



Ministry of Health  
Malawi

# INFECTION PREVENTION & WASH GUIDELINES FOR MALAWI



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## **PREFACE**

The prevention and control of infections is essential to the provision of high-quality and safe health care services. With the increased burden of health-care-associated infections (HAIs) a situation that results in a high burden of preventable morbidity and mortality, the need to have all health care workers (HCWs) competently implementing evidence-based infection prevention and control (IPC) practices cannot be overemphasized. Globally, HAIs are a significant problem and a major public health concern, as they lead to prolonged hospital stay, long-term disabilities, increased resistance of microorganisms to antimicrobials, additional financial burdens, and additional costs for patients and their families, and death. As such, the prevention and control of HAIs must be a top priority for hospital settings and healthcare institutions.

These standards and guidelines were developed after extensive review of relevant literature, international guidelines and standards and consultation with experts, professional groupings, and other stakeholders. This document lays down the broad standards and guidelines required for the practice of nationally acceptable standards of IPC, WASH and AMR in health care settings and we urge HCWs to make use of these guidelines as valuable for improving the quality of services, because its contents are realistic, practical, and designed to address peculiarities in Malawi health delivery system.

The Ministry of Health is hopeful that effective implementation will lead to sustainable IPC and patient safety culture.

A handwritten signature in black ink, consisting of a large, stylized 'C' followed by 'M' and 'S' with a long horizontal flourish extending to the right.

**Dr. Charles Mwansambo**  
**SECRETARY FOR HEALTH**

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It is our hope that the guidelines will go a long way in guiding provision of safe and high quality healthcare for the people of Malawi. Infection Prevention & Control, Water and Sanitation is the Commitment for everyone.



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## Abbreviations and Acronyms

A&E	Accidents and Emergency
ABHR	Alcohol Based Hand Rub
AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
CAUTI	Catheter Associated Urinary Tract Infection
CBO	Community Based Organization
CHW	Community Health Worker
CLABSI	Central Line Associated Bloodstream Infection
CQI	Continuous Quality Improvement
CSSD	Central Sterile Supply Department
DEHO	District Environment Health Officer
DHSS	Director of Health and Social Services
ERT	Emergency Response Team
ETT	Endotracheal Tube
EVD	Ebola Virus Disease
FIFO	First In First Out
HAIs	Healthcare Associated Infections
HAP	Hospital Associated Pneumonia
HBsAg	Hepatitis B surface Antigen
HBV	Hepatitis B Virus
HCF	Healthcare Facility
HCMC	Health Centre Management Committee
HCV	Hepatitis C Virus
HCW	Healthcare Workers
HIV	Human Immunodeficiency Virus
HLD	High Level Disinfection
ICU	Intensive Care Unit

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IM	Intramuscular
IPC	Infection Prevention and Control
IT	Information and Technology
IV	Intravenous
LMIC	Low and Middle Income Countries
MDR	Multi drug Resistant
MDRO	Multi Drug Resistant Organisms
MoH	Ministry of Health
NaDCC	Sodium Dicloroisocyanate
NGO	Non-Government Organization
OPA	Orthophthalaldehyde
OPD	Out Patient Department
OT	Operating Theatre
PPE	Personal Protective Equipment
QI	Quality Improvement
QIST	Quality Improvement Support Team
QM	Quality Manager
QMD	Quality Management Directorate
QMTWG	Quality Management Technical Working Group
SARS	Severe Acute Respiratory Syndrome
SDGs	Sustainable Development Goals
SIR	Standardized Infection Ratio
SOP	Standard Operating Procedure
SSI	Surgical Site Infection
TB	Tuberculosis
UHC	Universal Health Coverage
UTI	Urinary Tract Infection
VAP	Ventilator Associated Pneumonia

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WASH	Water Sanitation and Hygiene
WD	Washer Disinfectant
WHO	World Health Organisation
XDR	Extensively Drug Resistant

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## Glossary

**Airborne transmission:** Transfer of particles 5 µm or less in size into the air, either as airborne droplets or dust particles containing the infectious microorganism. They can be produced by coughing, sneezing, talking, or procedures such as bronchoscopy or suctioning. They can remain in the air for several hours and can be spread widely within a room or over longer distances. Special air handling and ventilation are needed to prevent airborne transmission.

**Animate:** Property of having life or being alive (for example, human tissue or organs).

**Antisepsis:** Destruction or inhibition of microorganisms to reduce their number on living tissues (skin, mucous membranes, or other body tissue) by applying an antimicrobial (antiseptic) agent.

**Antiseptic or antimicrobial agent (used interchangeably):** Chemicals that are applied to the skin or other living tissue to inhibit or kill microorganisms (both transient and resident), thereby reducing the total bacterial counts.

**Antiseptic handrub or waterless, alcohol-based antiseptic handrub (used interchangeably):** Fast-acting antiseptic handrub that do not require use of water to remove transient flora, reduce resident microorganisms, and protect the skin. Most contain 60 percent to 90 percent alcohol, an emollient, and often an additional antiseptic, such as 2 percent to 4 percent chlorhexidine gluconate that has residual action.

**Asepsis and aseptic technique:** Combination of efforts made to prevent entry of microorganisms into any area of the body where they are likely to cause infection. The goal of asepsis is to reduce to a safe level or eliminate the number of microorganisms on both animate (living) surfaces (skin and tissue) and inanimate objects (surgical instruments and other items).

**Autoclave:** A process that destroys or removes all microorganisms (bacteria, viruses, fungi, and parasites, including bacterial endospores) from inanimate objects by high-pressure steam. Also refers to the device that sterilizes equipment and items through high-pressure, saturated steam.

**Bactericide:** Agent that kills bacteria.

**Biosafety level (BSL) guidelines:** Combination of primary and secondary containment and safety guidelines that are designed for use in microbiology laboratories and bacteriology research units functioning at four levels (BSL-1 to BSL-4) of increasing risk.

**Biological safety cabinet (BSC):** Device that provides protection for personnel, the agent being processed, and the environment. BSCs range in complexity from level 1 (general research cabinets for use with low- to moderate-risk microorganisms) to level 4 (totally

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enclosed cabinets with gas-tight construction that provide maximum protection to HCWs and the environment).

**Clean water:** Natural or chemically treated and filtered water that is safe to drink and use for other purposes, such as hand washing and cleaning medical instruments, because it meets specified public health standards.

**Cleaning:** Process that physically removes all visible dust, soil, blood, or other body fluids from inanimate objects as well as removing sufficient numbers of microorganisms to reduce risks for those who touch the skin or handle the object.

**Cleaning solution:** Any combination of soap (or detergent) and water used to wash or wipe down environmental surfaces such as floors, walls, ceilings, and furniture.

**Closed system for obtaining blood:** System in which the blood is not exposed to air or outside elements during collection, processing—including separation of components, such as platelets, if required prior to transfusion—and storage.

**Colonization:** Pathogenic (illness- or disease-causing) organisms are present in a person (they can be detected by cultures or other tests), but they are not causing symptoms or clinical findings (no cellular changes or damage).

**Contact time:** Amount of time a disinfectant is in direct contact with the surface or item to be disinfected.

**Contact transmission:** Infectious agent (bacteria, virus, or parasite) transmitted directly or indirectly from one infected or colonized person to a susceptible host (patient), often on the contaminated hands of an HCW.

**Contaminated:** State of having been actually or potentially in contact with microorganisms.

**Corrosion:** Action of chemical solutions, such as those containing salt (sodium chloride) or commercial bleach (sodium hypochlorite at concentrations above 0.5 percent), that causes metal instruments to be gradually eaten away (rusted) with prolonged contact (more than one hour).

**Critical medical device (or item):** Device that penetrates skin or invades normally sterile parts of the body (such as a central venous catheter).

**Culture:** Growth of microorganisms in or on a nutrient medium; to grow microorganisms in or on such a medium.

**Decontamination:** Process that makes inanimate objects safer to be handled by staff before cleaning.

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**Detergent or soap (used interchangeably):** Cleaning product (bar, liquid, leaflet, or powder) that lowers surface tension and thereby helps remove dirt and debris and transient microorganisms from hands.

**Disinfectant:** Chemical that destroys or inactivates 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 quaternary ammonium compounds (QUATs) are classes of disinfectants that are frequently used to clean noncritical surfaces such as floors, walls, and furniture.

**Disinfectant cleaning solution:** Product that is a combination of detergent (soap) and 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 QUATs or other nonionic surfactants, and acid detergents with iodophors.

**Disinfection:** A process of reducing microbial load without complete sterilization. Disinfection refers to the use of a physical process or chemical agent to destroy vegetative pathogens, but not bacterial spores.

**Droplet transmission:** Contact of the mucous membranes of the nose, mouth, or conjunctivae of the eye with infectious particles that are larger than 5  $\mu\text{m}$  and are produced by coughing, sneezing, talking, or procedures such as bronchoscopy or suctioning. Droplet transmission requires close contact between the source and a susceptible person, because particles remain airborne briefly and travel only about 3 feet (1 meter) or less.

**Dry-heat sterilization:** Sterilization procedure in an oven to sterilize metal instruments, glass syringes and bottles, and other items by dry heat. Plastic and rubber items cannot be dry-heat sterilized, because the temperatures that are used (160°C-170°C) are too high for these materials.

**Encapsulation:** Filling a sharps container when it is three-quarters full with cement or clay. After the clay or cement hardens, the container can be safely disposed of in a landfill.

**Endemic illness or disease:** Infectious disease, such as cholera or AIDS, that is continuously present at some level (prevalence) in a particular country or region.

**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, foul-smelling vaginal discharge (lochia), and signs of peritonitis in women who have had a Caesarean section.

**Endospore or spore (used interchangeably):** Relatively water-poor, round or elliptical resting cell that consists of condensed cytoplasm and nucleus surrounded by an impervious

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cell wall or coat. Spores are relatively resistant to disinfectants and sterilants, specifically the bacillus and clostridium species.

**Environmental controls:** Standards specifying procedures for the routine care, cleaning, and disinfection of environmental surfaces, beds, bedrails, bedside equipment, and other frequently touched surfaces.

**Epidemic:** Rapid spread of an infectious disease, such as cholera, among many individuals in a health care facility or community at the same time.

**Episiotomy:** Surgical cut made in the perineum (usually at the 6 o'clock position) just prior to delivery. The purpose is to facilitate delivery of the presenting part of the baby and minimize the risk of injury to the perineal area. Episiotomies are, however, associated with increased bleeding and might result in increased tearing (3rd or 4th degree perineal laceration). They frequently become infected and, more importantly, are usually not necessary.

**Exposure time:** Period of time in a sterilization process during which items are exposed to the sterilant at the specified sterilization parameters. In a steam-sterilization process, exposure time is the period during which items are exposed to saturated steam at the specified temperature.

**Hand washing:** Process of mechanically removing soil and debris from hands using plain soap and water.

**Hazard:** Any agent, equipment, material, or process that has the intrinsic potential or ability to cause harm.

**Health care-associated infection (HAI) or nosocomial:** An infection that was acquired in a health care facility by a health care user, HCW, or a visitor—that is, the infection was neither present nor incubating at the time the person made initial contact with the facility. HAIs include infections that were acquired in the hospital, but did not appear until after discharge, including any infection in a surgical site up to six weeks postoperatively. Occupational infections among staff of the health facility are also considered HAIs.

**Health care worker (HCW):** Any person whose main activities are intended to enhance the health of patients. HCWs include the people who provide health services (doctors, nurses, pharmacists, laboratory technicians, etc.) and workers in management and support services (financial officers, cooks, drivers, cleaners, etc.)

**High-level disinfection (HLD):** Process that eliminates all microorganisms except some bacterial endospores from inanimate objects by boiling, steaming, or using chemical disinfectants.

**Incineration:** Controlled burning of solid, liquid, or gaseous combustible (burnable) wastes to produce gases and residues that contain little or no burnable material.

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**Infection prevention and control committee (IPCC):** A multidisciplinary committee that deals with IPC issues. Each member of the committee contributes according to his or her discipline and fosters cooperation among all disciplines. The IPCC is made up of medical microbiologists, clinicians, pharmacists, public-health officers, representatives from hospital administration, and other HCWs who represent sterilizing services, housekeeping, laundry, and training services.

**Infection prevention and control programme:** A comprehensive programme that encompasses all aspects of IPC—education and training; surveillance; environmental management; waste management; investigating outbreaks; developing and updating IPC policies, guidelines, and protocols; cleaning, disinfection, and sterilization; employee health; and quality management in infection control.

**Infection prevention and control team:** The team of HCWs that are involved in the day-to-day IPC programme activities.

**Infectious microorganisms:** Microorganisms that are capable of producing disease in appropriate hosts.

**Infectious waste:** Medical waste that is capable of causing infectious diseases.

**Intermediate-level disinfectant:** Agent that destroys all vegetative bacteria, including tubercle bacilli, lipid and some nonlipid viruses, and fungus spores, but not bacterial spores.

**Invasive group B streptococcal sepsis:** Newborn infection characterized by bacteremia, pneumonia, meningitis, and death in up to 25 percent of infants with the infection. It occurs most commonly following IAIS. Other sites of the infection include the newborn's skin (cellulitis) and bones (osteomyelitis).

**Laboratory-acquired infection:** Any nosocomial infection in staff that results from performing laboratory activities.

**Linens:** Cloth items that are used in health care facilities: bedding and towels handled by housekeeping staff; cleaning cloths, gowns, and caps used by cleaning staff; caps, masks, scrub suits, surgical gowns, drapes, and wrappers used by surgical personnel; and items used by staff who are working in specialty units such as ICUs and other units and performing invasive medical procedures such as anaesthesiology, radiology, or cardiology.

**Low-level disinfectant:** Agent that destroys all vegetative bacteria (except tubercle bacilli), lipid and some nonlipid viruses, and some fungus, but not bacterial spores.

**Mechanical indicator:** Automated device that monitors the sterilization process (graphs, gauges, printouts, etc.).

**Medical devices:** All equipment, instruments, and tools that are used in health care settings for diagnosis, prevention, monitoring, treatment, or rehabilitation. These devices include

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products such as contact lenses, condoms, heart valves, hospital beds, resuscitators, radiotherapy machines, surgical instruments and syringes, wheelchairs and walking frames, etc.

**Microorganisms:** Causative agents of infection, such as bacteria, viruses, fungi, and parasites. For infection prevention purposes, bacteria can be further divided into three categories: vegetative (e.g., staphylococcus), mycobacteria (e.g., tuberculosis), and endospores (e.g., tetanus). Of all the common infectious agents, endospores are the most difficult to kill because of their protective coating.

**Municipal waste:** General waste for collection by municipalities (local city or town authorities) generated mainly by households, commercial activities, and street sweeping.

**Mycobacteria:** Bacteria with a thick, waxy coat that makes them more resistant to chemical disinfectants than other types of vegetative bacteria.

**Noncritical medical device (or item):** Device that normally contacts the patient's intact skin, such as a blood-pressure cuff or oxygen mask. These devices require low- to intermediate-level disinfection, and reusing them carries little risk.

**Nonlipid viruses:** Nonlipid viruses [also referred to as nonenveloped or hydrophilic (water-seeking) viruses] are viruses whose core is not surrounded by a coat of protein. Nonlipid viruses are generally viewed as more resilient to inactivation than lipid viruses.

**Nosocomial or health care-associated infection (HAI):** Infection that is neither present nor incubating at the time the patient comes to the health care facility. (Nosocomial refers to the association between care and the subsequent onset of infection. It is a time-related criterion that does not imply a cause-and-effect relationship.)

**Nosocomial diarrhea:** At least two consecutive days of at least three loose or watery stools, with the onset more than 72 hours after the patient was admitted to the health care facility (or more days than the incubation period if the agent is known).

**Nosocomial 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*.

**Nosocomial infection in obstetrical patients:** Infection that is neither present nor incubating at the time the patient is admitted to the health care facility. Most UTIs and endometritis are nosocomial, even though the causative organism might be endogenous (that is, it presents in the maternal lower genital tract prior to delivery).

**Occupational injury or infection:** Injury or infection that is acquired by HCWs while they are performing their normal duties.

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**Operating room (OR):** Area or space where surgical procedures are performed.

**Organ/Space SSI:** Any part of the body other than the incised body wall parts that were opened or handled during an operation.

**Parts per million (ppm):** Concentrations of trace contaminant gases in the air (or chemicals in a liquid) are commonly measured in parts per million (ppm) by volume. To convert percent concentration to ppm and vice versa, use this formula:  $\text{ppm} = \text{percent (\%)} \times 10,000$ .

**Personal protective equipment (PPE):** Specialized clothing or equipment, such as gloves, facemask, protective eyewear, gowns, caps, and plastic aprons, that HCWs wear to protect themselves from exposure to body substances, such as blood or body fluids, airborne droplet organisms, or other hazards. Uniforms, pants, shoes, and shirts that are not designed to function as protection against a hazard are not considered to be PPE.

**Phlebitis:** 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 and pus coming from the exit site, it is classified as a clinical exit-site infection.

