluids and/or specimens containing pathogenic microorganisms, and do not touch telephones, pens, lockers, etc., with gloves on;
- Eating, drinking or smoking is prohibited in the laboratory;
- Food should not be stored in refrigerators used for clinical or research specimens;

- Mouth pipetting is prohibited; use proper mechanical devices (e.g., suction bulbs);
- Do not open centrifuges while still in motion;
- Always cover the end of blood collection tubes with a cloth or paper towel, or point them away from anyone's face when opening;
- Decontaminate work surfaces daily or when contaminated, such as after spills after being collected with 0.5% chlorine solution;
- Wear protective face shields or masks and goggles if splashes of blood, body fluids, or fluids containing infectious agents are possible;
- Wear heavy-duty or utility gloves when cleaning laboratory glassware;
- Use puncture-resistant, leak-proof containers for sharps;
- Place infectious waste materials in appropriate plastic bags or containers;
- Wear a laboratory coat while in the laboratory and remove it when leaving the laboratory (coats should not be worn in non-laboratory areas such as offices, libraries canteens, etc.);
- Secure the lid of the specimen container tightly;
- Label the specimen clearly with name, date, time of collection and type of specimen at the site of collection;
- The laboratory should be kept neat clean and free of materials that are not pertinent to the work.

### 29.4. Blood Drawing (Phlebotomy)

Blood drawing (phlebotomy) is considered to be one of the highest-risk sharps procedures.

This is because the most frequently used needles are large bore (18 to 22 gauge), and a considerable amount of blood is left in the needle after use.

When collecting a blood specimen (phlebotomy) be sure to:

- Wear single use examination gloves;
- Have assistance when patients might be uncooperative (children, mentally impaired, etc.); and
- Have assistance for holding children when doing heel sticks.

## 30.0. BLOOD BANKS AND TRANSFUSION SERVICES

Blood banks and transfusion services collect, process, store and provide human blood intended for transfusion, perform pre-transfusion testing and, finally, infusion into a patient. The transfusion service, in turn, is responsible for maintaining an adequate supply of needed blood and blood products, blood-typing and cross matching patients, and releasing the blood for transfusion. Once the blood is collected, contamination can be avoided by:

- Maintaining appropriate storage conditions;
- Testing the blood unit without entering the closed collection system;
- Infusing or discarding the blood unit within a short period once the closed system has been opened.

In this section, the guidelines for the safe provision of Blood Bank and transfusion services are summarized from the perspective of:

- Screening the blood donor;
- Ensuring the safety of the donor;
- Testing to make sure the blood or blood product is safe for use;
- Protecting the patient receiving the transfusion; and
- Ensuring the safety of laboratory and clinical staff.

### 30.1. Definitions

**Blood Bank.** Facility or hospital unit that performs the collection, processing, storage and distribution of human blood or blood products.

**Clinically significant antibody**. An antibody capable of producing an adverse reaction to transfused blood or blood product obtained from a donor (allogenic antibody) or recipient (autologous antibody).

**Closed system for obtaining blood**. System in which the blood is not exposed to air or outside elements during collection and processing, including separation of components (e.g., platelets) if required prior to transfusion. It is the safest way to collect process and store blood.

**Donor-Patient.** Person whose blood is collected for possible transfusion to another person (allogenic transfusion).

**Donor-Recipient.** Person whose own blood is collected for possible transfusion to herself/himself (autologous transfusion).

**Look-back system.** Process of identifying persons who have received a blood transfusion from donors who are subsequently found to have infections with HCV, HIV (and often HBV), and notifying them if appropriate.

**Recipient transfusion reaction**. Adverse reaction to infusing blood or blood

products into a patient (recipient). It may occur at any time during the transfusion but often happens shortly after starting it. The reaction may be mild or severe and is rarely fatal.

**Transfusion service.** Facility or hospital unit that provides storage, pre-transfusion testing and cross matching, and infusion of blood or blood products to intended patients (recipients).

**Unit of blood.** Sterile plastic bag in which a fixed volume of blood is collected in a suitable amount of anticoagulant. (The collection system should be a closed system, usually consisting of a sterile hypodermic needle connected by tubing to a collection bag that has one or two sterile ports for inserting a sterile blood administration set).

**Urticarial reaction.** Allergic reaction consisting of itching (pruritis), hives, skin rash and/or similar allergic condition occurring during or following a transfusion blood product.

## 30.2. Indications for Blood Transfusion

- Acute severe anaemia
- Massive blood loss
- Blood disorders

## 30.3. Provision of Blood Transfusion Services

Blood Bank and transfusion services involve selecting donors; assuring that they are informed; collecting blood from screened donors; testing for blood components; antibodies and infectious diseases; storing and transporting blood; pre-transfusion testing of patient (recipient) blood; and transfusing patients.

### 30.3.1. Donor Selection

The donor selection process is one of the most important steps in protecting the safety of the blood supply. It is intended to identify medical problems, behaviours (e.g., intravenous drug use) or events that put a person at risk of being infected and transmitting a serious disease to the person receiving the transfusion.

### 30.3.2. Informed Consent

Prior to collection of blood, the elements of the donation process should be explained in simple, easily understandable terms using the patient’s primary language if possible. The explanation should include information about the risks of venipuncture (phlebitis or local infection and rarely bacteremia or septicemia) and potential adverse responses to having 400– 500 mL of blood removed. A donor who wants to know his/her HIV status should be informed with appropriate pre- and post-test counselling.

### 30.3.3. Blood Storage and Transportation

Blood units must be stored in a refrigerator that can be maintained at temperatures between 1-6oC (34-46oF). There must be a system to monitor temperatures continuously and record them at least every 4 hours. In addition, the refrigerator should have an alarm system that signals by sound before the blood reaches unacceptable storage temperatures. Blood units exposed to a temperature above the accepted level for an unknown period should be discarded. To do this:

- Wear examination or utility gloves and protective eyewear;
- Pour contents down a utility sink drain, into a flushable toilet or latrine;
- Place empty blood bags and tubing in a plastic bag or leak-proof, covered waste container;
- Dispose of plastic bags or contents of the container according to hospital or facility or facility waste management guidelines.

Blood units transported a short distance (e.g., from the blood bank or transfusion service to the ward or operating room) require no special handling. Blood should not, however, be allowed to reach temperatures outside the acceptable range.

## 30.4. Blood Components and Infectious Disease Testing

**ABO blood group** is determined by testing the donor's red cells with anti-A and anti-B reagents and by testing the donor's serum or plasma A and B red cells.

**Rh type** is determined by testing with anti-D reagent. If the initial test with anti-D is negative, the blood also should be tested using a method designed to detect weak D. Blood from donors with a history of transfusions or pregnancy should be tested for unexpected antibodies to red cell antibodies using methods to demonstrate clinically significant antibodies.

***Note****: In addition, blood should be tested for several infectious diseases. Blood should not be released for transfusion unless the results are negative for all tests, with the exception of the test for syphilis that has been shown to be a biologic false positive.*

The recommended tests include:

- Syphilis by screening with a standard antibody test such as the rapid plasma regain (RPR) test;
- Hepatitis B virus by testing for the hepatitis B surface antigen (HbsAg) and HBV core antigen (anti-HBc);
- Hepatitis C virus by testing for anti-HCV;
- Human immunodeficiency virus by testing for type 1 (HIV-1) antigen and antibodies to HIV-1 and HIV-2 antigens;
- Malaria parasites.