**Protective barrier:** Physical or mechanical barrier, or a chemical process that helps prevent the spread of infectious microorganisms from person to person (patient, health care client, or HCW); and from equipment, instruments, and environmental surfaces to people.

**Quaternary ammonium compound (QUAT):** A surface-active, water-soluble, low-level disinfecting substance that has four carbon atoms linked to a nitrogen atom through chemical (covalent) bonds.

**Reprocessing:** Decontaminating, disassembling (if necessary), cleaning, inspecting, testing, packaging, labeling, and sterilizing or high-level disinfecting single-use devices (SUDs) after they have been used on a patient for their intended purpose. Reprocessing is also performed on SUDs that were removed from the package (or container), but not used on a patient, or whose expiration date has passed.

**Resident flora:** Microorganisms that live in the deeper layers of the skin, as well as within hair follicles, and cannot be completely removed, even by vigorous washing and rinsing with plain soap and clean water.

**Resterilization:** Repeat application of a terminal process that removes or destroys all viable forms of microbial life, including bacterial spores, to an acceptable level of sterility assurance. This process is performed on devices whose expiration date has passed or that have been opened and might or might not have been used.

**Risk management:** All of the processes that are involved in identifying, assessing, and judging risks; assigning ownership; taking actions to mitigate or anticipate risks; and monitoring and reviewing progress.

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**Safe zone (also Neutral zone):** Device or designated area of the sterile field in which sharps are placed, accessed, returned, and retrieved to avoid hand-to-hand transfer of sharps between personnel.

**Sanitary landfill:** Engineered method of disposing of solid waste on land in a manner that protects the environment (for example, spreading the waste in thin layers, compacting it to the smallest practical volume, and then covering it with soil at the end of each working day).

**Scavenging:** Manually sorting solid waste at landfills and removing usable material.

**Segregation:** Systematic separation of solid waste into designated categories.

**Semi-critical medical device (or item):** Device or item that comes in contact with mucous membranes or nonintact skin during use, such as an endoscope or respiratory equipment. These devices require HLD if sterilization is not practical, and reuse carries a greater risk for cross-contamination than noncritical items.

**Sharps:** Suture needles, scalpel blades, scissors, wire sutures, broken glass, or any objects that can cause a puncture or cut.

**Soap and detergent (used interchangeably):** Cleaning product (bar, liquid, leaflet, or powder) that lowers surface tension and thereby helps remove dirt, debris, and transient microorganisms from hands. Plain soaps require friction (scrubbing) to mechanically remove microorganisms, while antiseptic (antimicrobial) soaps remove and kill (or inhibit the growth of) most microorganisms.

**Soiled or contaminated linen:** Linen from multiple sources within the health care facility that has been collected and brought to the laundry for processing.

**Sorting:** Process of inspecting and removing foreign and, in some cases dangerous, objects such as sharps or broken glass from soiled linen before washing. This step is extremely important, because soiled linen from the OR or clinic occasionally contains sharps (scalpels, sharp-tipped scissors, hypodermic and suture needles, towel clips, etc.). Sorting takes place in the laundry room.

**Spaulding classification:** Strategy for reprocessing contaminated medical devices. The system classifies medical devices as critical, semi-critical, or noncritical based on the contamination risk to a patient.

**Spore or endospore (used interchangeably):** Relatively water-poor, round or elliptical resting cell that consists of condensed cytoplasm and nucleus surrounded by an impervious cell wall or coat. Spores are relatively resistant to disinfectants and sterilants, specifically the bacillus and clostridium species.

**Steam sterilization:** Sterilization process that uses saturated steam under pressure for a specified exposure time and at a specific temperature as the sterilizing agent.

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**Sterilant:** Chemical that is used to destroy all forms of microorganisms, including endospores. Most sterilants are also HLDs when used for a shorter period of time. Sterilants are used only on inanimate objects (e.g., surgical instruments) that are used in semi-critical and critical areas (e.g., surgery). Sterilants are not meant to be used for cleaning environmental surfaces.

**Sterile or sterility:** State of being free from all living microorganisms, usually described in practice as a probability function (the probability of a microorganism surviving sterilization as being one in a million).

**Sterilization:** A process that destroys or removes all microorganisms (bacteria, viruses, fungi, and parasites, including bacterial endospores) from inanimate objects by high-pressure steam (autoclave), dry heat (oven), chemical sterilants, or radiation.

**Sterilizer:** Apparatus used to sterilize medical instruments, surgical gloves, equipment, or supplies by direct exposure to the sterilizing agent (autoclave or dry-heat oven).

**Surfactant:** Agent that reduces the surface tension of water or the tension at the interface between water and another liquid—a wetting agent found in many sterilants and disinfectants.

**Surgical asepsis:** Preparation and maintenance of a reduced (safe) level of microorganisms during an operation by controlling four main sources of infectious organisms: the patient, personnel, equipment, and the environment.

**Surgical-site infection (SSI):** Either an incisional or organ/space infection occurring within 30 days after an operation or within one year if an implant is present. Incisional SSIs are further divided into superficial incisional (involves only skin and subcutaneous tissue) and deep incisional (involves deeper soft tissue, including fascia and muscle layers).

**Surgical unit:** The whole surgical area: lockers and dressing rooms; preoperative and recovery rooms; peripheral support areas, including storage space for sterile and high-level disinfected items and other consumable supplies; corridors leading to restricted areas; the operating room(s); scrub-sink areas; and the nursing station.

**Surveillance:** Systematic collection of relevant data on patient care, the orderly analysis of the data, and prompt reporting of the data to those who need it. Surveillance can be either active or passive: active surveillance refers to collecting information directly from patients or HCWs; passive surveillance refers to examining reports, laboratory information, and data from other sources.

**Transfusion service:** Health care facility unit that provides storage, pre transfusion testing and cross-matching, and infusion of blood or blood products to intended patients (recipients).

**Transient flora:** Microorganisms acquired through contact with patients; other HCWs; or contaminated surfaces such as examination tables, floors, or toilets during the course of the

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normal workday. These organisms live in the upper layers of the skin and are partially removed by washing with plain soap and clean water.

**Unit of blood:** Sterile plastic bag in which a fixed volume of blood is collected in a suitable amount of anticoagulant.

**Vegetative bacteria:** Bacteria that are devoid of spores and usually can be readily inactivated by many types of germicides.

**Visibly soiled hands:** Hands showing visible dirt or that are visibly contaminated with blood or body fluids (urine, feces, sputum, or vomit).

**Waste management:** All activities—administrative, operational, and transportation—involved in handling, treating, conditioning, storing, and disposing of waste.

**Waterless, alcohol-based antiseptic handrub or antiseptic handrub** (used interchangeably): Fast-acting antiseptic handrub that do not require water to remove transient flora, reduce resident microorganisms, and protect the skin. Most contain 60 percent to 90 percent alcohol, an emollient, and often an additional antiseptic, such as 2-4 percent chlorhexidine gluconate, that has residual action.

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## CHAPTER 1

### 1.0 INTRODUCTION TO INFECTION PREVENTION AND CONTROL AND WASH

Infection Prevention and Control (IPC) practices are evidence-based procedures and practices that can prevent and reduce disease transmission, and eliminate sources of potential infections (PIDAC, 2012). It is a universally relevant component of all health systems and recognized as a public health priority because it affects the health and safety of both people who use health services and those who provide them.

Water, sanitation and hygiene (WASH) services for health care facilities (HCFs) plays a pivotal role of not only caring for the sick but also in preventing the spread of HCAs, and upholding the dignity of vulnerable populations.

HCFs are therefore required to have a standardized approach that guides the provision of WASH services so as to ensure quality and safe care, and most importantly, minimize the risk of HCAs for staff, patients, carers and visitors. Adequate WASH services in HCFs reduce the risk of HCAs, tackle anti-microbial resistance and ultimately improve the health outcomes of patients. In addition, maintaining high standards of environmental cleanliness within the premises of HCFs have positive effects on the health of the clients who seek health care services and those who provide services.

Water, Sanitation and Hygiene (WASH) in healthcare facilities, includes acute support services and infrastructure that is essential for basic hygiene and IPC. People receiving health care are at risk of becoming infected unless precautions are taken to prevent infection. The risk to infection can be due to direct or indirect contact with contaminated equipment or items, dirty environment and clients that are colonized/infected with micro-organisms. Risk to infection is increased where patients or clients share items, there is overcrowding and are exposed in a closed environment for a prolonged period of time. IPC/ WASH is part of every healthcare workers' duty of care to ensure that no harm is done to patients, visitors or staff.

The consequences of poor WASH in HCFs are that facilities become potential areas of spreading infectious diseases and compromise their ability to provide safe and quality health care. This presents serious health risks to people who seek health care services and those who provide such services. IPC cannot be met without WASH services and therefore IPC/ WASH is a core component of health systems and part of health care quality improvement and patient safety initiatives.

#### 1.1 Importance of IPC/ WASH

IPC/ WASH occupies a unique position in the field of patient safety and quality universal health coverage. The measures are designed to reduce the risk of hospital-associated infections and to ensure a safe and healthy hospital environment for our patients, healthcare providers and visitors. They are important to health workers and patients at every single health-care

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encounter. IPC/ WASH maintain a safe environment for everyone by reducing the risk of the potential spread of disease. Consistently using proper IPC practices will reduce the spread and prevent the transfer of Healthcare Associated Infections (HAIs) in all health care settings. A proper IPC program will reduce the risks not only for patients, but for staff too. IPC plays a strong role through emphasis of low cost interventions, applicable to all providing care, preventing microbial spread and therefore avoiding the need for antimicrobial treatment. IPC enhances patient safety, limit the spread of antimicrobial resistant infections and prevents the use of scarce resources for the treatment of healthcare-associated infection

## **1.2 Relevance of IPC/ WASH in Health**

IPC is relevant to all aspects of healthcare and a central strategy for dealing with public health threats. Good IPC practices contribute to achieving the United Nations SDGs 3 and 6 related to children and women's health. Patients receiving health care are at risk of acquiring infections due to procedures, conditions that impair defence against infections and the environment. It is important for health workers to know and use a system of recommended IPC/ WASH principles to minimize the risk of transmitting these infections.

Health care-associated infections (HAIs) are a major patient safety problem in most Low and Middle Income Countries (LMIC) and result in increased morbidity, prolonged admission, and mortality in health facility. Though the true burden of HAIs in LMIC is unknown it has been estimated that for every 100 hospitalized patients, 10 to 15 acquire at least one HAI World Health Organisation (WHO, 2016). In Malawi, there is limited data on HAIs because few studies have been conducted in this area.

A central rule of the right to health is that health care must be safe. An adequate health system should improve people's health and not create serious risks to health and other social costs to individuals, families and communities. Ineffective IPC have led to HAIs and community outbreaks of emerging infections, causing preventable deaths and social disruption. Poor hygienic conditions in health facilities discourages people from seeking care at the facility. This leads to poor patients' dignity as they may need to walk out of the facility to relieve themselves and outcomes as patients are harmed by avoidable infections.

Therefore, adherence to infection prevention and control practice is critical to patient safety and is integral in Continuous Quality Improvement (CQI) in a health care program. Good infection prevention and control practice is indicative of good quality health care for it reduces cost of care, morbidity and mortality.

Global experience in managing issues of public health concern, including antimicrobial resistance clearly demonstrates the extent to which unacceptable IPC/ WASH practices can pose significant personal and health system problems. Concerted efforts have been made to improve IPC practices and WASH in health care facilities, to ensure safe care and to enhance the health systems' detection, prevention, response to epidemics and other public health events.

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## CHAPTER 2

### 2.1 BASIC MICROBIOLOGY

Micro-organisms are very small life forms that are not visible to the naked eye. They include bacteria, viruses, fungi and microscopic parasites. Microorganisms are found everywhere (on our bodies, in food, in soil, water and plants). Most micro-organisms are not harmful to humans and many actually colonise and protect us by preventing growth of pathogens. Pathogens are micro-organisms that can cause disease (infection) and are potentially harmful to humans. To cause disease, these pathogenic microorganisms must first be passed on (transmitted) to a person and then overcome the body's defence systems.

#### Types of microorganisms

- **Bacteria** are single celled organisms with a rigid cell wall that can survive outside the human body and can multiply on their own (replicate) without the help of the human "host" cell.
- **Fungi** and moulds are made up of many cells, each with a rigid cell wall, which allows survival and replication outside of the human body.
- **Viruses** are made up of genetic material (either DNA and/or RNA) and they cannot survive or multiply outside the living cells of their hosts.
- **Parasites** include the groups helminths (worms and flukes) and protozoa (amoebas, ciliates, flagellates, and sporozoans). They can also survive and multiply outside of the human host.
- **Prions** are tiny protein particles which can cause infections if introduced into the central nervous system (brain and spinal cord)
- **Micro-organisms are, usually, not visible to the naked eye:**  
Bacteria, fungi, moulds and parasites can be seen under a microscope which enlarges (magnifies) by 100–1000 times. Bacteria range in size from around 1 to 5 microns (micrometres).
- Viruses are much smaller, ranging in size from 30 to 400 nanometres. Viruses can only be seen using an electron microscope, which magnifies the image by up to 10 million times.

#### Basic anatomy and physiology of bacteria

Most bacteria are easily recognizable because they have particular shapes, staining characteristics and follow particular grouping or clustering patterns.

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## **Classification of Bacteria**

### **Shape**

The shape of the bacteria varies for different families, for example they can appear round (cocci), rod-like (bacilli), spiral (spirochetes) or curved (vibriosis).

### **Staining**

Bacteria can also be classified based on their staining pattern. The Gram stain is the most commonly used laboratory method to identify the staining pattern of bacteria. A smear is made on a glass slide of a fluid, either directly from a clinical sample (e.g. pus) or from a culture of growing bacteria (in liquid broth or on solid agar plates). The slide is allowed to dry and then several steps of applying blue and pink dyes followed by a decolourising agent. Those bacteria that keep the blue dye stain are called Gram positive and those that lose the blue dye (decolour) will appear pink and are referred to as Gram negative.

The staining of bacteria also allows identification by shape, such as round cocci or long bacilli, and grouping pattern.

### **Grouping pattern**

The grouping pattern that the bacteria take up when seen under the microscope after staining, can also help to identify the bacterial species. For example some bacteria (staphylococci) are clustered together (appearing like a bunch of grapes) and others occur in chains (streptococci, enterococci). Most of the gram-negative rods (bacilli) have no particular grouping pattern.

### **Bacteria culturing in the laboratory**

In microbiology laboratories, bacteria are grown on agar plates (essentially a jelly containing all the nutrients that bacteria need to grow). The laboratory can use other appearances (bacterial growth characteristics) on these agar plates to further identify the species. For examples, colonies of *Staphylococcus aureus* bacteria growing on an agar plate have a characteristic golden yellow colour.

### **Structure of Bacteria**

Bacteria are single cell organisms that have all the structures needed for their survival and replication. All bacteria are surrounded by a rigid outer cell wall, which gives them their shape (gram-positive bacteria have thicker cell walls than gram-negative bacteria). The cell wall allows some substances in and out of bacteria through tiny channels (porins). Some bacteria have projections from the cell wall called pili and flagella. Pili help with bacterial attachment to host cells, while flagella allow bacteria to move. A thin membrane called the cytoplasmic membrane runs inside the cell wall and holds together all the cell contents. Important cell contents include the bacterial genetic material (DNA) and ribosomes (which act as factories producing more genetic material).

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## **Growth of Bacteria**

Bacteria will grow best when they are in an environment that provides the correct combination of nutrients, temperature and humidity. The time taken to multiply (replicate) depends on the environmental conditions and bacterial species, but can be as fast as every 20 minutes. The growth cycle can be divided into 4 phases:

1. Lag phase: there is no growth (numbers remain static)
2. Log phase: there is a rapid increase in bacterial numbers
3. Stationary phase: numbers are maintained but there is no further growth (as the nutrient supply is used up)
4. Death: the number of bacteria starts to reduce.

## **Fungi, viruses and parasites**

### **Structure of Fungi**

Fungi are made up of many cells with a thick cell wall. Most fungi multiply by forming long string-like filaments (known as hyphae), some produce fungal spores (a type of resting form that fungi take up under unfavourable conditions) and others (yeasts) grow by budding. Fungi can be commonly found in the environment and can also cause a variety of diseases in humans.

Candida is the most commonly encountered fungal infection in healthcare settings. Fungal infections can be superficial (affecting the skin and subcutaneous tissue) or deep (affecting organs or systemic, spreading throughout the body). Deep fungal infections usually occur in hosts with weakened immune systems.

### **Structure of viruses**

Viruses can only survive within host (human, animal or plant) cells, usually cells of the immune system.

Once inside the host cells, viruses are relatively protected from the host's defence mechanisms and can use the host structures to replicate. The intracellular location of viruses makes it difficult to produce drugs that kill the virus without causing damage to the host cell.

Viruses are categorized both by their genetic make-up (single- or double stranded, RNA or DNA) and their shape. The virus' shape (icosahedral, helical and complex) is determined by its nucleocapsid structure, which is a combination of viral nucleic acid and capsid (the outer shell). In some viruses the nucleocapsid is covered by an outer membrane (known as an envelope), whereas others are "naked" or non-enveloped. Viruses without an envelope are more difficult to destroy or remove by disinfection.