## 31.0. PROGRAM MANAGEMENT ON INFECTION PREVENTION AND CONTROL

Successful programs for preventing the spread of infectious diseases by any route (body fluids, air, droplet or contact) in healthcare facilities are based on understanding the scope of the problem, prioritizing activities and effectively using available resources. Careful planning, implementing and monitoring of activities on a regular basis are all essential.

HAIs and AMR are important public health concerns in Tanzania. There is conclusive evidence to show that the establishment of a surveillance system for HAIs and AMR is associated with reductions in infection rates.

### 31.1. Scope of IPC programme

- To prevent the occurrence of HAIs in patients, health-care workers, visitors and other persons associated with healthcare facilities;
- To prepare health-care facilities for the early detection and management of epidemics and to organize a prompt and effective response;
- To contribute to a coordinated response to control community-acquired infectious diseases, endemic or epidemic, that may be “amplified” via health care;
- To contribute to preventing the emergence of antimicrobial resistance and/or dissemination of resistant strains of microorganisms;
- To minimize the environmental impact of these infections or their management. An Infection Prevention and Control (IPC) programme, implemented within a health-care facility, is critical not only to prevent HAIs but also to prepare for and respond to communicable diseases crises.

A set of essential core components has been defined to help plan, organize and implement an IPC programme.

### 31.2. Core components for IPC

- Make sure technical guidelines are available and used
- Human resources, including − Training − Programme staffing − Occupational Health issues for health-care workers;
- Surveillance of disease and assessment of compliance with IPC practices;
- Microbiology laboratory support;
- Environment IPC;
- Evaluation of IPC programmes;
- Link with public health and other Services/societal bodies.
- Preventing Infections in Home-Based Care Settings

**Strategies for successful IPC programme**

**Promoting early detection of infections through surveillance and monitoring**

- The MoHCDGEC shall develop a national infection control surveillance system to produce quality data on targeted health care associated infections and antibiotic resistant organisms. PORALG & QIT shall implement appropriate interventions according to the developed surveillance system;
- The MoHCDGEC shall identify key infectious diseases for targeted surveillance;
- The MoHCDGEC shall develop appropriate reporting back mechanisms that provide clinical teams with comparative data on the levels of health care associated infection rates within their hospitals;
- The MoHCDGEC shall coordinate and optimize linkages between laboratory services and health care facilities to ensure optimal use of laboratory data for the diagnosis of healthcare associated infection.

**Addressing health care worker needs and requirements; education for all level of healthcare workers**

- The MoHCDGEC shall develop standardized courses for infection prevention and control that will equip infection control officers to provide appropriate in-service training for health care workers in facilities;
- The PORALG in collaboration with MoHCDGEC shall Implement an education and training programme for all level of healthcare workers;
- RHMT and CHMT shall strengthen health facility based WIT and QIT and provide them with appropriate training on infection control;
- WIT and QIT in the health facilities shall increase awareness of the importance of prevention, surveillance and control of infections, amongst health care workers.

**Reducing risk through implementation of guidelines for infection prevention and control**

- All levels of healthcare shall promote the use of existing guidelines, through an awareness raising activities that fully engages patients and service users as well as health care professionals. E.g. conduct national and zonal workshops and distribute guidelines as widely as possible.

**Reducing reservoirs of infection**

- The MoHCDGEC shall develop infrastructure design and management for airborne isolation;
- Health facilities shall implement employee programmes on IPC at the work place to minimize the possibilities of health care workers contracting

preventable infectious diseases and transmitting such diseases to other health care workers;

- Health facilities shall adhere to standards for the prevention and control of infection, which includes:
  - Designing and implementing a coordinated programme to reduce the risk of nosocomial infections in patients and health care workers.
  - Implementing targeted surveillance of devise-associated infections.
  - Identifying the procedures and processes associated with the risk of infection and implement strategies to reduce infection risk.
  - Ensuring protective clothing, disinfectants and other barrier techniques are available and are used correctly when required.
  - Ensuring Laboratory cultures are obtained from designated sites in the health care facility associated with significant infection risk when indicated.
  - WIT and QIT to ensure the health facilities' IPC plan has a quality management and improvement program
  - WIT and QIT to ensure adherence to Infection control and environmental cleaning standards in the health facility.
  - WIT and QIT to ensure cleaners receive in-service training on cleaning and use of chemicals and solutions for disinfection.

**Rational use of antimicrobial agents**

- The MoHCDGEC shall develop a surveillance system for antimicrobial use and resistance to provide information for the optimal management of resistance;
- The MoHCDGEC shall build capacity of health care workers on conducting epidemiological surveillance of antimicrobial resistance;
- The MoHCDGEC shall provide continuous education of all groups of prescribers and dispensers on the importance of rational antimicrobial use;
- The MoHCDGEC shall develop laboratory capacity in all healthcare facilities for culture and sensitivity testing to guide antimicrobial choice;
- The health facility shall adhere to rational prescriptions of antimicrobial agents;
- The MoHCDGEC shall provide public health education to promote appropriate antimicrobial use and use of preventive measures such as immunization and vector control.

**Research and development**

- The MoHCDGEC shall liaise with academic and research institutions to conduct studies to identify behaviours and environmental factors that predispose people to infectious diseases, and to determine the status quo with regard to practices, skills, knowledge, staffing, availability and use of guidelines and protocols, effectiveness of reporting lines, etc. The outcome of

these studies shall determine priorities to be addressed by the MoHCDGEC infection prevention and control structures;

- The MoHCDGEC shall encourage academic and national research institutions to develop research programme that address gaps where they exist;
- The MoHCDGEC shall liaise with development partners to support the development of national nosocomial research programme.

### 31.3. Program Development

Infection prevention must be made a priority; hence adequate IPC infrastructure, sufficient fiscal and human resources must be made available. The PO-RALG in collaboration with MoHCDGEC shall ensure availability of the required IPC infrastructure, sufficient amount of appropriate equipment and supplies necessary for the consistent infection prevention and control in all health care facilities. Therefore, the PO-RALG in collaboration with MoHCDGEC shall:

#### i. Provision of IPC infrastructure in health facility design

Outpatient and In-patient accommodation in health facilities should be designed in a way that addresses a number of requirements, including IPC, maximising patient comfort and dignity, ensuring ease of delivery of medical care, making appropriate provision for family members, and other visitors, minimising the risk of infection, minimising the risk of other adverse events, such as falls or medication errors, sustainable design and energy efficiency.

Health facilities shall be designed to accommodate the recommended IPC infrastructure:

- Hand hygiene infrastructure supplies;
- Safe water supply;
- Sanitary infrastructure (waste water);
- Ventilation & isolation;
- Laundry, sluice and other cleaning areas;
- Healthcare waste disposal.

#### ii. Equipment & supplies

Ensure availability of sufficient and appropriate supplies necessary for adherence to Standard Precautions (e.g., hand hygiene products, personal protective equipment, and injection equipment). Access to examination gloves, alcohol-based hand-rub and healthcare waste collection & removal facilities (bins, liners, trolleys) is also important.