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## Classification of parasites

Parasites include the sub-groups protozoa and helminths. Protozoal parasites are divided into four main types, grouped by their form (structure) and how they move (motility).

### Protozoa

- Sporozoa: these parasites can only exist inside host cells (intracellular) e.g. malarial parasites
- Flagellates: move using tail-like projections (flagellae) e.g. *Giardia lamblia* (causes giardiasis)
- Amoebae: move using special rounded projections (pseudopods) e.g. *Entamoeba histolytica* (causes amoebiasis)
- Ciliates: move by beating many tiny hair-like projections on the surface of their cells e.g. *Balantidium coli* (causes balantidiasis)

### Helminths

The helminths are divided into worms and flukes. There are many different types of worms that can cause human infestations, including:

- Round worms (*Ascaris lumbricoides*)
- Pin or thread worms (*Enterobius vermicularis*)
- Hook worms (*Necator americanus*, *Ankylostoma duodenale*)

These worms are spread mainly by ingestion (swallowing) of the eggs. Certain helminths can be spread by insects (so called vector-borne helminths which can infect blood and/or human tissues) e.g. *Loa loa* (onchocerciasis) and *Wuchereria bancrofti* (elephantiasis). The sub-group of helminths known as flukes, include the parasites that cause bilharzia

## 2.2 Chain of Infection

It is important to understand the dynamics of disease transmission in hospitals and health care facilities to control the spread of infections. The spread of infection requires six (6) elements:

**Agent**- disease-producing microorganism

**Reservoir** - place where agent lives—humans, animals, plants, soil, air, water

**Mode of exit** - how the agent exits the reservoir

**Mode of transmission** - how the micro-organism travels from person to person - healthcare workers' hands, contaminated instruments

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**Place of entry** - where the microorganism can enter to infect a susceptible host - mucus membrane, blood stream, surgical site and urinary tract

**Susceptible host** - person(s) who may become infected by the microorganisms – patients, healthcare workers

Each of these components must be present for the infection to be transmitted. See Figure 1 on the disease transmission cycle below.

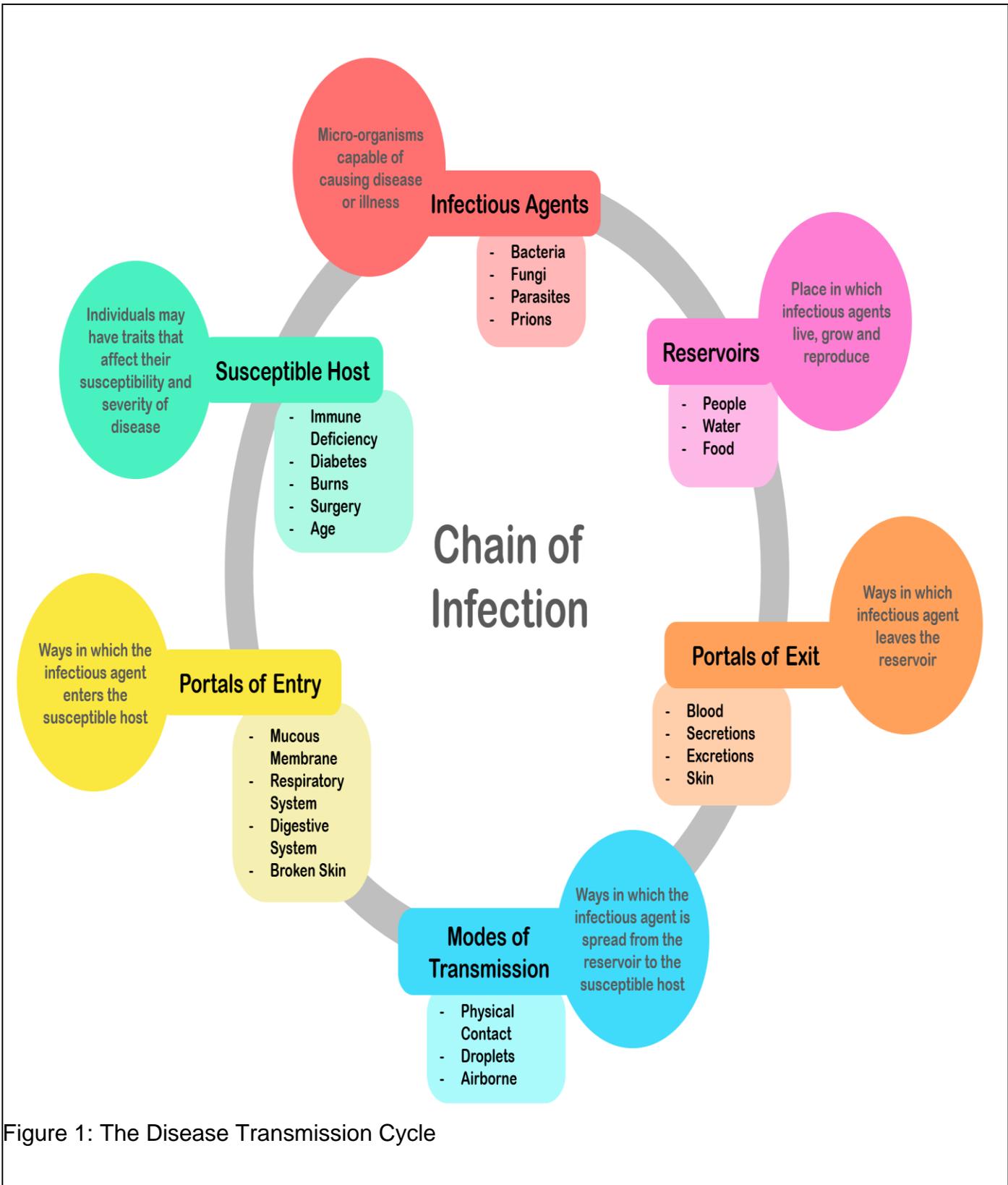


Figure 1: The Disease Transmission Cycle

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## **The agent**

The disease causing microorganisms include bacteria, virus, fungi, parasites etc. These can be group under two main categories;

### **Normal flora or commensals or resident microorganisms**

Normal flora/ commensals also known as microbiota are microorganisms that colonize human beings but do not cause disease. They work with the human body to help prevent colonization and infection by pathogenic microorganisms. They do this by;

- Occupying areas that pathogens might occupy
- Producing acids
- Producing bacteriocins

For example, the commensal bacteria of the gut help to stop pathogenic bacteria, such as *Clostridium difficile*, that cause diarrhea. However, commensal microorganisms can be opportunistic and can overgrow in the absence of defense mechanism and can cause infections when they invade a space where they do not belong.

### **Pathogens or transient microorganisms.**

Micro-organisms that cause infections are normally not found on the body but could be on objects, medical equipment, etc. An infection usually causes clinically apparent symptoms or sometimes may cause no symptoms and be sub-clinical. Symptoms vary according to the type of microorganism and the location of the infection. The characteristics and location of the microorganism as well as the immune status of the person determine if and how an infection progresses.

### **Reservoir**

This is also referred to as the source of the infecting agent. The source of the infecting agent may be patients, staff or visitors, animals, plants, the soil, air, water etc. It may include persons with the active disease, those in the incubation period of the disease or those who are colonized by the infectious agent, but have no apparent disease (carriers). Other sources of infecting micro-organisms can be the patient's own endogenous flora (autogenous infection), which may be difficult to control, and inanimate environmental objects that have become contaminated, including equipment and medications.

### **Mode of exit**

This refers to how the pathogenic microorganism leaves the reservoir and could be via coughing, sneezing, non-intact skin, blood and body fluids.

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## Mode of transmission

Mode of transmission is how the agent travels from person to person. Micro-organisms are transmitted in health facilities by several routes. It usually occurs via Healthcare Workers'(HCWs) hands, contaminated equipment, instruments, devices, and the environment (including air and water). Note that the same micro-organism may be transmitted by more than one route. There are five (5) classical modes of transmission: Contact, Droplet, Airborne, Common vehicle and Vector borne.

### Contact transmission

This is the most important and most frequent mode of transmission of HAIs and is divided into two sub-groups: direct contact transmission and indirect contact transmission

***Direct-contact transmission*** – Occurs when there is physical contact between an infected or colonised person and susceptible person. This also occurs when a person turns a patient, gives a patient a bath, or performs other patient care activities that require direct personal contact. Direct transmission also can occur between two patients, with one serving as the source of the infectious micro-organisms and the other as 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 that are not washed and gloves that are not changed between patients.

### Droplet transmission

Droplets are generated from the source person primarily during coughing, sneezing and talking during the performance of certain procedures such as suctioning and bronchoscopy. Transmission occurs when droplets containing micro-organisms generated from the infected or colonised 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.

### Air borne transmission

Airborne transmission occurs by dissemination of either airborne droplet nuclei (small particle residue) of evaporated droplets containing micro-organisms that remain suspended in the air for long period of time, or dust particles containing the infectious agent. Micro-organisms 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. Micro-organisms transmitted by airborne may include *Mycobacterium tuberculosis*, rubella, varicella viruses.

Control of airborne transmission is the most difficult, as it requires control of air flow through special ventilation systems.

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## **Common vehicle transmission**

Common vehicle transmission applies to micro-organisms transmitted by contaminated items such as:

- Foods – e.g. salmonella
- Water – e.g. shigella
- Medications / intravenous solutions
- Blood – e.g. Hepatitis B, C, HIV
- Equipment and devices.

These can transmit infection to multiple hosts and may result in an explosive outbreak.

## **Vector borne transmission**

Vector borne transmission refers to transmission by insects and vermin, and is prevented by appropriate health care facility construction, maintenance, closed or screened windows, and proper housekeeping. Vector borne transmission occurs when vectors such as mosquitoes, flies, cockroach, rats and other vermin transmit micro-organisms.

## **Mode or place of entry**

This is where pathogenic micro-organism can enter to infect a susceptible host. Common places of entry include the mucus membrane, blood, non-intact skin and urinary tract.

## **Susceptible host**

Susceptible persons or animals are the ones that lack effective resistance to particular micro-organisms. Susceptible hosts include patients, HCWs, and visitors who may become infected by the infecting microorganisms. Patients' resistance to pathogenic micro-organisms vary greatly. Some persons may be immune or colonised (asymptomatic carriers) and others may develop disease. Host features such as age, underlying diseases (diabetes, malnutrition e.t.c), certain treatments (antimicrobials, corticosteroids, immunosuppressive agents), irradiation and breaks in the first line of defence mechanisms caused by such factors as surgical operations, anaesthesia, and indwelling catheters may render patients more susceptible to infection.

## **2.3 Characteristics of micro-organisms associated HAIs**

Healthcare workers should know that microorganisms have characteristics that enable them to survive and/or easily spread in health care environments. These characteristics include ability to:

- Survive on the hands of HCWs, environmental surfaces, and medical equipment when IPC practices such as hand hygiene, cleaning, disinfection, and sterilization are suboptimal. Examples include influenza virus and Staphylococci Aureus (*S. aureus*), which can survive for several hours or days on hands and surfaces if not cleaned.

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- Survive dryness, heat, and disinfectants and can cause infections in patients and HCWs despite IPC measures such as hand hygiene, cleaning, disinfection, and sterilization. Examples include norovirus, *Clostridium difficile*, and some moulds that survive by forming spores, *Pseudomonas* species(spp) and microorganisms that have been known to survive in disinfectants.
  - Live in blood and body fluids even though they cannot survive for long duration in the health care environment. These microorganisms can be passed from person to another through items contaminated with blood or body fluids, even in minute amounts. Examples include hepatitis B virus, hepatitis C virus, and HIV on or in dialysis machines, multi-dose vials, multi-use lancets, or insulin pens; and Ebola virus on hands, equipment, and surfaces that are not adequately cleaned.
  - Thrive in damp areas, such as drains, sinks and equipment that use water (humidifiers, patient warmers, and respiratory equipment), intravenous fluids used in health care, disinfectants. Examples include *Mycobacterium* spp., gram-negative bacteria (e.g. *Acinetobacter* spp., *Pseudomonas* spp., *Burkholderia* spp., and *Enterobacteriaceae*).
  - Colonize patients and staff, allowing the microorganisms to survive in the health care environment and pass from person to person, causing infection if the immune defences become suboptimal, such as after surgery or when medical devices are in place. Examples include Methicillin resistant staphylococcus, *S. aureus*, *Enterobacteriaceae*, and *Enterococcus* spp.
  - Remain suspended in the air and be transmitted within short distances through the air in respiratory droplets, particularly when propelled by coughing or sneezing, and therefore can cause transmission if personal protective equipment is inadequate. Examples include influenza and *Neisseria meningitidis*.

## 2.4 Risk Management

A **risk** is defined as the *likelihood* that a person may be harmed or suffer adverse health effects if exposed to a hazard. **Hazard** is defined as a potential *source of harm* (e.g. biological or chemical) or adverse health effect on a person's health. The best way to manage risk is to *avoid* it in the first place, if possible. For example, avoid the use of indwelling urinary catheters in patients if it is not clinically indicated. If avoidance is not possible, then every effort must be made to reduce risk to an absolute minimum by reviewing the need for *all* indwelling devices daily and by monitoring for signs of infection to prevent HAIs.

The delivery of an effective IPC Programme to reduce HAIs requires IPC practitioners to identify unsafe and hazardous IPC practices, recommend cost-effective preventive measures

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to reduce HAIs and help Healthcare Facilities (HCFs) to set priorities. This objective can be achieved by applying the concepts of risk management using the following four key stages.

### **Risk identification**

The aim is to identify common practices that have an impact on a large number of patients or rare problems which can cause severe infection, disability or death. Once an activity and task are identified that put patients, healthcare workers, or visitors at risk, e.g. improper disposal of sharps, reuse of needles and syringes between patients, it is essential to obtain evidence through an investigation and this often requires the expert knowledge of the IPC team and can be achieved by observational or experimental studies.

### **Risk analysis**

Once the risk is identified, it can be managed using a step by- step approach for identifying possible causes. While performing the risk analysis, it is essential that the likely consequences to patients, HCWs, and visitors be estimated. This can be achieved by analyzing following four key questions:

5.4 **Why** are infections happening?

5.4 How **frequently** are they happening?

5.4 What are the likely **consequences** if the appropriate action is not taken? e.g. disability or increased length of stay due to HAIs **OR** mortality experienced by persons who had a procedure or were exposed to pathogens or chemical disinfectants, e.g. HCWs exposed to glutaraldehyde in a poorly ventilated area.

5.4 How much is it going to **cost** in order to prevent it? It is also important to estimate the cost of prevention of each risk. Estimated costs are acceptable, as the exact cost may be difficult to obtain. The cost of prevention is important because it helps IPC practitioners target resources where they will deliver the greatest advantage.

Severity and frequency of events can be prioritized and an action plan risk level matrix can be developed. Once all information is available on the severity, frequency of occurrence, and cost of prevention, priorities for action can be developed by calculating a risk rating as follows:

**Risk rating = severity × frequency (probability) × cost of prevention**

Once the risk analysis has been completed, a review the possible solutions and appropriate action plan should be developed.

**Critical/ High risk-** Has a major impact on individuals leading to death, disability, or long- term consequence. Immediate action is required.

**Moderate risk-** May lead to short- term consequences. Planned action is required.

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**Low risk-** Has minimum impact with no or minor consequences. The situation should be kept under constant review. The risk should be completely eliminated or should be reduced to a minimum or to an acceptable level. In some situations, it may be more cost- effective to purchase single- use items and/ or sterilized items from another source. If resources are severely constrained, then it may be possible to accept the risk in both the short and possibly long term. Willingness to tolerate known risks in a healthcare institution is different in different parts of the world and is based mainly on the availability of resources and the fear/ level of litigation.

### **Risk monitoring**

Appropriate measures should be put in place to reduce risk and it is essential to monitor their effectiveness. Resources should be made available to facilitate regular audits, process monitoring and outcome surveillance of HAIs. Timely feedback must be given to key stakeholders and senior management to ensure that measures are implemented. A person should be nominated for follow- up actions and feedback on the progress of improvements. S/he should work hand in hand with risk management committee or IPC or QI of the healthcare facility.

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## CHAPTER 3

### 3.1 INFECTION PREVENTION AND CONTROL/ WASH PROGRAM

The Infection Prevention and Control /Water Sanitation and Hygiene (IPC/WASH) programs in health care facilities are based on understanding the facility's problems or needs, prioritizing activities, and using available resources effectively. Resources are always limited, so careful planning, implementation, and evaluation of IPC activities are essential. In many healthcare facilities, surveillance systems and laboratory resources to identify the cause and treatment options for infections are limited. Thus, IPC is not only the most cost-effective option, but also the best strategy available to protect patients and limit the spread of disease within health care facilities.

The organization of an IPC/WASH program varies from country to country, depending on the available resources. In Malawi the program is delivered through a trained IPC/WASH team, which engages and educates staff in all areas and at all levels to play an active role in preventing the spread of infections among patients, fellow workers, and themselves. The IPC/WASH team is also responsible for the day- to- day running of the its program, setting priorities, implementing evidence- based practices, and advising hospital administrators on issues relating to IPC/WASH. The team must be multidisciplinary e.g. clinicians, nurses, allied staff, administration, community etc.

The IPC/WASH team must meet the core competencies to ensure that they have both the knowledge and skill to execute their tasks effectively. Research has proven that IPC programmes can make healthcare services safer and more affordable by preventing the suffering, loss of life and cost caused by healthcare-associated infection. However, for effectiveness of IPC programs, it is important to have qualified and dedicated staff, adequate budget and infrastructure that supports IPC/ WASH.

Due to the complexity of various factors, it is *not* possible to achieve a 100% reduction in HAI; however, WHO advocates a multimodal strategy (Allegranzi, 2013). A multimodal strategy comprises of several elements or components, implemented in an integrated way with the aim of improving an outcome and behaviour change. The five most common components include:

- System change
- Education and training of HCWs and key players
- Monitoring, audit and feedback
- Reminders in the workplace/ communications,
- Cultural/ Behavioural change

The core components of IPC programs should be implemented using multimodal strategies to improve practices and reduce HAIs and AMR (WHO, 2016). In essence, multimodal strategies are designed to support the implementation and embedding of every aspect of an IPC program.

It is important to institutionalise effective IPC structures with clearly defined roles and responsibility at all levels of the health system to plan and implement IPC as well as respond to disease outbreaks and other public health emergencies. The World Health Organization recommends the following as the core IPC components:

- 3.2 IPC programme.
- 3.2 Development, dissemination and implementation of evidence-based guidelines.
- 3.2 IPC education and training.
- 3.2 HAI Surveillance, including microbiological laboratory support.
- 3.2 Multimodal strategies for implementing IPC activities.
- 3.2 Monitoring, audit, and feedback of IPC practices.
- 3.2 Workload, staffing and bed occupancy.
- 3.2 Promotion of water, sanitation, and hygiene (WASH) infrastructure, equipment and services.

Using a multimodal strategy continuously maximizes outcomes and behaviour change. The IPC programme at all levels should assess and work with key stakeholders to design a practical and implementable multi-modal strategy that can achieve sustainable behaviour change in the health workforce, patients and community.

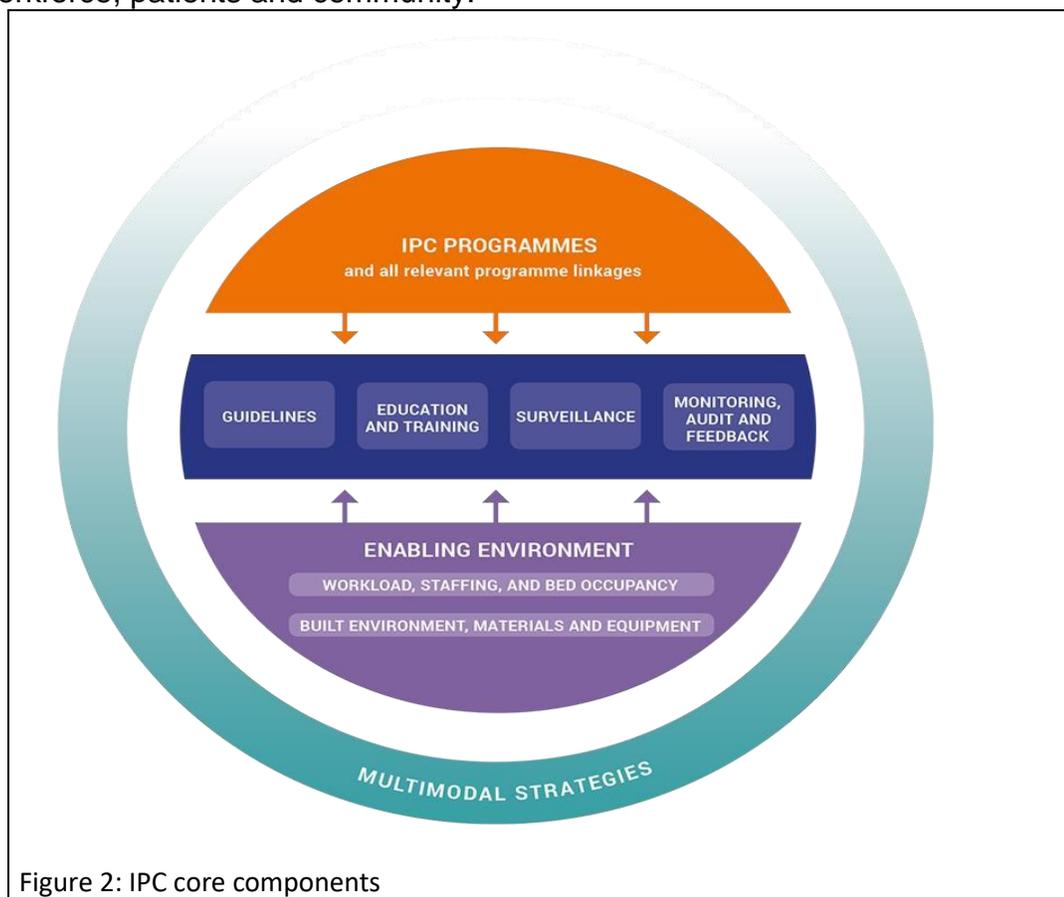


Figure 2: IPC core components

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## 3.2 IPC/WASH Governance and Organizational Structures

### National level

At the national level, the MoH through the Quality Management Directorate (QMD) has the ultimate responsibility and authority for ensuring the availability and utilization of IPC/WASH guidelines. QMD has a national IPC/WASH unit in the Quality Improvement(QI) division. Quality Management Technical Working Group (QMTWG) which is a partnership of key stakeholders that support and advise the unit. To effectively guide and support the program, leadership at the Ministry must grant formal authority to the IPC program with provision of adequate resources for activities. Effective communication about IPC/WASH is vital.

Roles and responsibilities of the IPC/WASH unit:

- Lead the formulation of policies, strategies and standards for IPC/WASH.
- Ensure dissemination and availability of policies, standards and guidelines.
- Ensure that there is a national budget for IPC/WASH in their annual plans.
- Ensure that there is knowledge management and adherence to IPC/WASH policies, standards and guidelines.
- Provide information, education, training and communication on IPC/WASH.
- Advise MoH on issues relating to IPC/WASH.
- Provide technical support to QIST/ IPC/WASH teams.
- Ensure that standards are adhered to, in the design and construction of health facilities.
- Liaise with procurement unit and end users in the purchasing of equipment and supplies.
- Institute systems to monitor and evaluate the implementation of IPC/WASH activities at all levels of service delivery.
- Conduct and coordinate research relevant to IPC/WASH.
- Advocate, lobby and mobilise resources for IPC/WASH activities.
- Perform any other functions related to IPC/WASH with regulatory bodies.

### Hospital/ Facility level

Hospital IPC/WASH is a unit in the Quality Improvement section. This is an integral part of the Hospital Quality Management Department/Division that should oversee all IPC/WASH activities at the facility. It should also be integrated into other programmes such as Environmental Health, TB and HIV programmes. The hospital IPC/WASH focal person should oversee the day-to-day IPC/WASH activities, including the coordination and organisation of agreed plans. The focal person should have dedicated time to carry out IPC/WASH activities. Where applicable, there must be a full-time IPC practitioners to oversee activities at health facility.

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Roles and responsibilities of the IPC/WASH team:

- Direct and facilitate the implementation and adherence to policies and standards.
- Advise on procurement of equipment and consumables.
- Conduct comprehensive assessments on availability and quality of services through monitoring, supervision and evaluation of IPC/WASH activities.
- Conduct IPC/WASH training in liaison with the in-service training coordinators.
- Provide advice on IPC/WASH and related matters.
- Conduct operational research, dissemination and knowledge management of information on IPC/WASH.
- Advocate and mobilise resources for IPC/WASH activities.
- Develop an annual budget for IPC/WASH activities for the health care facility and lobby for its financing/resourcing.
- Conduct surveillance on HAIs and outbreak investigation.
- Monitor and investigate incidences of medical errors.

### **Health Centre level**

Health centres management team is responsible for IPC/WASH and should have a Focal Person responsible for IPC/WASH activities.

Roles and responsibilities of the IPC/WASH team or Focal Person:

- Facilitate the implementation of and adherence to standards and guidelines on IPC/WASH.
- Manage supply chain and timely ordering of equipment and consumables for IPC/WASH.
- Monitor, supervise and evaluate IPC/WASH activities.
- Conduct IPC/WASH training in liaison with the in-service training coordinators.
- Provide advice on IPC/WASH and related matters.
- Disseminate information on IPC/WASH.
- Perform any other functions related to IPC/WASH.

### **Community level**

Community representatives— Community Volunteers, Village health committee (VHC), Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs) have a role to play in IPC/WASH. The relevant Community Health Worker (CHW) shall oversee IPC/WASH activities under the supervision of the health centre management team.

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## Partnerships

The MoH through QMD at the national level should facilitate the establishment of strong partnerships with other sectors and agencies such as academic institutions, professional associations, regulatory bodies, industries, non-profit organizations to support effective IPC/WASH implementation. Partners or stakeholders should follow the annual IPC/WASH plan lead by the IPC/WASH unit at national level.

### 3.3 IPC/ WASH Training and Education

All healthcare workers require a basic understanding of IPC/ WASH principles, to enable appropriate human resource development for IPC/WASH. There should be continuous education and training for all cadres of healthcare staff. Education is important to address workers' concerns, fears, stigmas and incorrect assumptions on IPC/ WASH. Different categories of workers have different information needs, it is therefore recommended that the training sessions be tailored to the specific target audience.

#### Institutions should

- Train a pool of health workers to champion the implementation of IPC/WASH at the various levels of service delivery.
- Ensure that all new staff and students on attachment undergo orientation on IPC/WASH practices when they are recruited.
- Organize educational programmes for staff and patients/clients to sensitize and create awareness on IPC, WASH and AMR issues.
- Identify health care facilities and set them up as centres of excellence for IPC/WASH.

**Pre-service:** Ministry of Health should ensure that health training institutions, through Regulatory Bodies and other Agencies incorporate IPC/ WASH component in their **pre-service** curriculum.

**In-service training:** IPC/WASH should be mandatory in the structured in-service training programme in all health facilities. IPC/WASH should be mandatory on CPD. All new employees should undergo an induction in IPC/WASH.

**Post-basic:** The MoH should encourage health professionals to pursue post-basic training specializing in IPC/WASH.

#### Training Package for different categories of staff

##### IPC/WASH Trainer of Trainers(ToTs)

This is a group of people that will be trained to be responsible for training of HCWs on IPC/WASH in their facilities and nationwide by MoH. The health facility management team should identify

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personnel to be trained as ToTs which should comprise IPC coordinator, laboratory staff, environmental staff, nursing staff, clinician, housekeeper and security person. Criteria for selecting ToTs

- Someone with passion in IPC/WASH
- Have undergone basic IPC/WASH training
- Good interpersonal skills

The ToTs course is for 5 days, 2 of which are for teaching practice. There is a pre and post-test. Any person who fails the test is not eligible for certification as a ToT. Their training must cover the following topics:

- Basic microbiology and modes of disease transmission.
- Organization and management of IPC/WASH program.
- Support supervision, monitoring (audits) and evaluation of IPC/WASH.
- All components of standard, transmission based and additional precautions.
- Surveillance, including risk identification, assessment and control.
- Occupational Health and safety issues.
- Antimicrobial stewardship policy and practice.
- Information management and operational research.
- Teaching methods
- Hospital design
- IPC/WASH in selected areas
- Change management

### **IPC/WASH focal person, QIST and HCWs**

Doctors, nurses, or other professionals who are responsible for direct patient care should gain basic knowledge in all areas relevant to IPC/WASH, including, patient safety, Antimicrobial resistance, quality improvement, epidemiology and statistics. These should undergo a five-day training on the following topics:

- Basic microbiology and modes of disease transmission.
- Organization and management of IPC/WASH program.
- Support supervision, monitoring (audits) and evaluation of IPC/WASH.
- All components of standard, transmission based and additional precautions.
- Surveillance, including risk identification, assessment and control.
- Occupational Health and safety issues.

- 
- Antimicrobial stewardship policy and practice.
  - Information management and operational research.

Support staff should receive tailored IPC/WASH training based on their job description. The training must be done for 2 days on the following topics:

- IPC/WASH program.
- All components of standard and transmission- based precautions.
- Occupational health and safety.

### **Facility management team:**

Administrative and managerial staff should appreciate the importance of supporting IPC/WASH infrastructure, implementation and monitoring of IPC/WASH guidelines and practices that mitigate harm to patients and HCWs. Orientation for 1 day should be done on the following topics;

- IPC/WASH program and the role of leaders.
- Standard and transmission- based precautions.
- Occupational health and safety.

### **Client/ community education**

The importance of the facility and community IPC/WASH measures should be explained to patients, their families, caretakers and visitors. Patient/guardian health education should be done in the facility either in the morning or afternoon depending on activities in the ward or service area. Topics should include; hand hygiene, Sanitation and Hygiene, Respiratory hygiene (e.g. wearing a mask, sneezing and coughing into the elbow), Waste management (e.g. proper disposal of home care medical waste and sharps like insulin syringes) and additional precautions as required.

### **IPC/WASH Refresher course**

Annual refresher courses or short in-service training updates are recommended for all categories of healthcare staff. The simplest and often most well accepted format for training is face to face and small group teaching. However, this is time-consuming and may limit the number of staff the trainer can educate. Incorporating short sessions into the weekly clinical schedule and utilizing other staff for IPC/WASH education may be effective e.g. using the sister-in-charge of a ward to give a demonstration on hand hygiene techniques at the morning ward handover rounds. Alternative methods include formal IPC/WASH courses, distance learning (including small-group, self- study and collaborative learning, video demonstrations and e-learning (online short courses) provided by international organizations.

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## 3.4 Monitoring and Evaluation

Monitoring is an organized method of systematically identifying, collecting, analysing, reporting, disseminating and utilizing information related to IPC/WASH activities. Evaluation determines systematic and objective the significance of an IPC/WASH intervention, strategy and policy. The main aim of monitoring and evaluation is to assess the extent to which standards are being met and activities are being performed according to the set objectives and indicators.

There are three key indicators that can be used to report on the impact of an IPC/WASH programme.

### **Input indicators**

These rate how well local or national guidelines are being followed e.g. the percentage of hand wash basins, availability of soap, water and towels.

### **Process indicators**

These rate how well individuals follow facility-based guidelines, but may also include how many individuals were trained on policy implementation e.g. the percentage of hand hygiene compliance, number of people trained in tuberculosis (TB) infection control.

### **Outcome indicators**

These measure the outcome that IPC/WASH programmes are trying to prevent, health care associated infection e.g. the facility's infection rate from surgical site infections, urinary tract infections in catheterised patients and rates of antibiotic-resistant infections.

Though monitoring activities should cover all the components of the system - inputs, activities/processes, outputs, outcomes and impact, IPC/WASH monitoring in health facilities usually focus on inputs, processes, outputs and outcomes. These components are briefly described below

### **Structures**

Structures are IPC/WASH resources that are necessary for effective performance. It includes qualified personnel, policies, guidelines and protocols, funds, supplies and equipment. Though it is important to monitor all inputs, for practical purposes, monitoring should be limited to a list agreed tracer inputs.

### **Process/ activities**

These are actions necessary to transform given inputs into planned outputs within a specified period of time. Processes comprise the step-by-step activities that are performed. Examples of

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IPC/WASH processes are performing hand hygiene, environmental cleaning, and use of protective equipment/clothing and performance of aseptic procedures.

### **Output**

Output refers to the amount of work done. Examples are number of staff trained, number of supervisory visits, e.t.c.

### **Outcome**

This is the end result of an activity or set of activities that provides value to the client. It is dependent on the quality of inputs, process and outputs. Examples are client satisfaction with cleanliness of health facility, wound infection rate and prevalence of other healthcare associated infections, change in IPC/WASH knowledge and skills, attitude and behaviour.

Monitoring can be both **internal** and **external**. Internal monitoring involves a system set up by the health facility/wards/units and uses people within the health facility/ward/unit to undertake the exercise. External monitoring is one that is conducted by people from outside the health facility and could be from the National IPC/ WASH unit at the MOH or outside the country. In both types of monitoring, agreed standards will be used.

## **Monitoring and evaluation responsibilities**

### **National Level**

The purpose of monitoring at the national level is to assess the overall performance, identification and implementation of relevant interventions to improve the quality of service. The Quality Improvement (QI) Division is responsible for designing a national IPC/WASH monitoring system. The QI should perform an annual evaluation to assess the extent to which the objectives are met.

### **Satellite Level**

The Satellite IPC/WASH focal persons are responsible for monitoring within the zones. The purpose of monitoring at this level is to identify gaps in performance at the various health facilities and support the implementation of relevant interventions to improve the quality of service.

### **Health facility/ward/unit level**

The focal person(s) and the committee/team are expected to conduct a quarterly monitoring of IPC/WASH activities. They should ensure that the appropriate structures, policies and procedures for monitoring are instituted and functioning. All set indicators must be tracked.