#### iii. Cleaning and sterilization

The QIT shall implement policies and procedures for environmental cleaning practices, cleaning frequency and equipment sterilization. Each healthcare facility

must ensure that:

- There is written standard environmental cleaning procedures with clearly defined responsibilities for all areas in the facility where decontamination is performed;
- There is written cleaning and disinfection schedule with clear cleaning areas including stands, tables, countertops, sinks, floor, and equipment surface;
- Floors are cleaned at least daily;
- Sinks shall be cleaned each shift at a minimum and more frequently as necessary;
- Sinks used for cleaning endoscopes and respiratory equipment shall be cleaned between each use;
- Endoscopes, laryngoscopes, dialysis, otoscopes, dental and respiratory equipment must be cleaned and sterilized after every single use;
- The sequence of cleaning shall be from clean areas to soiled areas, from high areas to low areas (i.e., top of walls to floor) and from least contaminated to most contaminated;
- Environmental cleaning staff shall not move back and forth between clean and soiled areas;
- Environmental cleaning equipment used in the decontamination area shall not be used in any other area;
- Training for healthcare staff on cleaning and sterilization to be provided regularly;
- Health workers to wear proper PPE in the cleaning and sterilization procedure.

**iv. Behaviour changes for compliance with IPC**

In order for healthcare workers to comply with IPC guideline and standards, QIT and WIT shall ensure the following activities:

- Providing regular in-service training on IPC,
- Setting standards and monitor staff performance,
- Enhancing consistent support by all hospital administrators, managers and staff,
- Providing regular feedback and reward appropriate behaviour,
- Encouraging senior staff and health facility management to be role models for recommended infection prevention and control practices.

### 31.4. Program Management

**Organization principles**

Each health facility must have IPC focal person in the QIT to coordinate IPC activities. WIT chairperson should be responsible for IPC activities in the unit. The

purpose of the IPC program management is to guide and support the use of recommended practices and to review and resolve related problems that may arise. IPC program management should be conducted at a variety of patient care areas including surgery, central sterilization and supply services, housekeeping, laboratory, purchasing and administration.

**The responsibilities of the IPC focal person in QIT include:**

- Conducting an initial and follow up assessment on IPC infrastructure, isolation facility, equipment and supplies, cleaning and sterilization, and behaviour changes;
- Establishing the relative importance of the problem using Spaulding's categories of potential risk, including critical, semi-critical and non-critical;
- Coordinate IPC activities with WIT members in different units;
- Identifying and analysing the reasons for poor or incorrect performance and estimating the costs and benefits;
- Estimating cost of annual IPC supplies including alcohol-based handrub, PPE, and disinfectants;
- Estimating cost of repair and maintenance for essential equipment for IPC such as autoclave;
- Participating in the preparation of an action plan with costing, budgeting and financing;
- Developing a strategy for healthcare workers on continuous IPC education at work place;
- Strengthening supportive supervision on IPC;
- Conducting staff orientation before new guidelines, recommendations or procedures are started and providing follow-up training when reinforcement is needed;
- Ensuring continuous availability of IPC supplies and equipment;
- Confirming value through monitoring, providing data and measuring the impact of IPC interventions;
- Ensuring effective and regular communication and feedback at all levels.

### 31.5. Management Roles and Responsibilities in IPC

**National level**

**Roles and responsibilities of MoHCDGEC to ensure proper IPC practice includes:**

- Providing IPC guideline and standards;
- Capacity building of healthcare workers in IPC;
- Coordinating monitoring and supervision of IPC at all levels;

- Mobilizing resources (HR, financial, and materials) for IPC activities.

**President Office Regional Authority Local Government level**

**Roles and responsibilities of PORALG to ensure proper IPC practice includes:**

- Coordinating implementation of IPC activities at regional and district level corresponding to guideline and standards from MoHCDGEC;
- Mobilizing and allocating resources (HR, financial, and materials) for IPC activities;
- Providing supportive supervision to local government authorities on IPC in collaboration with MoHCDGEC;
- Reporting to MoHCDGEC on the result of supervision and all relevant activities.

**Regional level**

**Roles and responsibilities of RHMT to ensure proper IPC practice includes:**

- Providing training to healthcare workers in IPC;
- Planning and implementing supportive supervision to all councils in the region;
- Monitoring allocation of utilization of resources for IPC;
- Reporting to PO-RALG on the result of supervision and all relevant activities;
- Staffing and allocating staff for better practice of IPC.

**Council level**

**Roles and responsibilities of CHMT to ensure proper IPC practice includes:**

- Providing training to healthcare workers in IPC;
- Planning and implementing supportive supervision to all healthcare facilities in the council;
- Preparing Comprehensive Council Health Plan incorporating IPC activities;
- Reporting to RHMT on the result of supervision and all relevant activities.

**Health facility level**

**Roles and responsibilities of the health facility to ensure proper IPC practice includes:**

- Planning IPC activities in the health facility;
- Budgeting & allocating resources corresponding to IPC activity plan of the health facility;
- Implementing IPC activities in the health facility;
- Reporting to CHMT on the result of monitoring and evaluation of IPC in the health facility;

- Conducting regular monitoring and evaluation on IPC activities in the health facility;
- Organizing Quality Improvement Team and Work Improvement Team;
- Appointing IPC focal person in the QIT;
- Designate leadership and authority for the IPC programme with dedicated qualified staff, scope, functions and adequate budget;
- Establish preparedness and response procedures within the HCF for communicable diseases emergencies;
- Adapt and implement guidelines at the local level;
- Provide basic training for all health-care workers;
- Provide specialized training for IPC professionals;
- Ensure adequate staffing levels (numbers, skills and training);
- Assess local context and define local objectives, priorities and surveillance methods;
- Conduct appropriate surveillance, in line with local needs and national objectives, and report to appropriate authorities;
- Monitor compliance with IPC practices in a blame-free culture;
- Ensure good quality microbiology laboratory services;
- Establish liaison and communication between laboratory and IPC activities;
- Implement biosafety standards;
- Identify infectious risks in the environment and implement appropriate interventions;
- Conduct regular monitoring;
- Submit regular reports on processes, outcome and status of the local IPC programme;
- Promote evaluation of performance in a non-punitive culture;
- Establish links with public health activities and represent IPC to other HCF services;

****Note: IPC should be a permanent agenda of QI meeting**

**All levels** of management should ensure following critical activities in IPC:

- Compliance with multimodal strategy for hand hygiene by WHO;
- Following appropriate selection of effective antiseptic agents or chemical disinfectants, ones that are affordable and usually locally available;
- Consistent use of personal protective equipment (PPE), especially gloves and other items;
- Design of safer surgical operations;
- Compliance with cleaning and sterilization requirement;

- Repair and maintenance of IPC infrastructure (built environment);
- Use of safety checklists for making the operating room safer for patients and staff;
- Proper waste management particularly difficult problems.

### 31.6. Administrative Priorities in All Healthcare Facilities

- Ensure recommended infection prevention practices are adhered to, such as sterilization, or where appropriate HLD, of all items that come in contact with normally sterile tissue;
- Ensure patient care practices are performed according to the Standard Precautions;
- Monitor compliance with recommended practices for certain high-risk procedures such as inserting central venous catheters;
- Work to eliminate unnecessary and unsafe practices, e.g., unsafe injections;
- Routine surveillance should not outweigh investigating outbreaks, or providing safe water, food and sanitation within the hospital or healthcare facilities.

### 31.7. Staff Training

The QIT shall ensure that all cadres of healthcare workers are trained on infection prevention and control. Key topics to be taught should include:

- Public health importance of healthcare acquired infection;
- The disease transmission cycle, routes of infection and how to break the cycle;
- Use of Standard Precautions when dealing with all patients;
- Methods of minimizing disease transmission as well as “hands on” demonstrations about standard precautions;
- Antimicrobial resistance.