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## 3.5 Research

Many Low and Middle Income Countries (LMICs) face a number of issues and challenges in IPC/WASH that require investigation to guide implementation. Periodic studies should be conducted at all levels of health care delivery, not only to determine the status of implementation but also to guide decisions on practices, technological and equipment choices as well as demonstration of cost-effectiveness of interventions. A better understanding of the cultural and social context within which IPC/WASH is practiced is required. The MoH research agenda should include priority areas on IPC/WASH in healthcare. Research topics may include AMR, Surgical site infections, hand hygiene practices, cleaning and disinfection, e.t.c.

## 3.6 Occupational Health and Safety

Occupational Health and Safety (OHS) is about the protection and promotion of health of workers by eliminating occupational factors and conditions hazardous to health and safety at work. Protection of healthcare workers (HCWs) should be an integral part of the Infection Prevention and Control (IPC) program health services and especially hospitals, are amongst the employers with the largest number of employees in the country. Those employed in the service have the right to a high a standard of occupational health as found in industry at its best. An occupational health service results in healthier, more effective employees and reduces absenteeism due to sickness and other causes. It also reduces turnover and worker compensation. Health management teams have an obligation to ensure that all their employees are appropriately trained and skilled in the procedures necessary for working safely.

### Importance of OHS in hospitals

OHS is paramount in HCF because health workers are continually exposed to disease causing microbes which leads to workplace-related health impairments, injuries and illnesses. The hospitals set standards for preventive measures and policy determined from investigated accidents and their causes. Through screening, patients, colleagues or visitors are protected from risks associated with unhealthy employees who are colonized with an infectious disease but unaware and can transmit the infection. Through OHS program, hospitals establish procedures for dealing with workplace hazards, provides for enforcement of the immunizations for health workers and assessment of risks and hazards that may impact safety on the job.

### Common Injuries in Hospitals

- Back, Neck and upper arm injuries
- Slips, trips and falls
- Burns
- HCAI- Respiratory Infections, Exposure to carcinogenic substances, Needle sticks, exposure to blood and body fluids
- Stress related disorders

- 
- Electric shock/ burns

#### Risks and Hazards in Health Care Settings Incorrect lifting of heavy objects

- Electric cables left out for people to trip over
- Employee fatigue/ Stress
- Wet floors and spills that are left uncleaned
- Poor ventilation
- Long work hours
- Occupational violence

#### **Responsibilities for Employer and Employee in OHS**

##### The duties of the employer:

- Provide a safe work place (Infrastructure)
- Provide safe plant and equipment
- Provide safe systems of work (policies, standards)
- Provide training on health and safety
- Equip staff with skills to identify and manage hazards
- Investigate accidents and the causes to inform policy

##### **Employee**

- Comply with health and safety Regulations and Policies
- Properly recommended PPE when performing activities and procedures
- Should not to interfere with or misuse items that have been provided but instead use for intended purposes
- Must protect oneself from injuries and injuries to others by following right steps in any procedure and work activities
- Not to endanger the work place by interfering with safety arrangements
- Change the one's mind set from service provision at the risk of their own lives to improved self-defense during emergencies and routines

##### **Roles of OHS Team.**

HCWs should be assessed *before* employment it is necessary that all newly employed staff must undergo screening and/or medical examination, which should include history of infectious disease, immunization needs and treatment of any ailment. The employees must be given assurance of complete confidentiality of their occupational health record. The IPC focal person or OHS should keep accurate and up-to-date records of immunization of all staff at the required time interval. Keeping records of all sharps/inoculation injuries, and arranging post-exposure prophylaxis and counselling of staff. The records of injuries will also determine the training needs for IPC refresher training needs on management of sharps injuries and exposure to blood and body fluids. In addition, another role would be to examine staff returning to work after an absence due to infectious conditions and survey potential risks and hazards to staff in HCF to decide on control measures to manage the risk.

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## CHAPTER 4

### 4.0 STANDARD PRECAUTIONS

Standard precautions are work practices required for basic level IPC and are based on the principle that all blood, body fluids, secretions, excretions including sweat, non-intact skin and mucous membranes may contain transmissible infectious agents. Standard precautions should be applied during all patient-healthcare worker interactions that are likely to involve exposure to blood, body fluids and pathogens. Standard precautions recommended for the treatment and care of all patients / clients irrespective of their perceived infectious status.

**The components of standard precautions are**

1. Hand hygiene.
2. Personal Protective Equipment.
3. Processing of used medical equipment and other devices.
4. Patient placement.
5. Occupational Health and safety
6. Environmental cleaning and disinfection.
7. Handling of hospital textiles and laundry.
8. Respiratory hygiene and cough etiquette.
9. Injection safety
10. Safe handling sharps.
11. Waste management.

**The guidelines on each of the components of the standard precautions are presented below.**

#### 4.1 Hand Hygiene

Hand hygiene is a general term that applies to routine hand washing, antiseptic hand rub, or surgical hand antisepsis. The hand is the common vehicle for transmission of infections. Hand washing is the single most effective method used in preventing the spread of infections. The goal of hand hygiene is to remove soil, dirt, and debris and reduce both transient and resident flora. Proper hand hygiene reduces the number of potentially infection-causing microorganisms on the hands and decreases the incidence of infection transmission in the health facility. The effectiveness of hand hygiene is improved when skin is intact, nails are natural (not acrylic), short and not varnished; hands and forearms are free of jewellery; and sleeves are above the elbow.

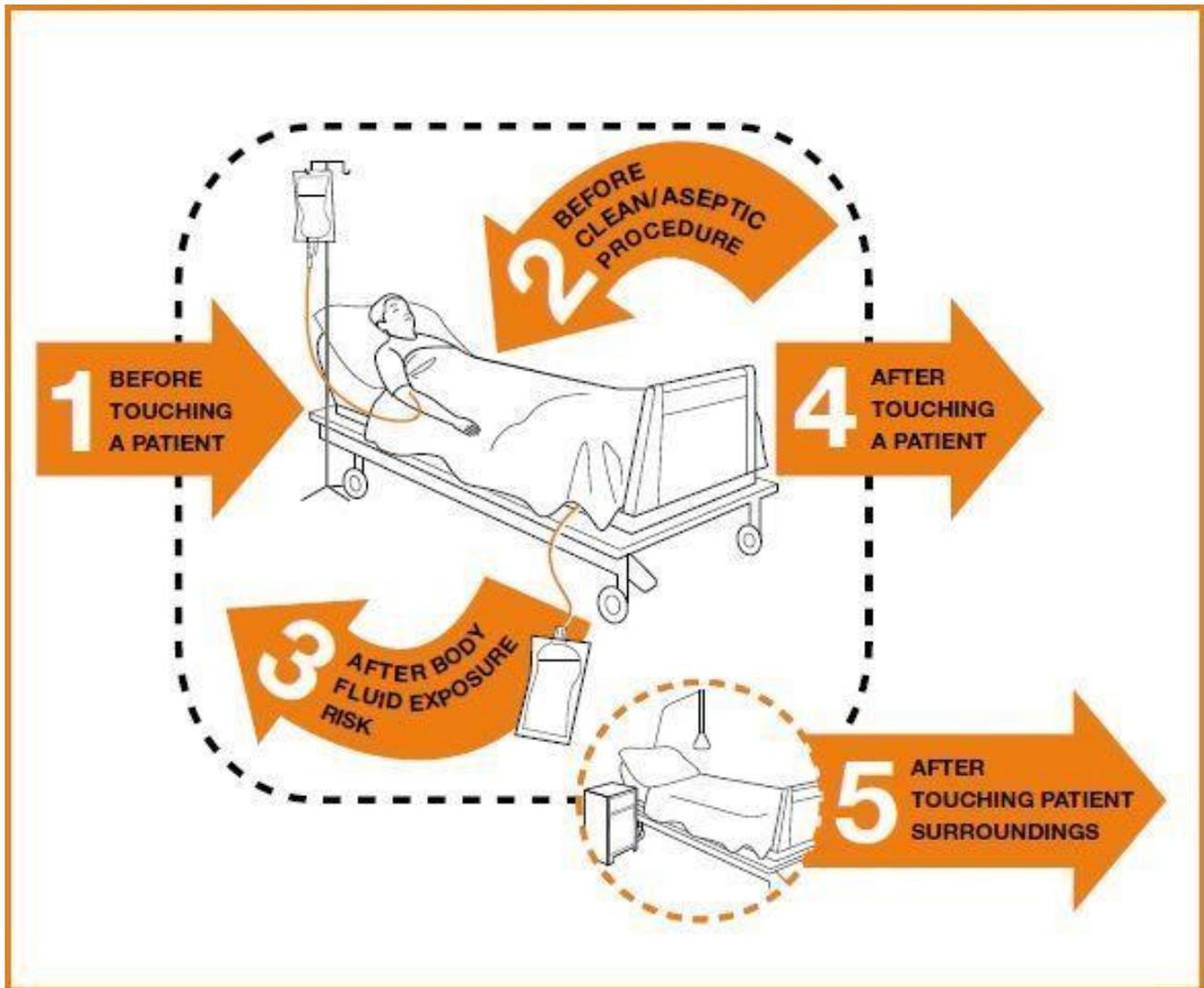
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All health staff should be bare below the elbow while on duty. Remove all bracelets, wrist watches and all rings (flat, with stones or ridges), roll up all long-sleeved clothing above the elbow. Any broken skin (cuts, dermatitis or abrasion) should be covered with a waterproof film dressing.

### **Indications for hand hygiene**

The World Health Organization has five recommended points in time when hand hygiene should be performed to prevent transmission of HAIs. These recommendations are called the “My 5 Moments for Hand Hygiene” (see Figure 3). These moments are;

1. Before touching a patient.
2. Before clean/aseptic procedure.
3. After body fluid exposure risk of exposure.
4. After touching a patient.
5. After touching patient’s surrounding areas
6. Before donning and during doffing of PPE



**Figure 3: WHO Five Moments for Hand Hygiene**

## **Types of hand hygiene**

The major types of hand hygiene are routine hand washing, alcohol-based and non-alcohol based hand rubs (or hand sanitizer), and surgical hand wash/rub.

### **Routine hand washing**

This is hand washing with plain soap and running water for at least 40-60 seconds to remove most transient germs (e.g. *E. coli*) and soil from the hands. Social hand washing shall be done:

- Before and after handling or eating food.
- After visiting the toilet.
- Before and after attending to patients in situations such as bathing and feeding.

- 
- When hands are soiled.
  - On arrival to a healthcare facility and when leaving the Healthcare facility

Liquid or bar of plain soap is acceptable. When bar soap is used, cut it into smaller pieces and keep in a rack that facilitates drainage of water.

**Note:** Avoid using hot water as repeated exposure to hot water may increase the risk of dermatitis.

### **Hygienic hand washing or hand antisepsis**

This involves the use of antiseptic detergents to wash hands for about 40-60 seconds or the use of alcohol based agents to disinfect hands. Hygienic hand washing or hand antisepsis removes transient micro-organisms, kills or inhibits the growth of resident micro-organisms. This type of hand hygiene is required;

- Before performing invasive procedures such as setting intravenous lines, lumbar puncture, and catheterisation.
- Before and after wearing sterile gloves/surgical gloves.
- After contact with blood, body secretions or following situations in which microbial contamination is likely to occur.
- Before caring for susceptible (immunocompromised) patients.

The procedure for social or hygienic hand washing is in Figure 4. Recommended agents for hand hygiene are presented in Annex 4. Antiseptic hand cleansers are designed to rapidly wash off much of the transient flora by their mechanical detergent effect and to exert an additional sustained microbiological activity on the resident hand flora.

# How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

 **Duration of the entire procedure: 40-60 seconds**



**0** Wet hands with water;



**1** Apply enough soap to cover all hand surfaces;



**2** Rub hands palm to palm;



**3** Right palm over left dorsum with interlaced fingers and vice versa;



**4** Palm to palm with fingers interlaced;



**5** Backs of fingers to opposing palms with fingers interlocked;



**6** Rotational rubbing of left thumb clasped in right palm and vice versa;



**7** Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



**8** Rinse hands with water;



**9** Dry hands thoroughly with a single use towel;



**10** Use towel to turn off faucet;



**11** Your hands are now safe.



**World Health Organization**

**Patient Safety**  
A World Alliance for Safer Health Care

**SAVE LIVES**  
Clean Your Hands

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May 2009

Figure 4: Procedure for hand washing with soap and water

When piped water is not available, use one of the following:

A bucket with a tap or other tap fitted water storage containers (Figure 5) or an overhead water storage tank.



Figure 5: Bucket with a tap system



Figure 6: A Jug of water to pour over hands with help of an assistant

**Note:** Microorganism grow and multiply in standing water. It is recommended to:

- Change water 24 hourly.
- Clean and if possible disinfect (high level disinfection) water storage containers daily.
- Avoid dipping or washing your hands in a basin that contains standing water, even if an antiseptic solution is added.
- Hand washing using plain soap and water removes microorganisms on the hands. It does not kill them.

### Alcohol-Based Hand Rub (ABHR) or hand sanitizer

Alcohol based hand rub is only one kind of antiseptic hand rub. It kills or inhibits the growth of transient and resident microorganisms but does not remove germs or soil. This method can be used when hand washing with antiseptic soap and running water is not possible or practical as long as hands are not visibly soiled with dirt, blood or other organic materials. If hands are dirty, wash with soap and running water. To reduce the build-up of emollients on hands after repeated use, it is recommended to perform social hand wash after 6-10 applications of alcohol rub (See Figure 7 below on how to apply alcohol-based hand rub).



Figure 7. Hand rub using ABHR

**Note:** Alcohol based hand rub should be used only when hands are not physically dirty or soiled.

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## Preparation of Alcohol-Based Hand rub

**Recommended formulae for making alcohol-based hand rub in health facility pharmacies.**

### Formula 1

To produce final concentrations of ethanol 80% v/v, glycerol 1.45% v/v, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) 0.125% v/v: Pour into a 1,000-mL graduated flask:

- Ethanol 96% v/v, 833.0 mL
- H<sub>2</sub>O<sub>2</sub> 3%, 41.7 mL
- Glycerol 98%, 14.5 mL

Top up the flask to 1,000 mL with distilled water or water that has been boiled and cooled; shake the flask gently to mix the contents.

### Formula 2

To produce final concentrations of isopropyl alcohol 75% v/v, glycerol 1.45 v/v, hydrogen peroxide 0.125% v/v: Pour into a 1,000-mL graduated flask:

- Isopropyl alcohol (with a purity of 99.8%), 751.5 mL
- H<sub>2</sub>O<sub>2</sub> 3%, 41.7 mL
- Glycerol 98%, 14.5 mL

Top up the flask to 1,000 mL with distilled water or water that has been boiled and cooled; shake the flask gently to mix the contents. v/v=volume percent, meaning 80 parts absolute alcohol in volume and 20 parts water measured as volume, not as weight

### In low-resource settings:

Add 2mls glycerine to 98mls 60-90% of alcohol solution to make 100mls

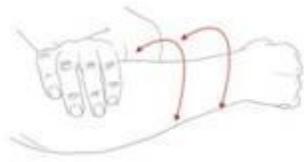
**Note:** Do not “top- up” alcohol-based dispensers as this practice may lead to bacterial contamination

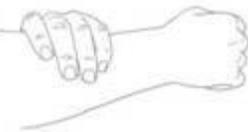
## Surgical Hand Scrub

This involves the use of antiseptic detergents to wash hands for 3-5 minutes. Hands must be washed from the fingers to the elbows. If an alcoholic preparation is used, two applications are recommended. Surgical hand washing should be done before all surgical procedures. The procedures for surgical hand wash / scrub is as follows: **(see Table 1 below)**

**Table 1 – Steps for Surgical Scrub**

Step one: Pre-scrub/pre-wash	Perform this procedure before the first scrub of day or after returning to theatre to re scrub
Remove all rings, watches, bracelets, ensure scrub suit is bare below elbow prior to wetting your hands	
Open tap and ensure that the water runs at a comfortable hand hot temperature and steady flow to avoid undue splashing	
Wash hands and arms to elbows with running water and antimicrobial solution or soap. Keep hands above elbows allowing water to drain away. Rinse hands and arms from finger tips to elbows  Use the following procedure:	
Working from your fingertips down to your elbows use the seven-step method:	
1. Rub palm to palm	
2. Rub the back of each hand with the palm of the other hand with fingers interlaced	
3. Rub palm to palm with fingers interlaced	
4. Rub with backs of fingers to opposing palms with fingers interlaced	

<p>5. Rub each thumb clasped in opposite hand using rotational movement</p>	
<p>6. Rub tips of finger in opposite palm in a circular motion</p>	
<p>7. Using a rotational movement rub from the wrist to the elbow of each arm, rinse from fingertips to elbow. Once the elbow has been reached the hand must not go back to the other hand or wrist until after rinsing</p>	
<p>8. Remove debris from under nails using a nail pick, under running water</p>	
<p>Wash for 1 minute</p>	
<p>Step two: Scrub Procedure (3 minutes)</p>	
<p>Wet your hands and forearms and apply approximately 5mls of antimicrobial solution (approximately 3 applications) to your hands</p>	
<p>Working from your fingertips down to just below your elbows use the seven-step method:</p> <ol style="list-style-type: none"> <li>1. Rub palm to palm</li> <li>2. Rub the back of each hand with the palm of the other hand with fingers interlaced</li> <li>3. Rub palm to palm with fingers interlaced</li> <li>4. Rub with backs of fingers to opposing palms with fingers interlaced</li> <li>5. Rub each thumb clasped in opposite hand using rotational movement</li> <li>6. Rub tips of finger in opposite palm in a circular motion</li> <li>7. Using a rotational movement rub from the wrist to the elbow of each arm, rinse from fingertips to elbow. Once the elbow has been reached the hand must not go back to the other hand or wrist</li> </ol>	<p>See Above steps 1-7</p>

until after rinsing	
Wash for 1 minute	
Rinse your hands and arms from the fingertips to the elbows - allowing the water flow to remove the scrub solution	
Apply another 5mls of solution; wash your hands and arms using the seven step method as above, paying particular attention to palms, finger webs and dorsum of the hands. Only wash the first two thirds of the forearms and do not touch the elbows to avoid contamination	
Wash for a further 1 minute	
Rinse your hands and arms from the fingertips to the elbows - allowing the water flow to remove the scrub solution	
Turn the taps off using your elbows	
Allow excess water to drain from your elbows into the sink	

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## Hand hygiene considerations

- Intact skin is a major defence from infection. Hand hygiene and gloving can irritate skin.
- Hand hygiene cannot reduce the bacterial counts of personnel with dermatitis.
- Health care providers with dermatitis carry high numbers of micro-organisms and may be at increased risk of exposure to blood borne pathogens.
- Workers with chapped or abraded skin must contact their supervisor before initiating work with potentially infectious materials.
- Lotions can ease the dryness resulting from frequent hand-washing. It can also help prevent dermatitis from frequent glove use.
- Staff responsible for processing instruments who have open sores or cuts on their hands or forearms should not clean instruments until the lesions are healed or should apply water-proof adhesive and wear double gloves.
- Do not use hand rub after hand washing as it increases chances of irritation.

## Improving compliance to hand hygiene

Management involvement and commitment to hand hygiene improves compliance. This includes:

- Demonstration of appropriate hand hygiene behaviour by respected individuals (role models) and encouragement of other staff to do same.
- Inadequate supply of water, soap or antiseptics can play a major role in non-compliance to hand hygiene guidelines.

It is therefore important for:

- Supervisors and managers to make water, soap and antiseptics available at all times.
- Supervisors and managers to support and model good hand washing behaviour.
- Health facilities to provide educational activities and aids to make sure all staff are aware of the importance of good hand hygiene practices.
- Management to provide posters or signs listing the steps and times for hand hygiene to be displayed at strategic points (rest rooms, eating areas, toilets) to help staff become aware of appropriate hand washing practices.
- Regularly monitor adherence to hand hygiene guidelines.
- IPC focal persons should use monitoring tools such as the WHO hand hygiene self-assessment framework and the hand hygiene observation forms.
- Results of monitoring should be disseminated to all relevant stakeholders.

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## Hand hygiene for patients and family members

Patients, family members and visitors should be educated on when and how to perform hand hygiene. Hand hygiene facilities for both social hand washing and alcohol-based hand rub should be made available in all wards/units to facilitate hand hygiene behaviour.

### 4.2 Personal Protective Equipment

Personal Protective Equipment (PPE) or (barrier protection items) are used to prevent blood, body fluids and other potentially infectious materials from coming into direct contact with clothing and the body of HCWs, patients, relatives and the community.

There are different types of personal protective equipment/clothing and the use of each type depends on the task to be performed and the anticipated exposure. They include: Gloves, Gowns, Rubber apron, Face and eye protection (Masks, face shields and goggles), Coats, coveralls, Headgears, Helmets and Leg protections (e.g. boots, closed/covered shoes). Staff uniform is also part of PPE, members of staff should wear home cloths from home and change on arrival and departure from the health facility. Scrub suits should only be worn in designated areas such as operating theatre and labour ward. All members of staff must wear covered/closed shoes.

Personal protective Equipment are expensive and should therefore be used rationally. This will prevent unnecessary expenditure by government, reduce the amount of waste generated by single use PPE and reduce Healthcare workers chances of exposure to infectious micro-organisms during doffing of such irrationally used PPE.

#### Gloves

Gloves protect clients, staff and the community by acting as a barrier against infectious microorganisms. Staff must always select the appropriate gloves and size for the right procedure. The most common types of gloves are :

- Sterile or Surgical gloves
- Single-use examination gloves
- Utility, sometimes called domestic gloves
  
- Heavy duty gloves

#### Sterile Surgical gloves

These are sterile and should always be used for procedures that involve contact with sterile areas of the body. There are two main types: wrist and elbow level gloves. While the wrist level gloves could be used for most sterile procedures; Elbow-length (gauntlet) gloves should be used when the hand and forearm are likely to contact with blood and other body fluids.

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## Single-use examination gloves

These are non-sterile disposable gloves and should be used for procedures involving contact with intact mucous membranes (unless otherwise indicated) and for other patient care procedures that do not require the use of sterile gloves.

## Utility gloves

Utility gloves are sometimes called domestic or household gloves. They are used during activities such as instrument processing. Utility gloves are also used for catering services or kitchen activities. Utility gloves are reusable.

## Heavy-duty gloves

These shall be used when handling contaminated items and when performing non-surgical activities such as housekeeping, waste and linen management. Heavy duty gloves are reusable. Avoid dipping heavy duty gloves in Chlorine solutions after use as this reduces their life span.

**Table 2: Types of gloves and the Procedure for use.**

Task or Activity	Gloves Needed	Examination Gloves	Sterile Gloves	Utility gloves
Giving an IM injection	No	No	No	No
Giving oral medications	No	No	No	No
Pelvic examination	Yes	Yes	No	No
Contact with vaginal secretions	Yes	Yes	No	No
IUD insertion	Yes	Yes	No	No
Norplant insertion and removal	Yes	Acceptable	Preferable	No
Surgery	Yes	No	Yes	No
Emergency childbirth	Yes	Acceptable	Preferable	No
Blood drawing/ IV Infusion	Yes	Yes	No	No
Oral/nasal suctioning, manually cleaning airway	Yes	Yes	No	No
Handling and cleaning instruments with microbial contamination	Yes	No	No	Yes

Handling contaminated waste	Yes	No	No	Yes
Cleaning blood or body fluid spills	Yes	No	No	Yes
Dressing of wounds (extensive wounds)	Yes	Yes	Preferable	No
Performing lumbar puncture	Yes	No	Yes	No
Changing soiled linen	Yes	No	No	Yes
Changing colostomy bag	Yes	Yes	No	No
Urethral catheterization	Yes	No	Yes	No

### **Guidelines for using all types of gloves**

The following are guidelines for using all types of gloves:

- Gloves should be worn as an additional measure, not as substitute for hand hygiene.
- Gloves are not required for routine care activities in which contact is limited to a patient's intact skin.
- Wash hands before wearing gloves.
- Wear gloves on both hands before touching blood and body fluids, mucous membranes, or non-intact skin of all patients.
- Do not use gloves if they are expired, peeling, cracked or discoloured, or if they have punctures, tears, or other forms of deterioration.
- Remove gloves, wash hands immediately when you come into direct contact with a patient's blood or other body fluids, even if the procedure is not completed. Then, put on a new pair of gloves and continue the procedure.
- Change gloves and wash hands in between patients
- Never reuse disposable and sterile surgical gloves
- Remove gloves before leaving the examination/patient's room, dirty utility areas or other work areas
- Dispose used gloves in appropriately designed disposal containers.
- Clean all utility gloves with soap and water before taking them off and do not immerse them into chlorine solution
- Wash hands after removing any type of glove.

### **Examination gloves**

- Perform hand hygiene
- Slip the gloves onto the dominant hand first and then the other.

**Note: keep an extra pair of glove ready in case the original pair tears or becomes soiled**

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## **Sterile /Surgical gloves**

- Remove all jewellery on the hands, including rings.
- Wash hands thoroughly with an antiseptic and dry them with a sterile material.
- Open the package containing the sterile gloves and drop them into the sterile field or request an assistant to open the sterile pack of gloves.
- Carefully open the inner wrapper, maintaining aseptic technique, being careful not to contaminate the gloves by touching them.
- Grasp the folded edge (inside surface) of the dominant glove's cuff with the other hands and slip the dominant hand inside the glove.
- To avoid contamination, the fingers of the other hand should only touch the inside of the glove. If the glove becomes contaminated discard it and use a new one.
- Slip the fingers of the gloved hand under the cuff of the second glove (touching only the outer surfaces) of the glove. Insert the other hand into the glove and pull the glove on the dominant hand. Avoid touching the skin with the gloved hand. Keep the thumb up and back.
- Adjust the gloves so that they fit properly.
- Inspect the gloves for tears before and during the procedure.

## **Procedure for removal of surgical gloves**

Do not allow the outside surface of the gloves to come in contact with your skin and do not let the gloves snap, as this may cause contaminants to splash into eyes, mouth, skin or other areas. Remove used gloves before touching anything.

- Pull one glove near your wrist towards your fingertips until the glove folds' over
- Carefully grab the fold and pull towards your fingertips. As you pull you are turning the inside of the glove outwards.
- Pull the fold until the glove is almost off.
- To avoid contamination of your environment, continue to hold the removed glove. Completely remove your hand from the glove.
- Slide your finger from your glove free hand under the remaining glove. Continue to slide your finger towards your fingertips until almost half of your finger is under the glove. (see figure 9 below)

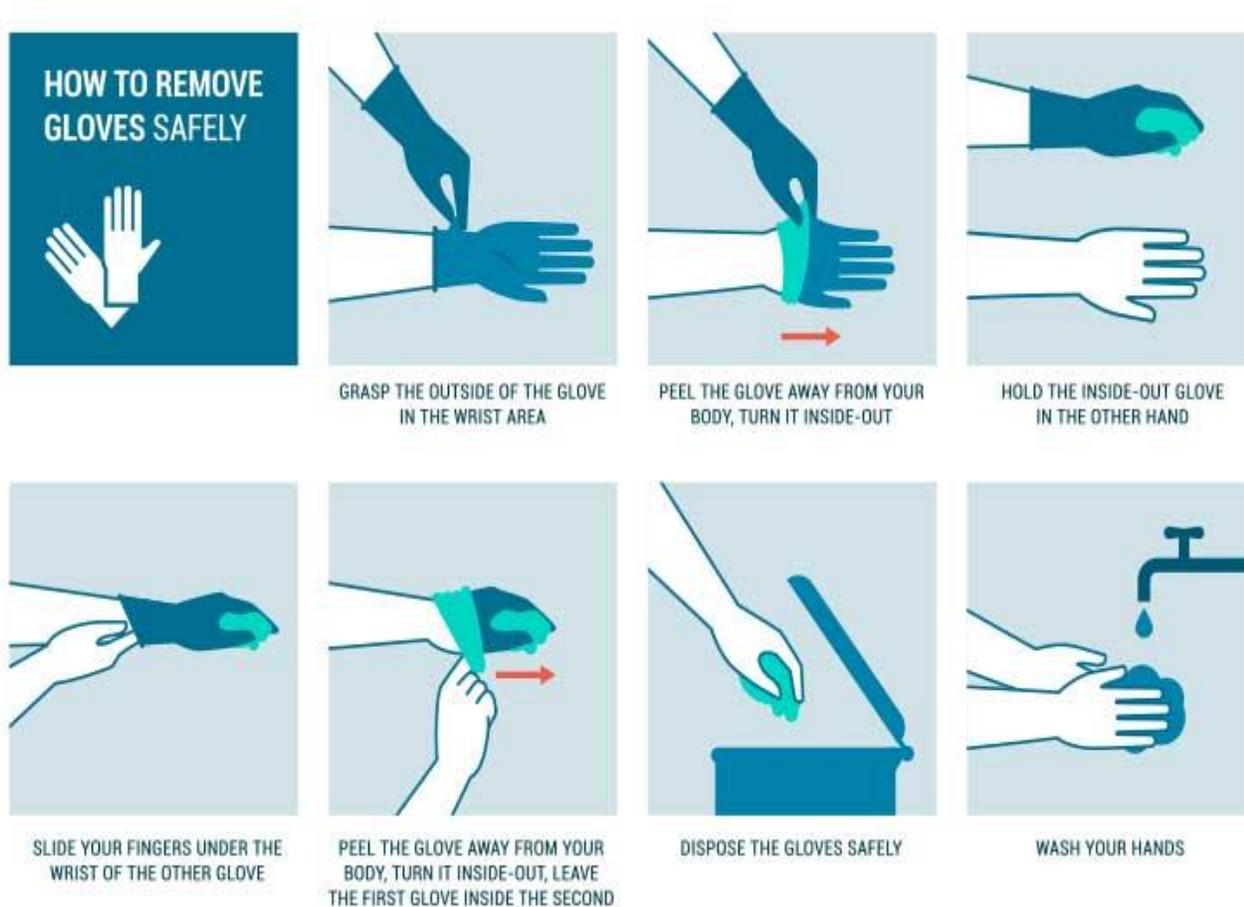


Figure 8 – doffing/taking off gloves

### Double gloving

Although double gloving cannot prevent needle sticks, it may lower the risk of blood-hand contact and could be applied in the following situations:

- Procedures that involve contact with large amounts of blood or other body fluids (e.g., vaginal deliveries and caesarean sections).
- Procedures where sharp bone fragments, wire sutures, and other sharps are likely to be encountered e.g. orthopaedic, dental.
- Procedures that include the risk of developing severe/potentially fatal disease (e.g., Ebola Virus Disease [EVD] and other haemorrhagic fevers) following the smallest amount of exposure to contaminated blood and body fluid.

### Note:

- **DO NOT** wear gloves away from point of use ie bedside or laboratory bench
- **DO NOT** handle phone, clean equipment or patient care supplies; in hallways or elevators with gloved hands.

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- Gloves **DO NOT** replace the need for **HAND HYGIENE**.
  - Gloves **DO NOT** provide protection from needle sticks or other puncture wounds caused by sharp objects. Use extreme caution when handling needles, scalpels etc.
  - **DO NOT** wash or disinfect gloves for reuse except **UTILITY/ HEAVY DUTY GLOVES**
  - **DO NOT** use gloves when giving **ORAL MEDICATIONS**

## Gowns

Gowns are recommended to prevent soiling of clothing when taking care of patients and to prevent transmission of infection from clothing and body. The following are guidelines;

- Gowns and aprons should be worn when splashes to the skin or clothing with body fluids are likely to occur.
- Gowns, including surgical gowns, should be made of / or lined with impermeable material to protect all areas of exposed skin.
- The gowns should be large enough to cover the entire clothing of personnel and protect all areas of exposed skin.
- All management of healthcare facilities should ensure adequate supply of gowns.

## Steps for wearing gowns

- Perform hand hygiene
- Hold the gown so that the back is facing the front of the body
- Slip arms one at a time into the sleeves.
- Fasten the neck tab located at the back of the gown to close the top of the gown.
- Extend the ties found at the waist and tie them in the back of the gown, taking care to overlap the edges to protect clothing.
- During surgical procedures, an assistant should help in putting on the gowns.
- If both a gown and gloves are worn, the gown should be put on first.

## Removing the gown

- Untie the waist ties and then unfasten the neck tab.
- Remove the gown using a peeling motion; gently pull the gown from one shoulder towards the same hand, and then from the other shoulder towards that hand. The gown will turn inside out during the process.
- Hold the removed gown away from body and roll into a ball in a motion directed away from the body.
- Discard single use gowns into a waste bin and put reusable gowns into a covered container.
- Wash hands after removal of gown and other personal protective barrier equipment.

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## **Plastic aprons**

Aprons prevent contact with infectious body fluids that may soak through clothes. These should be worn over outer garments. Aprons should have:

- Hooks or ties that fasten around the neck.
- Have ties at the waist that reach around and tie at the back.
- Be long enough to cover the top of the boots and provide additional protection from spills running inside the boots.

## **Wearing apron**

- Perform hand hygiene.
- Wear apron over the outer garment and tie around the waist at the back.

## **Removing apron**

- Perform hand hygiene.
- Remove the apron touching only the inside of the apron.
- Remove, folding the outside part in.
- Dispose use single aprons into appropriately waste bin
- Clean and hang reusable aprons
- Wash hands

## **Face and eye protection**

Face shields or goggles are designed to protect the eyes and the face from anticipated with blood and other body fluid splashes. They must be worn whenever there is likelihood of splashes, spray, splatter or droplets of blood or other potentially infectious material getting into the eyes, nose, mouth or other facial areas. Use safety glasses or normal glasses with shields or goggles for eye protection.

## **Goggles**

- These should be made of clear polycarbonate plastic with side and forehead shields. These should be optically clear, antifogging and distortion-free.
- Disposable goggles are preferred but reusable ones can be used after proper re-processing.