Support staffs including cleaners, security guards, and drivers shall have essential training on:

- Public health importance of healthcare acquired infection;
- The disease transmission cycle, routes of infection (linen, clothing and healthcare waste) and how to break the cycle;
- Use of standard precautions when dealing with all patients;
- Methods of minimizing disease transmission as well as “hands on” demonstrations about standard precautions.

For the clinical personnel (i.e. nurses, doctors, laboratory technicians, pharmacists, radiologists, and medical attendants), the newly recruited person should be trained within the first 6 months of employment, and regular employees should have

refresher training every six months on:

- National IPC guideline;
- National IPC standards.

Following training, QIT should conduct supportive supervision to assess its effectiveness.

General reminders regarding the importance of maintaining an infection-free environment for safer delivery of services should be repeatedly emphasized.

### 31.8. Guidelines for HPs on How to Prevent Infections in Home-Based Care Settings

For any procedures where the skin may be broken, and there may be contact with an open wound or sore, or where there may be contact with blood or other bodily secretions, caregivers should use the following guidelines:

- Practice good hand hygiene;
- Use gloves and plastic aprons when contact with blood and body fluids is anticipated;
- If the patient has a skin condition with open lesions/sores (broken skin), keep them clean and dry, and clean the lesions/sores with mildly salty water and cover them with a clean, dry dressing;
- Dispose of all materials that have come in contact with blood, body fluids, secretions or excretions carefully so that they do not pose a risk to members of the community.
- If they are to be reused, clean and high level disinfect them in 0.5% chlorine solution prepared with boiled or sterile water;
- Dispose of any cloth or plastic sheets that come in contact with blood, body fluids, secretions or excretions; if they are to be reused, wash with soap or detergent, and dry in full sunlight (and iron the cloth);
- Wipe surfaces (e.g., mattresses, tables) that may have been in contact with blood after cleaning, body fluids, secretions or excretions with a cloth that has been soaked in 0.5% chlorine solution;
- Burn and bury all materials that have come in contact with blood, body fluid, secretions or excretions (cloth or plastic sheets, razor blades, gloves, etc.); this is the best procedure;
- Waste should be buried in a deep hole and completely covered with soil so that it is not accessible to community members or children; it can also be disposed of in a deep pit latrine;
- Wear utility gloves when handling and disposing of contaminated waste products.

### 31.8.1. Preventing Infection in Home Deliveries

For women who deliver at home, in addition to the above guidelines, there are some specific requirements for conducting a clean delivery.

In the preparation for delivery, the following delivery kit should be available:

- New razor blade;
- New cord ties (string to tie the umbilical cord);
- Clean delivery surface (a plastic sheet is recommended; a cloth that has been well washed and fully dried in sunlight, and ironed if possible, is the next best alternative);
- Gloves;
- Soap;
- Clean and safe water;
- Sanitary pads or pieces of cloth that have been washed and dried in full sunlight and ironed if possible;
- Clean warm wrappings for the baby, which have been washed and dried in full sunlight and ironed if possible;
- Running water for handwashing;
- Clean protective clothing for the birth attendant.

**Together with the above supplies, the following are recommended:**

- Avoid shaving hair;
- clean and boil any reusable instruments, and properly dispose any waste products;
- If there are large spills of blood, body fluids, secretions or excretions, contain the spill, clean with water and soup when it is dry wipe with chlorine.

## 32.0. INFECTION MONITORING

### 32.1. Surveillance

Surveillance is the monitoring of behaviour, activities, or other changing information for the purpose of influencing, managing, directing, or protecting people. Surveillance is used by governments for monitoring health conditions, intelligence gathering, and prevention of crime, the protection of a process, person, group or object, or the investigation of crime. It is also used by criminal organizations to plan and commit crimes, such as robbery and kidnapping, by businesses to gather intelligence, and by private investigators.

The area of surveillance is increasingly a topic of academic study, including through research centres, books and peer-reviewed academic journal

Public health problems are diverse including infectious and non-infectious disease. Surveillance system is a key tool to monitor the situation, identify the problem and the cause of the problem, to have best interventions, and to evaluate the effectiveness of the interventions.

The goal of surveillance can be variable depending on its purpose, however, its general goal is to provide information that can be used for health action by healthcare or public health personnel, government leaders, and the public to guide public health policy and programs.

#### 32.1.1. Surveillance of Healthcare Associated Infection

**Definition of Surveillance**

“The ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control” (WHO).

Surveillance is also useful in monitoring the effectiveness of preventive and infection control programs and is required for patient safety. Surveillance of healthcare associated infections (HAIs) and feedback of the results to QIT is central to efforts to improve performance.

Output from the surveillance program can be used in the following ways:

- Identify patients and their contacts for treatment and intervention;
- Detect epidemics, health problems, changes in health behaviours;
- Estimate magnitude and scope of health problems;
- Measure trends and characterize disease;
- Monitor changes in infectious and environmental agents;
- Assess effectiveness of programs and control measures;
- Develop hypotheses and stimulate research.

Therefore, having surveillance system is essential to control infections in the healthcare facility setting, as well as in the community setting. Also, keeping good quality of records and data of targeted disease or conditions is crucial to make effective implementation practices.

**Objectives**

The overall aim of surveillance is to provide information that is required to inform public health actions. The specific objectives and the associated actions are:

- Assessing the quality of healthcare services
  - To inform QIT for action in respect of the control and prevention of HAIs and AMR infections, and the occurrence of disease in the healthcare setting
- Defining IPC priorities
  - To inform policy and planning in respect of the current and likely future impact of HAIs and AMR infections
- Evaluating IPC programmes
  - To inform decisions regarding the status of existing IPC interventions
- Stimulating research
  - To generate hypotheses and inform research methodologies
- Detecting outbreaks and exposure

**How to start surveillance**

- Assess the targeted healthcare population and identify for the outcome or process of interest
  - Outcomes: Healthcare-associated infections
  - Processes: Patient care practices aimed at preventing HAI
- Select the outcome or process for surveillance:
  - Examples of outcomes: HAI, infection or colonization with a specific organism, pyrogenic reaction or vascular access infection in haemodialysis patients, sharp injuries, etc.;
  - Examples of processes: Central line insertion practices (CLIPs), surgical care processes (e.g., preoperative antimicrobial prophylaxis), medication errors, influenza vaccination rates, hepatitis B immunity rates, personnel compliance with protocols, etc.;
  - Examples of other events: Occurrence of reportable diseases and conditions, communicable diseases in personnel, organisms or syndromes indicative of bioterrorist events, etc.
- Determine observation time period
- Choose the surveillance methodology
- Monitor for the outcome or process using standardized definitions for all data collected

- Collect appropriate denominator data, if rates are to be calculated
- Analyse surveillance data
- Report and use surveillance information in a timely manner

Healthcare programmes to prevent Healthcare Associated Infection and the evidence-based implementation practice have been shown to reduce the occurrence of HAIs and AMR. Surveillance is an essential element for revealing the current prevalence of HAIs and AMR to identify potential risk factors and to implement various preventive strategies.

Routine HAI surveillance in most in-patient healthcare facilities should be conducted by IPC focal person in an active, patient-based, prospective, targeted manner that yields risk-adjusted incidence rates.