## **To put on goggles**

- Perform hand hygiene
- Position goggles over eyes and secure to the head using the ear pieces or headband and adjust to fit.
- Eye protection should be worn by securing it over the bridge of the nose and also over the mask.

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**To put on a face shield**

- Perform hand hygiene
- Position face shield over face and secure on brow with headband
- Adjust to fit comfortably

**To remove face shield**

- Perform hand hygiene
- Grasp strap from behind the head or head pieces with ungloved hands
- Lift away from face
- Place in designated receptacle for disinfecting or disposal

**Surgical Masks and particulate respirators**

Surgical masks protect the mucous membranes of the mouth and nose. These generally provide protection against droplets, splashes and sprays. Masks must cover both the nose and the mouth, and fit the face closely, so that air passes through the mask before being inhaled. Note that face masks have large pores and lack air tight seal around edges. Try not to touch the mask once it is secured on your face as frequent handling may reduce its protection. If you must do so, wash your hands before and after touching the mask.

**Putting on a surgical mask with strings**

- Perform hand hygiene
- Position the mask to cover both nose and mouth
- The coloured side of the mask faces outwards, with the metallic strip uppermost
- Tie the two (2) top strings first firmly at the crown of the head.
- Tie the two (2) bottom strings at the back of the neck.
- Mould the flexible metal tab above the bridge of the nose to help secure the mask.
- The mask should conform to the shape of the face to minimize venting at the sides.

**Putting on surgical mask with elastic bands**

- Perform hand hygiene
- When using the mask with elastic bands, position the mask to cover both the nose and mouth with the bands looped behind each ear.
- Mould the flexible metal tab as described above.
- Once in position, handling of the mask and talking should be minimized.
- Replace the mask immediately if it is damaged or soiled.

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### **Steps in removing a surgical mask with strings**

- Perform hand hygiene
- Untie the bottom strings.
- Untie the top strings, being careful not to let go of the mask with both hands.
- Hold mask by the strings, taking care not to touch the outside of the mask with hands and discard into a waste receptacle for that purpose.
- Used mask must not be crushed or squeezed before discarding into a waste receptacle.
- Perform hand hygiene

### **Steps in removing surgical mask with elastic band**

- Perform hand hygiene
- Masks with elastic bands should be removed by unlooping the bands from behind each ear, being careful not to drop the mask.
- After taking off the mask, fold the it outwards (i.e. the outside of the mask facing inwards) and put it into rubbish bin with a lid.
- Perform hand hygiene
- A surgical mask should be discarded after use and under no circumstances should it be used for longer than a day.

### **Particulate respirators**

Respirators have tiny pores which block droplet nuclei and rely on an air tight seal around the entire edge. Respirators can protect health care workers from inhaling microbes such as Mycobacterium tuberculosis only if standard IPC work practices and environmental controls are in place.

It must also be noted that respirators are expensive and require specialized equipment to determine proper fit. Their use should therefore be restricted to specific high risk areas in health care facilities such as rooms where spirometry or bronchoscopy are performed or specialized treatment centres for persons with multi drug resistant (MDR) or extensively drug resistant (XDR) TB.

The sequence of wearing an N95/FFP2 particulate respirators and doing the seal check

- Perform hand hygiene
- Cup the respirator in your hand with the nose piece at your fingertips allowing the headbands to hang freely
- Position the respirator under your chin with the nose piece covering the entire nose. Pull the top strap over your head resting it high at the back of your head or the crown.
- Pull the bottom strap over your head and position it around the neck below the ears

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- Using two fingertips of each side of the nose piece, mould the nose piece to fit the shape of your nose. Pinching the nosepiece using one hand may result in less effective respirator performance
  - Cover the front of the respirator with both hands, being careful not to disturb the position of the respirator

### **To check for positive seal**

- Hold the respirator with both hands making sure that its position is not disturbed
- Exhale sharply. A positive pressure inside the respirator signifies no leakage.
- If leakage, adjust position and/or tension straps.
- Retest the seal by repeating the steps until respirator is sealed properly

### **To check for negative seal**

- Inhale deeply. If no leakage, negative pressure will make respirator cling to your face.
- Leakage will result in loss of negative pressure in the respirator due to air entering

### **Coats**

Coats can be used to protect street clothing against biological or chemical spills as well as for body protection. The specific hazard(s) and the degree of protection required must be assessed before selecting coats.

### **Coverall**

The coverall is a protective clothing used in the management of highly infectious cases. It can also be used in confined areas where hazards have not been fully characterized. Coveralls are full-body suits made from materials that are lightweight, breathable, and impermeable to liquids. It must be worn by trained personnel whenever a potential risk is anticipated. They are designed to go over a scrub suit and create a barrier to eliminate or reduce contact exposure to blood, body fluids, and highly infectious microorganisms.

### **Head gear**

Head gear or covers are intended to protect hair from contamination and to prevent the hair and other particles in the hair from falling onto sterile environment.

- Disposable caps or scarves or hood should be used where indicated (e.g. in operating theatres, reverse isolation, etc.).
- If disposable ones are not available, well-fitting cotton caps and scarves should be used. These should be laundered daily at high temperatures or sterilised.

### **Leg protections**

Staff must wear leg protections whenever there is the potential of the legs coming into contact with blood, body fluids or other contaminated materials e.g. during surgical operations, delivery and in the isolation wards. Examples of leg protections are gumboots, disposable shoes, surgical clogs

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## **Gumboots**

Gumboots are intended to protect the feet and legs from contamination and injury.

- The recommended rubber boots are those that have textured soles and easy to clean
- Staff must be assigned individual pairs of boots.
- Make sure that the personnel use the correct size.
- Gumboots must be cleaned and dried after use.
- Should be stored in covered shelves between each use.
- Gumboots for the operating theater should be white in colour this makes it easy to notice stains from blood and other body fluids

**Note – Use of overshoes is discouraged**

### **4.3 Patient Placement**

Place patients who pose a risk for transmission of infections to others (e.g. patients with uncontained secretions, excretions or wound drainage; infants with suspected viral respiratory or gastrointestinal infections) in a single-patient room when available. If single-patient rooms are not available, patients with similar diseases must be placed in the same room. Determine patient placement based on the following principles:

- Route(s) of transmission of the known or suspected infectious agent.
- Risk factors for transmission in the infected patient.
- Patient options for room-sharing (e.g. cohorting patients with the same infection).

The standard for bed occupancy is one patient per bed with adequate spacing (1 meter) between patients.

### **4.6 Transporting Patients with Infectious Diseases**

The following should be observed when transporting patients with infectious diseases:

- Patients infected with virulent or epidemiologically important micro-organisms should leave their room only for essential purposes.
- When transporting the patient, the appropriate precautionary procedures related to their specific infection should be adhered to. e.g. In infectious respiratory diseases like SARS, Coronavirus and MDR-TB surgical masks should be used to cover the mouths and noses of patients.
- Staff transporting the patient in a single chamber ambulance should wear the appropriate PPE.
- The department or institution receiving the patient should be notified.

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## Vehicles and patient transportation

Vehicles used to transport patients to and from health care settings are possible sources of infection. These may become contaminated during transportation of patients. The following measures should be used to disinfect these vehicles after transporting patients:

- Use appropriate PPE and cleaning method and agent to clean the vehicle.
- Disinfectant cleaning solution should be used and rinsed off with clean water.
- Air dry after cleaning.

## 4.5 Injection Safety

Injection safety is an important component of standard precaution. The concept of “standard precautions”, with mandatory safe practices, must be routinely applied in all health-care settings, and every person in such settings should be considered a potential source of infection. The global burden of disease estimated that 40% injections given worldwide were unsafe (Gokhale et al, 2017).

Unnecessary and unsafe injection practices are common especially in low- and middle- income countries and have been associated with the transmission not only of blood borne viruses (HIV, hepatitis B, and C), but also viral hemorrhagic fevers (Ebola and Marburg viruses) and other infections including bacterial infections and abscesses at the injection site.

The spread of infection can be prevented by following proper IPC practices and maintain aseptic technique during the preparation and administration of injectable medications.

Healthcare facilities should provide practical training and education on injection safety and prevention of misuse of vials to all staff.

### Safe injection practices

- Avoid giving unnecessary injections to patients.
- Always use sterile needle and syringes— never reuse or decontaminate needle or syringes.
- Do not administer medications from a single syringe to multiple patients, even if the needle or cannula on the syringe is changed.
- Never enter any vial with a used syringe or needle.
- Use single- use disposable safety engineered syringes (auto destruct syringes).
- Apply 60 – 70% alcohol- based solution (isopropyl alcohol or ethanol) on the skin for 30 seconds on a single use swab or cotton ball and allow it dry.
- Do not use cotton balls stored wet in a multi- use container.
- Do not use methanol or methyl alcohol as these are not safe for human use.

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## Single and multi- dose vials and IV solutions

- Use single- dose vials for IV medications whenever possible.
- Do not administer medications from single- dose vials or ampoules to multiple patients or combine leftover contents for later use.
- Do not use medications packaged as single- dose or single- use for more than one patient.
- Do not use infusion bags or bottles of intravenous fluids as a common source of supply for multiple patients.
- Limit the use of multi- dose vials and dedicate them to a single patient and label with patient's name.
- If multi- dose vials are used, they should only be kept and accessed in a dedicated medication preparation area.
- Do not keep multi- dose vials in the immediate patient treatment area and store in accordance with the manufacturer's recommendations.
- Discard according to manufacturers' recommendation or if sterility is compromised or questionable.
- Never leave needles in vial entry diaphragms between uses, as this may contaminate the vial's contents.
- Do not cover with other objects (e.g. sticky tape) to avoid contamination.
- Once a multiple- dose vial is punctured or opened refer to the manufacturer's recommendation regarding duration of use.
- Always use a new sterile needle and a new syringe to access the multi- dose vial.
- Disinfect the vial's rubber septum before piercing by wiping and using friction with a sterile 60-70 % isopropyl alcohol or other approved antiseptic swab and allow the septum to dry before inserting a needle or other device into the vial.

## Double- dipping

Double dipping is using the same syringe to inject more than one patient from a multi- dose vial. This is a dangerous and unsafe practice in which after a syringe is used to draw medication from a multi- dose vial and inject that medication into a patient, the same syringe is then reused, with or without a new needle, to draw more medication from the vial.

When the same syringe is used to enter the vial, even for the same patient the entire multi- dose vial is contaminated. When that contaminated vial is used for the next patient(s), even if new syringes and new needles are used, infections can be transmitted. **Double dipping should never be practiced.**

## Preparation of injections

- Avoid contamination of sterile injection equipment by using aseptic non-touch technique.

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- Use fluid infusion administration sets (IV bags, tubing, and connectors) for *one patient only* and disposes appropriately after use.
  - Consider a syringe or needle/ cannula contaminated once it has been used to enter or connect to a patient's IV infusion bag or administration set.
  - The injection preparation area or room must be a dedicated clean area. It is essential that this area must not be contaminated with blood or body fluids.
  - Any contaminated items, including blood samples must not be brought to this room or area.
  - This clean area/ room should be used to draw up injections,
  - Needles, syringes etc. must be discarded into a sharp container in a dedicated dirty area

### **When giving injections**

- Always follow the '5 Rs' of drug administration
- Unexpected client motion at the time of injection can lead to accidental needle sticks.
- Many needle-sticks injury occur when children or adults move unexpectedly.
- Always prepare clients/patients when you are about to give them an injection.
- Restrain children gently and securely in the lap of an adult with arms and legs held
- Assess the mental condition of bed-ridden patients and ask a co-worker to help restrain adult patients who may be confused
- **Do not give already prepared injections to guardians to keep.**

### **Recapping: The "One-Hand" Technique**

- Recapping is a dangerous practice. Sharps injuries contribute to about 2.5% of HIV among health care workers and 30% of new cases of HBV among health care workers annually.
- Many accidental needle sticks occur when health workers are recapping needles using both hands.
- Dispose of needles immediately without recapping them
- Do not bend or break the needle and do not remove a hypodermic needle from the syringe by hand.

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## 4.6 Health Care Waste Management

Healthcare waste is defined as waste generated in health care institutions, e.g. waste generated during investigation or treatment of patients or in research studies. Terms such as 'hospital waste', 'clinical waste', 'infectious waste', 'medical waste', 'biomedical waste', and 'biohazard waste' have been used synonymously, and often inappropriately used in many situations.

Healthcare waste carries a higher risk of infection and injury than any type of waste. The greater part of waste generated by health institutions (75% - 90% of all waste) is not hazardous and can be managed like household waste. The remaining 10-25% is hazardous and requires special arrangement from the management of the facility.

Health care waste includes all solid and liquid waste (both hazardous and non-hazardous). Management of clinical and related waste should conform to the health care waste management policy of the Ministry of Health. All staffs have a responsibility to manage waste in a manner that poses minimal hazard to patients / clients, visitors, staff and community.

### Importance of proper waste management

- Minimizes the spread of infections
- Reduces the risk of accidental injuries.
- It helps to avoid scavenging
- It helps to provide a pleasing atmosphere and reduces unpleasant odour.
- It prevents the attraction of insects, flies and other animals to the facility
- Reduces the likelihood of contamination of the soil or ground water with chemicals or microorganisms.

### Classification of Healthcare Waste

**General or normal waste:** This is similar to domestic waste. It is not harmful. Examples are waste from the hospital kitchen/canteen, sweepings from offices i.e. paper, cardboard, plastics, etc. and this accounts for 75 to 90 % of all Healthcare waste.

**Infectious Waste:** Waste generated by inpatient and outpatient activities that are likely to contain harmful organisms. Examples of infectious waste are blood, body fluids, and laboratory waste while highly infectious waste is blood and body fluids from patients with viral haemorrhagic fevers (Ebola, Lassa fever and Marburg)

**Sharps:** These are sharp-edged waste with puncturing and / or cutting properties. Examples are needles, blades, broken vials. They may be infectious when contaminated with blood or body fluids. They are also likely to cause injuries.

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**Pathological Waste:** This type of waste includes body parts, placenta, tissues from surgery, birth, etc. They are potentially infectious.

**Genotoxic waste:** waste containing substances with genotoxic properties e.g. waste containing cytotoxic drugs, genotoxic chemicals.

**Pharmaceutical waste:** These are chemical wastes that are normally generated in the provision of pharmaceutical services. Examples are expired drugs and vaccines and left over drugs.

- **Electronic Waste:** e.g. X-ray machines, Films, Computers, Ultra-Sound Scans etc.
- **Radioactive Waste:** e.g. Radionuclides, medium, broken mercury glass thermometers etc.

The ultimate responsibility for ensuring that waste is properly managed lies with the person or institution that generates the waste. Health care institutions are therefore responsible for the waste that is generated by their activities and are required to take practical steps to ensure their separation, storage, treatment and safe disposal.

## **Components of Health Care Waste management**

A healthcare waste management system comprises of the following components: Minimization, Segregation, Collection, Transportation, Storage, Treatment and Final disposal.

### **Waste generation and minimisation.**

Waste minimization is a process that involves reducing the overall amount of waste generated. The most preferred method for waste minimization is avoiding unnecessary waste production. Other mechanisms include

- Purchasing of environmentally friendly products and packaging and/or purchasing supplies with minimal packaging.
- Recycling and using reusable medical devices, where feasible.
- Effective management of stock: first in, first out (FIFO).

### **Segregation and Collection**

Different types of waste require different methods of disposal. It is therefore important that healthcare waste is segregated into various categories for effective disposal. Segregation should be at the source of generation. Example, each type of waste must be placed immediately in its appropriate colour-coded container.