**How is Surveillance Performed?**

There are several established components to an active, effective surveillance system:

**1. Planning**

Because it is not feasible to monitor all types of infections at all times, choosing which infections will be surveyed is based upon an initial assessment that will establish the priorities for the surveillance system. An initial assessment will include:

- the types of patients/residents that are served by the health care setting
- the key medical interventions and procedures that are provided in the health care setting
- the frequency of particular types of infections within a particular health care setting
- the impact of the infection (including per cent case fatality and excess costs associated with the infection)
- the preventability of the infection required mandatory reporting elements (e.g., antibiotic-resistant organisms, ventilator-associated pneumonia).

**2. Data Collection**

Collection of infection data for surveillance purposes must be done using validated, published definitions for HAIs. If the definitions that are used to categorize an infection are not standardized, a health care setting's infection rates cannot be accurately compared to either their own historical infection rates or to external benchmarks. In order to generate valid HAI rates, information must be collected on those who are at risk of getting an HAI (denominator) and those who actually develop an HAI (numerator). Electronic screening of patient records is an emerging tool for identification of potential HAIs. These computerized systems of case finding will reduce the time spent by Infection Control Professionals (ICPs) in case finding.

Long-term care homes will have a more limited range of information available for

case finding, relying on ongoing contact and feedback from those directly involved in resident care.

Post-discharge surveillance for surgical site infection is becoming an increasingly important component of a surveillance system in acute care, due to shorter hospital stays following surgeries and an increasing proportion of surgeries taking place in the outpatient setting. Innovative strategies that do not put undue burden on their program resources are encouraged in hospitals to detect surgical site infections.

**3. Data Analysis**

The recommendation is to calculate incidence density rates in hospitals and long-term care homes (i.e., the measurement of new cases of infection (incidence) during a defined period of risk in the patient/resident population, e.g., length of stay in a hospital or long-term care and control practices can be implemented to lower the risk of HAI. Analysis and interpretation of infection data may be done with the facility's Infection Prevention and Control Committee or other advisory body to the Infection Control Team.

HAI rates may be compared to both the facility's own previous HAI rates and benchmarks, or to external standards or benchmarks set by other health care settings. When comparing HAI rates to those of other health care settings, it is essential that the same case finding methods are used, the same case definitions are applied and the same methods for risk stratification are employed. Recommended practice is that a set of peer facilities that serve a similar case mix, use the same case definitions and similar case finding methods be identified to serve as a comparison group.

**4. Communication of Results**

Communication of surveillance data should take place on an ongoing, systematic basis and be targeted to those with the ability to change infection prevention and control practice. Communication may be targeted to:

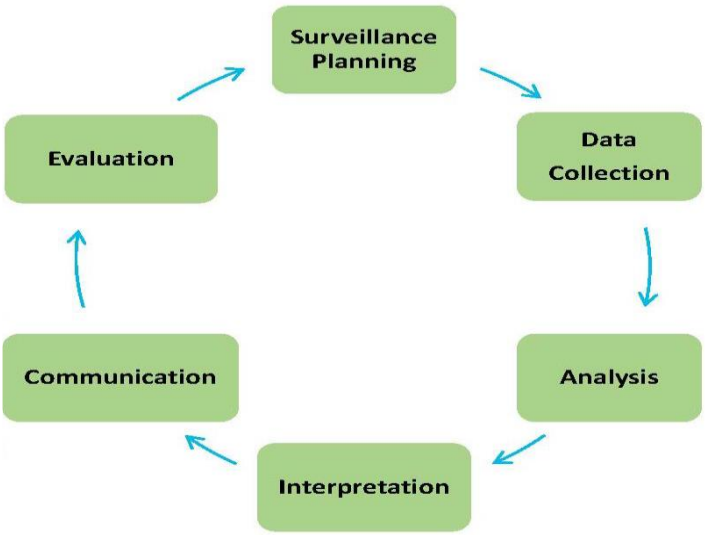
- A health care setting's Infection Prevention and Control Committee, which provides an aggregate picture of all infections of interest in the hospital;
- A particular patient/resident care area or specialty care area, focused on the risk of specific types of infections that are of importance to these groups;
- Patient/resident care staff following the identification of an emerging risk of infection, to remind or notify of the required precautions in infection prevention and control;
- Local public health unit when there is a reportable communicable disease event. home). Where medical devices are inserted and/or surgical procedures are performed, rates of device-associated or surgical site infection should also be calculated on an ongoing basis. It may be useful in hospitals to stratify rates of surgical site infections by standardized risk ratios/rates in order to compare the rates to other hospitals.

An electronic spreadsheet/database and/or statistical analysis program should be used in hospitals and long-term care homes to store data and calculate HAI rates, to maximize infection prevention and control resources and reduce the potential for errors associated with manual calculations.

**5. Interpretation of Data**

Surveillance data require interpretation to identify areas where improvements to infection prevention outcomes to which the surveillance system contributes. Evaluation should include how information produced by a surveillance system is used to reduce the risk of health care-associated infection. Outcome evaluation should take place at least annually and a realignment of surveillance objectives undertaken when indicated.

The steps provided in this best practice guide will assist infection prevention and control professionals to develop and implement their surveillance programs in a manner that will permit comparisons with their peers and allow them to quickly detect early increases in health care-associated infections that may indicate the presence of an outbreak.




### 32.1.2. Methodology of Surveillance

### A. Active and passive surveillance

- Active surveillance:
  - Health agencies contact health providers seeking reports;
  - Ensures more complete reporting of conditions;
  - Used in conjunction with specific epidemiologic investigation;
  - Trained personnel, mainly IPC focal person, vigorously look for HAI;
  - Information accumulated by using a variety of data sources within and beyond the health facility;

- Passive surveillance:
  - Diseases are reported by health care providers;
  - Simple and inexpensive;
  - Limited by incompleteness of reporting and variability of quality;
  - Persons who do not have a primary surveillance role, such as ward nurses or respiratory therapists, identify and report HAI.

**B. Patient-based and laboratory-based**

- Patient-based:
  - Count HAI, assess risk factors, and monitor patient care procedures and practices for adherence to infection control principles;
  - Antimicrobial use and susceptibility patterns;
  - Requires ward rounds and discussion with caregivers.
- Laboratory-based
  - Detection is based solely on the findings of laboratory studies of clinical specimens

**C. Prospective and retrospective**

- Prospective surveillance:
  - Monitor patients during their hospitalization;
  - For SSIs, also monitor during the post-discharge period;
- Retrospective surveillance;
  - Identify infections via chart reviews after patient discharge.

**D. Targeted and comprehensive**

- Targeted:
  - Objectives for surveillance are defined;
  - Focus is on specific events, processes, organisms, and/or patient populations.
- Comprehensive:
  - Continuous monitoring of all patients for all events and/or processes;
  - Highly personnel resource intensive if done manually.

**How to collect data for surveillance**

Surveillance data must be accurate and consistent for effective monitoring of trends and outbreaks. The data collected as part of a surveillance system in a healthcare setting can be used to identify patients or healthcare workers at high risk for HAIs and AMR infections or practices associated with a high risk of infection.

**Clinical review** of medical records should include collecting basic demographic information (e.g., name, age, date of birth, admission diagnosis), checking for fever, new antibiotic use, and new cases of diarrhoea, clinical sepsis or the presence of an inflamed surgical wound, drain or IV site.

**Discussions with patients** (or parents of newborns in this example) should focus on their health, the health of other young children at home, general hygiene, food handling and sanitation.

**Discussions with staff** working in the affected area should deal with ensuring that recommended patient care activities are being performed both correctly and at the appropriate times.

**Laboratory information** to be checked should include a review of positive cultures and other diagnostic findings if available.

**Pharmacy information** to be checked prescribed and dispensed antimicrobial.

**Surveillance system attributes**

| Attribute | Question It Answers |
|---|---|
| Usefulness | How useful is the system in accomplishing its objectives? |
| Data quality | How reliable are the available data? How complete and accurate are data fields in the reports received by the system? |
| Timeliness | How quickly are reports received? |
| Flexibility | How quickly can the system adapt to changes? |
| Simplicity | How easy is the system's operation? |
| Attribute | Question It Answers |
| Stability | Does the surveillance system work well?<br>Does it break down often? |
| Sensitivity | How well does it capture the intended cases? |
| Predictive value positive | How many of the reported cases meet the case definition? |
| Representativeness | How good is the system at representing the population under surveillance? |
| Acceptability | How easy is the system's operation? |

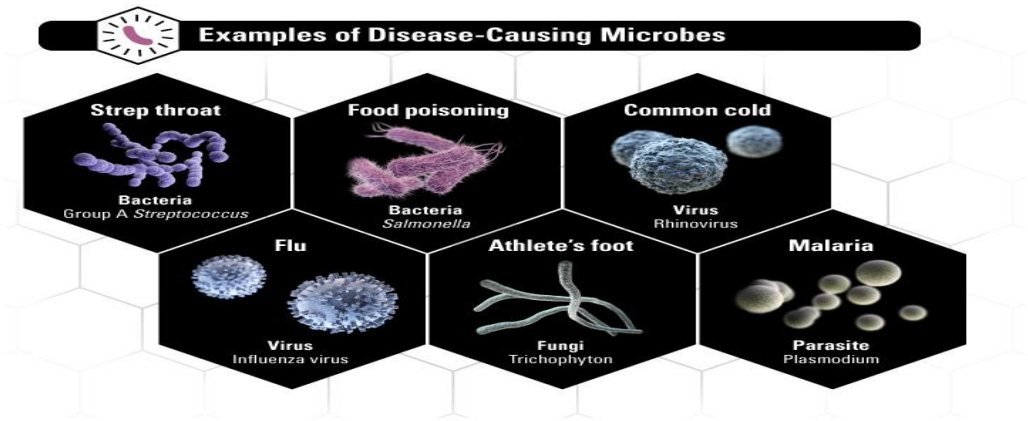
**Detecting and Managing Outbreaks**

In case of an outbreak, proceed according to the guidelines on outbreaks in Integrated Disease Surveillance and Response Guidelines, Health Sector Guidelines & Protocol on Emergency Disaster Management and cholera guidelines.

**Antimicrobial Resistance Surveillance**

Antimicrobial resistance happens when microorganisms (such as bacteria, fungi, viruses, and parasites) change when they are exposed to antimicrobial drugs (such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintic). WHO

## 32.2. Antimicrobial Resistance




### How Resistance Happens

Simply using antibiotics creates resistance. These drugs should only be used to manage infections.

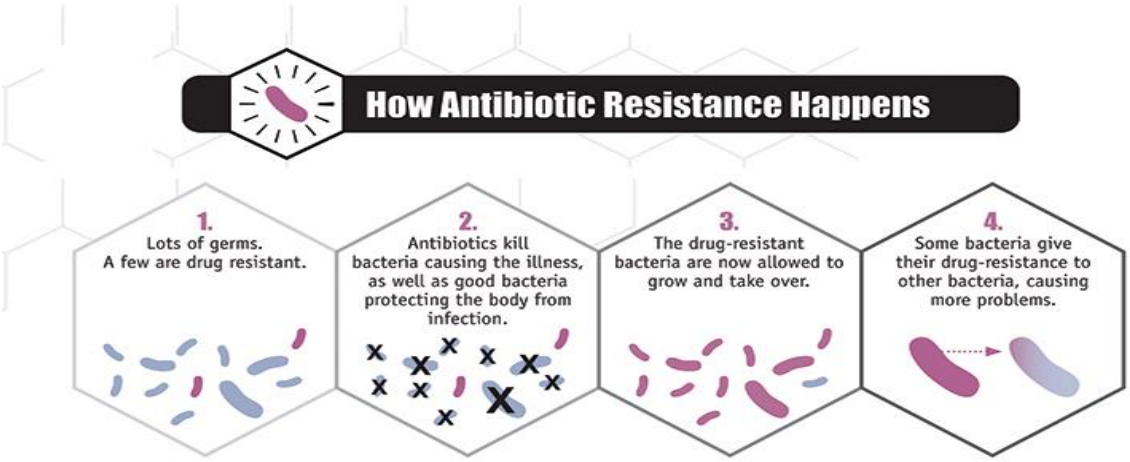
### Trends in Drug Resistance

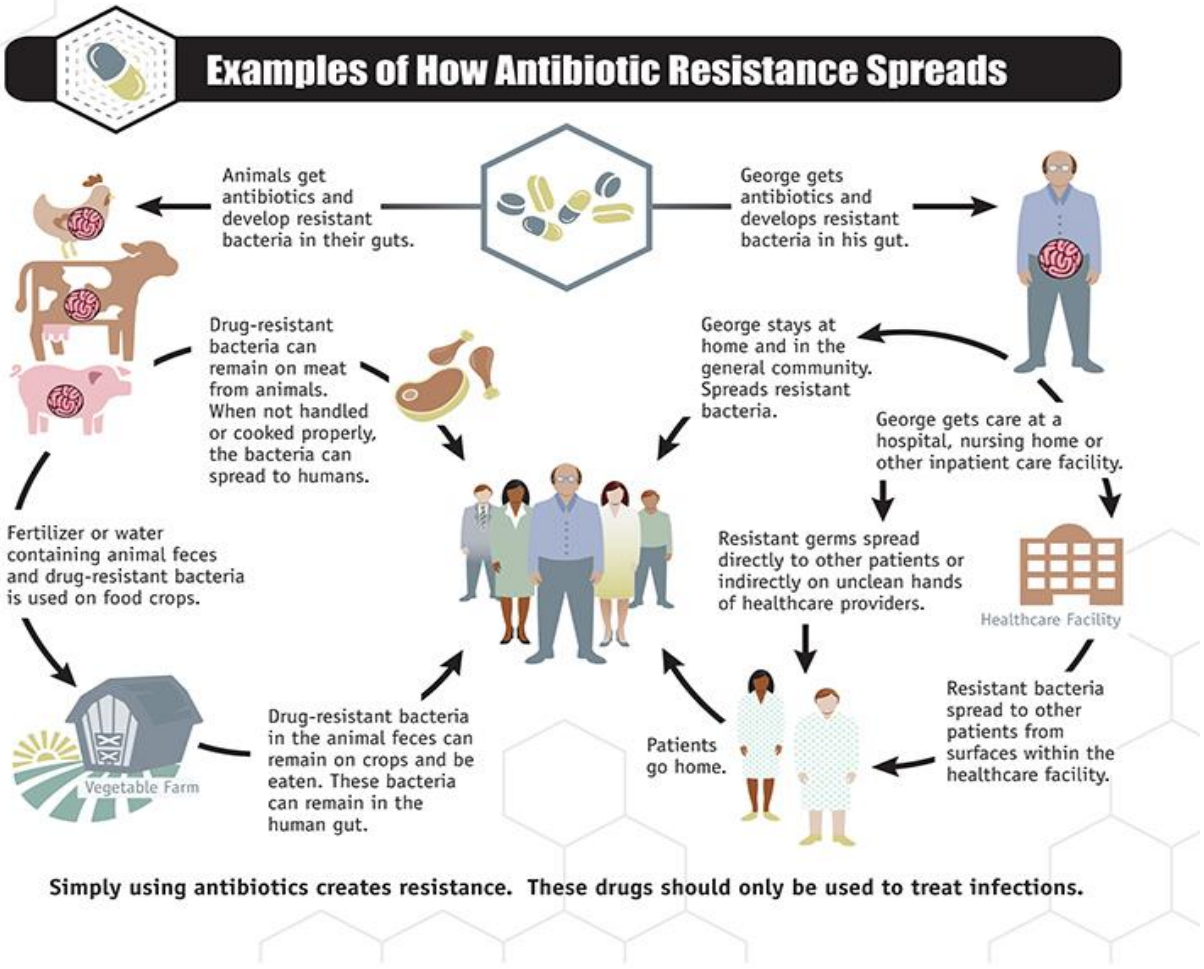
Antibiotics are among the most commonly prescribed drugs used in human medicine and can be lifesaving drugs. However, up to 50% of the time antibiotics are not optimally prescribed, often done so when not needed, incorrect dosing or duration.

The germs that contaminate food can become resistant because of the use of antibiotics in people and in food animals. For some germs, like the bacteria Salmonella and Campylobacter, it is primarily the use of antibiotics in food animals that increases resistance.

Because of the link between antibiotic use in food-producing animals and the occurrence of antibiotic-resistant infections in humans, antibiotics that are medically important to treating infections in humans should be used in food-producing animals only under veterinary oversight and only to manage and treat infectious disease, not to promote growth.

The other major factor in the growth of antibiotic resistance is spread of the resistant strains of bacteria from person to person, or from the non-human sources in the environment.




**Simply using antibiotics creates resistance. These drugs should only be used to treat infections.**

## Four Core Actions to Fight Antimicrobial Resistance

### 1. Preventing Infections, Preventing the Spread of Resistance

Avoiding infections in the first place reduces the amount of antibiotics that have to be used and reduces the likelihood that resistance will develop during therapy. There are many ways that food preparation, handwashing, and using antibiotics as directed and only when necessary. In addition, preventing infections also prevents the spread of resistant bacteria.

### 2. Tracking

Gathering data on antibiotic-resistant infections, causes of infections and whether there are particular reasons (risk factors) that caused some people to get a resistant infection. With that information, experts can develop specific strategies to prevent those infections and prevent the resistant bacteria from spreading.

### 3. Improving Antibiotic Prescribing/Stewardship

Perhaps the single most important action needed to greatly slow down the development and spread of antibiotic-resistant infections is to change the way antibiotics are used. Up to half of antibiotic use in humans and much of antibiotic use in animals is unnecessary and inappropriate and makes everyone less safe. Stopping even some of the inappropriate and unnecessary use of antibiotics in people and animals would help greatly in slowing down the spread of resistant bacteria. This commitment to always use antibiotics appropriately and safely—only when they are needed to treat disease, and to choose the right antibiotics and to administer them in the right way in every case—is known as antibiotic stewardship.

### 4. Developing new Drugs and Diagnostic Tests

Because antibiotic resistance occurs as part of a natural process in which bacteria evolve, it can be slowed but not stopped. Therefore, we will always need new antibiotics to keep up with resistant bacteria as well as new diagnostic tests to track the development of resistance.

**REFERENCES**


- http://www.infectionpreventioncontrol.co.uk/content/uploads/2016/12/06-Decontamination-Cleaning-and-March-2016-Version-2.00.pdf:
- *NHS, (2015). Community infection prevention control: Guidance for Health and Social Care Retrived on 10th Octb 2017 at 12:30)*
- WHO, (2004). Practical Guidelines for Infection Control in Health Care Facilities
- WHO, (2016). Decontamination and Reprocessing of Medical Devices for Health-care Facilities
- NHS, (2016). Community Infection Prevention and Control Guidance for Health and Social Care :Decontamination, Cleaning and Disinfection www.infectionpreventioncontrol.co.uk
- USAID, (2016). Improving Infection Prevention and Control Practices at Health Facilities in Resource-Limited Settings: SIAPS Technical Report July 2016
- Ministry of Public Health and Sanitation and Ministry of Medical Services, (2010). National Infection Prevention and Control Guidelines for Health Care Services in Kenya Ministry
- AST, (2009). Standards of Practice for the Decontamination of Surgical Instruments. Association of surgical technologist *www.ast.Org retrieved 10th October 2016*
- PHICS, (2014) Linen And Laundry Management Guidelines For Hospitals And Other Healthcare Facilities
- Standards and recommendations for Safe Perioperative practice 2011. Third Edition. The Association for Perioperative Practice, Harrogate.
- Behaviour & Rituals in the Operating Theatre, 2002. A report from the Hospital Infection Society Working Group on Infection Control in the Operating Theatres
- WHO Safety Surgical Checklist 2009. National Patient Safety Agency
- Amanda Dunbar , Heather Stewart *(2013)* The National Institute for Health and Clinical Excellence *(NICE) Clinical guidelines*
- Centers for Disease Control and Prevention (CDC) (2014). Introduction to Public Health. In: Public Health 101 Series. Atlanta, GA: U.S. Department of Health and Human Services, CDC.
- Centers for Disease Control and Prevention (CDC) (2006). Outline For Healthcare Associated Infections Surveillance: U.S. Department of Health

and Human Services, CDC.
- Gosling, R., Mbatia, R., Savage, A., Mulligan, J.A. and Reyburn, H., (2003). Prevalence of hospital-acquired infections in a tertiary referral hospital in northern Tanzania. *Annals of Tropical Medicine and Parasitology*; 97(1):69-73.
- World Health Organization, (2010). The Burden of Health Care-Associated Infection worldwide: A summary. World Health Organization, Patient Safety – A world Alliance for Safer Health care.
- Centers for Disease Control and Prevention, Page last updated: Septemb er 19, 2017. https://www.cdc.gov/drugresistance/about.html. Retrieved on Mar 5, 2018
- Department of Health of United Kingdom (1970). Food Hygiene (General) Regulations https://www.food.gov.uk/business-guidance/general-food-law
- Department of Health England (2007). Food Hygiene Regulations
- Department of Health of United Kingdom (1991). Food Safety Act 1990 (Revised August 1991
- NHS Hygiene HMSO of Britain (1986) Health Service Catering and Hygiene,
- Chadwick House (1997). Industry Guidelines to Good Hygiene Practice: Catering Guide
- Milton Keynes PCT(2007) Food Handling and Safety Policy
- NHS Executive HSG(96)20, (1996) Management of Food Hygiene and Food Service in the National Health Service of Britain
- Harvey, P., Baghri, S. and Reed, R. A. (2002). Emergency Sanitation, Assessment and Programme Design, WEDC, Southborough, UK
- Martin, S. A. (2015). A Framework to Understand the Relationship Between Social Factors that Reduce Resilience in Cities: Application to the City of Boston, *International Journal of Disaster Risk Reduction* 12:53-80
- Jensen, R. A. (2000). Mass Fatality and Casualty Incidents: A Field Guide. Boca Raton, FL: CRC Press
- Lynn, P. (2011). Taylor's Clinical Nursing Skills: A Nursing Process Approach (3rd Ed.), New York: Lippincott Williams & Wilkins
- Pan American Health Organization (2003). Unseating the Myths Surrounding the Management of Cadavers Disaster Newsletter. No. 93. PAHO, USA.
- Pan American Health Organization (2004). Management of Dead Bodies in Disaster Situations: Disaster Manuals and Guidelines Series, Nº 5. USA; Washington.
- Polson, C. J. and Marshall, T. K. (1975). The Disposal of the Dead Body. St. Paul's House, Warwick Lane, London: The English Universities Press Limited.
- Wisner, B. and Adams, J. (2002). Environmental Health in Emergencies and Disasters WHO, Geneva.
- Wisner, B. and Adams, J. (eds.) (2002). Environmental Health in

Emergencies and Disasters WHO, Geneva.

- World Health Organization, (1998). Infection Control for Viral Hemorrhagic Fevers in the African Healthcare Setting, Geneva.
- Alexander J Kallen; Matthew J Arduino; Priti R Patel, (2010): Preventing Infections in Patients Undergoing Hemodialysis;8(6):643-655
- CDC. (2001). Recommendations for Preventing Transmission of Infections among Chronic Hemodialysis Patients.
- Magill SS, Edwards JR, Bamberg W, et al. (2014): CDC HAI Prevalence Survey Multistate Point-Prevalence Survey of Health Care–Associated Infections. *N Engl J Med* ;370:1198-208
- Kingston Rajiah, Kok Pui San, Ting Wei Jiun, Tam Ai May, Yap Chan Neng, Hee Kah Seng, Lim Jing Soon, and Nazanin Pazooki (2015): Prevalence and Current Approaches of Ebola Virus Disease in ASEAN Countries

## APPENDIX 1: CORE INFECTION PREVENTION AND CONTROL INTERVENTIONS FOR HEALTHCARE FACILITIES AT A GLANCE

| Specific interventions | Target groups | Equipment and supply needs | Clinical process indicators for monitoring |
|---|---|---|---|
| Hand hygiene | • All healthcare workers<br>• Visitors<br>• Patients | • Clean running water<br>• Soap (preferably mounted)<br>• Towels<br>• Alcohol-based solutions | • Proportion of staff observed performing hand hygiene before attending patients |
| Personal protective equipment | • All health workers | • Gloves<br>• Gowns | • Proportion of staff observed wearing gloves when exposure to blood or body fluids is anticipated |
| Isolation precautions | • Nurses<br>• Physicians<br>• Nursing Aids<br>• Others | • Gloves<br>• Gowns<br>• Masks<br>• Eye protection | • Average time between admission and isolation for tuberculosis patients |
| Aseptic techniques | • Nurses<br>• Physicians<br>• Laboratory technicians<br>• Dental surgeons | • Antiseptics<br>• Sterile gloves<br>• Sterile devices and instruments<br>• Sterile barrier devices | • Proportion of intravenous lines inserted using aseptic technique |
| Cleaning and Disinfection | • Nurses<br>• Nursing Aides<br>• Housekeeping staff<br>• Laboratory staff | • Cleaning fluids<br>• Cleaning equipment<br>• Disinfectant | • Proportion of rooms appropriately disinfected after patient's discharge |
| Sterilization | • Sterilization staff<br>• Nurses<br>• Laboratory technicians<br>• Dental surgeons | • Autoclaves and steam sterilizers<br>• Test strips<br>• Chemicals | • Proportion of sterilized devices whose sterility is documented with test strips |

| Specific interventions | Target groups | Equipment and supply needs | Clinical process indicators for monitoring |
|---|---|---|---|
| Waste management | • Healthcare workers<br>• Waste handlers<br>• Logistics | • Sharp boxes and other collection containers<br>• Storage space and container for interim storage<br>• Final disposal options<br>• Personal protection equipment for waste handlers | • Presence of healthcare waste in the surroundings of<br>• the healthcare facility |
| Protocol for Antibiotic Use | • Physicians | • Essential list of antibiotics | • Proportion of prescriptions including an antibiotic |
| Immunization and exposure management | • All healthcare workers* | • Hepatitis B vaccine and other appropriate vaccines | • Three-dose hepatitis B vaccine coverage among nurses, physicians and laboratory technicians |

**APPENDIX 2: LIST OF PARTICIPANTS FOR THE DEVELOPMENT OF NATIONAL INFECTION PREVENTION AND CONTROL GUIDELINES FOR HEALTH CARE SERVICES IN TANZANIA**

| SN | NAME | TITLE |
|---|---|---|
| 1. | Dr. Mohammed Ally Mohammed | Director - Health Quality Assurance Division |
| 2. | Dr. Eliudi S. Eliakimu | Assistant Director - Health Services Inspectorate and Quality Assurance Section, MoHCDGEC |
| 3. | Dr. Joseph C. Hokororo | National IPC Coordinator, MoHCDGEC |
| 4. | Ms. Ruth R. Ngowi | Directorate of Health Quality Assurance, MoHCDGEC |
| 5. | Dr. Talhiya Yahya | National Star Rating Coordinator, MoHCDGEC |
| 6. | Dr Aloyce Lengesia | Directorate of Health Quality Assurance, MoHCDGEC |
| 7. | Dr. Saum Nungu | Directorate of Health Quality Assurance, MoHCDGEC |
| 8. | Dr. Chrisogone German | Directorate of Health Quality Assurance, MoHCDGEC |
| 9. | Ms. Lucy Issarow | Directorate of Health Quality Assurance, MoHCDGEC |
| 10. | Dr. Azma Simba | Epidemiology Section, Directorate of Preventive Services, MoHCDGEC, |
| 11. | Ms.Jackline Makupa | Head, Occupational Health, Directorate of Preventive Services, MoHCDGEC |
| 12. | Mr. Honest Anicetus | Environmental Health Officer, Directorate of Preventive Services MOHCDGEC |
| 13. | Ms. Sukyung Kim | Country Representative, Medipeace Tanzania |

| SN | NAME | TITLE |
|---|---|---|
| 14. | Ms. Sehyeon Kim | Program Officer, Medipeace Tanzania |
| 15. | Mr. Bakari Mahadhi | Program Officer, Medipeace Tanzania |
| 16. | Dr. Nyambuli Jigabha | Public Health Specialist, Medipeace Tanzania |
| 17. | Ms. Fatuma Salimu | Public Health Specialist, Medipeace Tanzania |
| 18. | Ms. Pauline Mtesigwa | Researcher, Medipeace Tanzania |
| 19. | Dr. Elizabeth Lyimo, | District Dental Officer, Sinza Hospital |
| 20. | Ms. Siana Mapunjo | Pharmaceutical Services Unit, MoHCDGEC |
| 21. | Dr. Daniel Nkungu, | Medical Officer In-Charge Mwananyamala Regional Referral Hospital |
| 22. | Dr. Mary Kitambi | Emergency Preparedness and Response Section, Directorate of Health Quality Assurance, MOHCDGEC |
| 23. | Dr. Hamisi Malebo | National Institute for Medical Research |
| 24. | Ms. Stella Stanslaus | Muhimbili National Hospital |
| 25. | Ms. Grace Ngugo | Muhimbili Orthopaedic Institute |
| 26. | Ms. Romana Sanga | Public and Private Health Facilities Section, Directorate of Curative Services, MoHCDGEC |
| 27. | Dr. Akili Mwanzo, | Muhimbili National Hospital |