**Table 3: Waste bins colour codes**

Category	Container and Colour code
General Waste/Non-Infectious waste	Black plastic bags and bins
Sharps	Yellow puncture resistant containers
Other Infectious Waste	Yellow plastic bags and bins
Pharmaceutical and chemical containers	Brown plastic bags and bins
Highly Infectious waste	Red biohazard plastic bags and bins

**Waste Segregation**

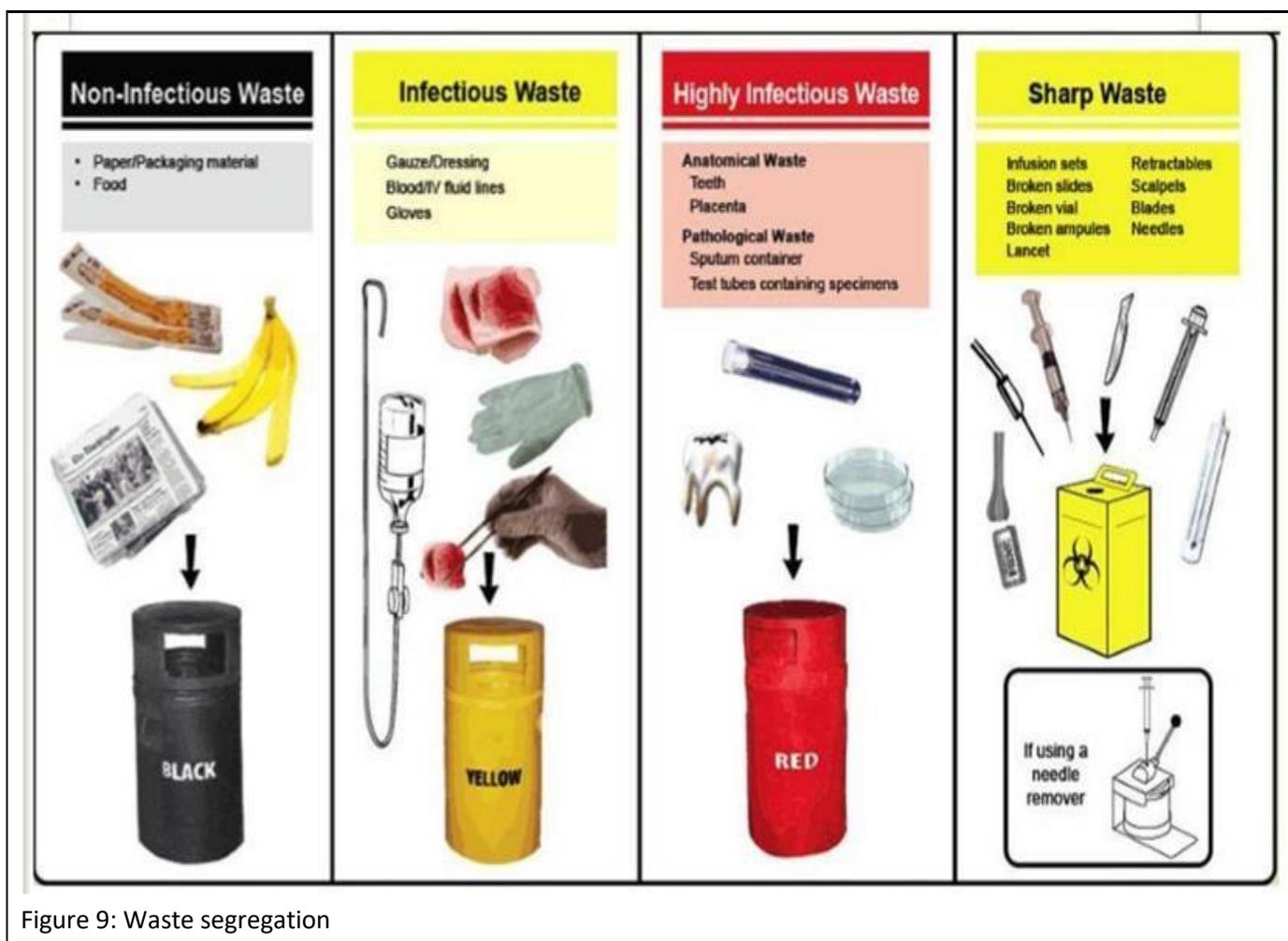


Figure 9: Waste segregation

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## General Requirements for waste containers

Containers for collecting waste should meet the following requirements:

- Non-transparent, impervious and leak proof.
- They should have close fitted lids.
- They should have sufficient strength to prevent easy damage during handling or use.
- Use bin liners of same colour codes

## Waste Storage

Storage takes place from the time of generation of waste until collection for final disposal. There are two types of waste storage internal and external.

**Internal waste storage:** This is temporary placement of waste at the point of generation (e.g. consulting room and injection room) before being sent to external storage sites.

The following should apply to internal waste storage:

- Do not store healthcare waste at the temporary sites for more than 24 hours.
- Store waste at areas where access is far from patients and staff.
- Empty waste bins /containers daily or when two thirds or 3/4 full (whichever comes first).
- Every unit or ward in the health care facility should be provided with adequate numbers of appropriate waste bins.
- Once you drop waste in the container, do not put your hands to remove anything from the container.
- Waste bins should be covered and placed in areas protected from rain, pests, etc.
- Clean and disinfect waste containers after emptying.

## External waste storage

This refers to the site where waste is stored after removal from internal storage area until it is collected for final disposal. Guidelines for external waste storage are as follows;

- External storage areas for health care waste should be sited away from the reach of the general public.
- The storage site should be enclosed and provided with gate and locked.
- The floor should be smooth, impervious and easy to clean.
- Do not allow access to the storage sites by unauthorized human beings and animals.
- Waste bins should be washed and disinfected after each collection and more frequently if required.

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- Positioning of the waste management sites should follow wind direction to mitigate air pollution to the area/sites

## **Transportation of Waste**

Healthcare waste must be transported directly to disposal or treatment site within the shortest possible time. Vehicles (e.g. wheelbarrow, colour coded otto bins) used for transportation (internally or externally) should be such as to prevent scattering, odour and be leak-proof.

Waste route should be separate from staff, patients, visitor's areas. In situations of infrastructure challenges, waste should be transported during quiet hours to avoid exposing staff, patients, clients and visitors from exposure to healthcare waste

## **Disposal of solid waste**

Proper treatment and disposal of healthcare waste is necessary to ensure that its impact on health workers, waste collectors, public and the environment is minimized or eliminated. The best disposal methods for treated health care waste are controlled disposal at proper sanitary landfill and burial. General waste should be treated as domestic waste and disposed of at landfill sites. Sharps, pharmaceutical as well as pathological waste must be incinerated.

## **Methods of Final Disposal of Waste**

### **Incineration**

Incineration is the controlled burning of solid, wastes to produce gases and residues that contain little or no burnable material. Incineration provides high temperatures and destroys microorganisms. It also reduces the volume of waste to be buried and is the best method for disposing of contaminated wastes. Waste should be weighed before final treatment. Do not overload the incinerator.

Simple incinerators can be built from locally available materials—bricks, concrete blocks, or used fuel or oil drums. Such an incinerator is useful only for small, usually rural, health care facilities that do not have large quantities of medical waste. If the health care facility is large, it is more efficient to build or install an incinerator large enough to accommodate all of the facility's waste-disposal needs.

To build a drum incinerator:

- Choose a place that is downwind from the clinic to prevent smoke and odours from coming into the health care facility and the neighbouring communities.
- Make sure there are sufficient air inlets on the sides of the oil drum and bottom of the fire bed.
- Place the incinerator on hardened earth or on a concrete base.

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For efficient burning, follow these practices:

- Burn only medical waste.
- Treat the ash as general waste.
- Use a regular community disposal site for general waste. This will conserve both time and resources.
- Medical waste might not burn easily, especially if it is wet. Add kerosene to make the fire hot enough to burn all waste. Be sure to add the kerosene before starting the fire.
- Bury or otherwise dispose of the ash in a designated area.

The following waste should not be incinerated:

- Pressurized gas containers (aerosol cans)
- Large amounts of reactive chemical waste
- Silver salts and photographic or radiographic wastes
- Plastic containing polyvinyl chloride (blood bags, IV sets, or disposable syringes)
- Waste containing high mercury or cadmium content, for example, broken thermometers, used batteries, and lead-lined wooden panels

## **Burning of waste**

Burning can be used for combustible, non-infectious waste such as paper. This should be carried out in a simple pit and not in the open. Disposing of waste in open sites should be avoided, because it is an infection risks, produces a foul odour, which attracts insects, and is unsightly.

## **Burying of waste**

Some waste, apart from food, generated in Health care facilities is managed by burning and burying. These include Papers, leaves, grass e.t.c. For effective and safe burial, follow these guidelines:

- The disposal site should be fenced and off limits to unauthorized persons.
- The burial site should be lined with a material of low permeability, if possible.
- Select a site at least 50 meters away from any water source to prevent contamination of the water table.
- The site should have proper drainage, be located downhill from any wells, free of standing water, and not in a flood-prone area. The site should not be located on land that will be used for agriculture or development.

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To make and use a small burial site for waste disposal, follow these guidelines:

- Find an appropriate location as described above.
- Dig a pit 1-meter square and 2 to 5 meters deep. The bottom of the pit should be 2 meters above water level. Consult the local water engineer or water authority for information about the location of the water table.
- Fence in the area to keep out animals, scavengers, and children.
- Burn contaminated waste and then cover the waste with 3 to 5 centimetres of soil each day.
- The pit should be covered with soil when three quarters full.
- When the level of the waste reaches within 30 to 50 centimetres of the surface of the ground, fill the pit with dirt, seal it with concrete, and dig another pit.

### **Disposal of liquid waste**

Disposal of liquid waste should be handled with utmost care. The following should serve as a guide:

- Carefully pour liquid waste down a sink dedicated for the purpose, drain, water closet or latrine. If this is not possible, bury it in a pit along with solid waste.
- Rinse the sink, drain or toilet thoroughly with water to remove residual waste, still avoiding splashing.
- Clean these areas with a disinfectant cleaning solution at the end of each day or more frequently if heavily used or soiled.
- Clean and disinfect the containers that held the liquid waste
- Clean, disinfect utility gloves.
- Wash your hands after handling liquid waste

### **Other waste**

- Placenta or body parts should be incinerated or buried in a safe area
- Chemical wastes should be treated as for liquid waste
- Genotoxics should be disposed of in consultation with experts.

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### **IPC precautions for waste disposal.**

- Use appropriate PPE when handling wastes.
- Clean gloves between uses.
- Handle wastes carefully to avoid spills or splashes and wear a complete PPE set.
- Always wash hands after removing gloves and handling contaminated wastes.
- Avoid transferring contaminated waste from one container to another.
- Incineration is the preferred method for waste treatment.
- If incineration is not possible, then careful burial is the next best alternative.

### **Dispose of used toxic chemicals or medicine containers properly:**

- Rinse glass containers thoroughly with water. Glass containers may be washed with detergent, rinsed, dried, and reused.
- Rinse plastic containers that contained toxic substances, such as glutaraldehyde, three times with water and dispose of by incineration, burial, or both.
- These containers may be used as sharps containers, but do not reuse them for any other purpose.
- Contaminated waste containers should be cleaned each time they are emptied and non-contaminated ones whenever they are visibly soiled.
- All contaminated waste containers must be labelled clearly.

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## CHAPTER 5

### 5.0 TRANSMISSION-BASED PRECAUTIONS AND ISOLATION

Expanded or transmission-based precautions are used when the route of transmission is not completely interrupted using standard precautions alone. These precautions are for patients who are known or suspected to be infected or colonized with infectious agents in health facilities. For some diseases with multiple routes of transmission e.g. SARS, more than one transmission-based precautions category may be used. When used either singly or in combination, they should always be applied in addition to standard precautions.

There are 3 categories of transmission-based precautions:

- Contact
- Droplet and
- Air borne

**Note: When additional precautions are indicated, appropriate education and counselling must be given to patients and relatives to counteract possible adverse effects on patients (e.g. anxiety, depression, perception of stigma, reduced contact with clinical staff) in order to improve compliance.**

#### 5.1. Contact Precautions

Contact precautions are intended to prevent transmission of infectious agents which are spread by direct or indirect contact with the patient or the patient's environment. Excessive wound drainage, faecal incontinence and other discharges from the body all lead to extensive environmental contamination. In addition to Standard Precautions:

- Patients should be nursed in a single room if available. If unavailable, share with another patient who has an active infection with the same microorganism.
- Patients must be physically separated from each other and the distance should be one metre with droplet infections.
- Health care personnel caring for patients on contact precautions should wear a gown, gloves, goggles (face shield), rubber aprons, foot wear and headgear for all interactions that may involve contact with the patient or patient's contaminated environment.
- Remove gloves and perform hand hygiene between contacts with patients in the same room at all times.
- Do not take off the attire whilst in the room.
- After completing procedures, gloves should be removed before leaving the patient's room and hand hygiene performed.
- Personnel should ensure that their hands do not touch potentially contaminated environmental surfaces after gloves are removed.

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- Patient movement should be limited to that which is absolutely necessary. Care should be taken during transport to minimize contact with other patients or environmental surfaces.
  - When transport is necessary ensure that infected or colonised areas of the patients' body are contained and covered.
  - Remove and dispose of non-reusable PPE and perform hand hygiene prior to transporting patients.
  - Wear clean PPE when handling the patient at the transport destination.
  - If sharing of common equipment is absolutely necessary, the equipment should be adequately cleaned and disinfected before using it for another patient.

## 5.2 Droplet precautions

Droplet precautions are intended to prevent transmission of infectious agents which are spread by aerosol particles generated during coughing, talking, singing, sneezing and some aerosol generating procedures (AGP).

**Droplet transmission** occurs when microorganisms come into **direct contact** with the mucous membranes of a person's mouth, eyes, and nose. This is a source of infection during face to face contact. The size of these particles and the distance they will be propelled is dependent on the force generated by the individual or the procedure. Within a few seconds, *large- size particles* (> 10 µm) will fall quickly to the ground due to gravitational force, but some larger droplets may desiccate and become smaller while in the air due to the loss of moisture.

### **Droplet transmission can be prevented by**

- Wearing a facial protection when within 1 metres of the patient
- Restricting the numbers of visitors in the room
- Avoiding overcrowding of patients in the ward.
- Provide sufficient space of 1 metre between adjacent beds to prevent cross- infection to ensure enough space between beds to carry out clinical activities.

### **Use the following droplet precautions in addition to Standard Precautions**

- Put a sign indicating precautions to be taken on the door of the patient's room and on the patient's chart.
- Wear appropriate mask when working within one metre of the patient.
- Patient movement must be limited to that which is absolutely necessary.
- Relatives must wear appropriate PPE when within 1 meter of the patient.
- Patients must be encouraged to use face masks at all times
- Instruct patients to follow Respiratory hygiene/ cough etiquette.
- With regards to patient transport instruct patient to wear mask and follow respiratory hygiene.

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### 5.3 Airborne precautions

Airborne precautions are designed for infections that are transmitted by airborne droplets. Due to size (< 5 µm) particles remain suspended in the environment for a significantly longer time and can be carried by air currents over a long distance. They may be found beyond the room as they remain suspended in the air.

Airborne precautions prevent transmission of infectious agents that remain infectious over long distances and period when suspended in the air. In addition, they bypass the upper respiratory tract and bronchial tree and reach the alveoli *directly* and cause infections. The most common microorganisms for which airborne precautions are necessary include *Mycobacterium tuberculosis*, varicella- zoster virus (chickenpox), SARS, rubella (German measles).

To prevent cross- infection, in addition to standard precautions observe the following Airborne Precautions

- A susceptible healthcare worker (HCW) should be replaced by another HCW who is immune to these infections either through previous immunization (e.g. measles) or past infection (e.g. history of chickenpox).
- Patients should be nursed in an isolation room with negative pressure ventilation (6– 12 air changes/ hour) to dilute and remove the infectious microorganisms safely
- Place the patient in a single room with the door closed.
- Wear a respirator before entering the room.
- Patients should be placed in an airborne infection isolation room that is equipped with special air handling and ventilation capacity (6 to 12 air changes per hour).
- Education about use of respirators, fit testing and user seal checks is required in any facility for airborne precaution.
- Patients must practice respiratory hygiene/cough etiquette
- Provide a higher level respirator for health care personnel to reduce airborne transmission.
- Surgical mask should only be used in such a situation if respirators are unavailable.
- A sign indicating precautions to be taken should be placed on the door of the patient's room and on the patient's chart.
- All relatives must wear the appropriate protective clothing before entering the room.
- Patient movements should be limited to that which is absolutely necessary.
- Patients must wear masks when being transported outside the room.
- HCW must use appropriate PPE to protect eyes, nose and mouth during performance of Bronchoscopy, Intubation and suctioning procedures.

**A respirator is recommended during procedures likely to contain TB, SARS, Avian or Pandemic Influenza viruses.**

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## 5.4 Isolation in Health Facilities

Isolation involves separating patients with certain infectious diseases from uninfected persons and separating immune- compromised patients from others. All persons accessing the isolation area shall observe the Standard and Transmission- based Precautions guidelines.

- All patients with known/ suspected transmissible infections and multi- drug resistant organisms (MDROs) should be isolated in a single room preferably with toilet and shower facility.
- Based on the type of infection, appropriate IPC precaution should be implemented.
- It is important to note that standard IPC precautions *must* be applied to *all patients* for the following reason:
- Patients may be incubating the disease and as a result may not show signs or symptoms of infection at the time of admission
- Patients may be *asymptomatic carrier* (hepatitis B & C, *Salmonella typhi*, etc.) or *colonized* with multi drug resistant organisms (MDROs) which are not known

The infectious status of the patients has not confirmed by laboratory diagnosis because:

- It is not suspected during the initial assessment of the patient due to lack of typical signs and symptoms.
- Specimen for diagnosis of microbial disease is not collected due to poor history taking by the clinical team
- The patient is unable to give proper history due to status of consciousness or language barrier.
- Test to confirm microbial diseases and MDROs are not readily available due to lack of laboratory facilities.
- Specimens for bacterial diagnosis is collected *after* the start of antibiotic therapy
- It is important to note that Isolation of patients have a psychological impact on the patient and have an adverse influence on the quality of care.

There are three main categories of isolation. These are:

### Category A

This applies to infections spread by direct contact with contaminated equipment, faeces, body fluids and airborne infections. Examples of diseases in this category are cholera, enteric fever and pulmonary tuberculosis.

In addition to standard precautions, the following measures should be adhered to;

- All health staff and visitors must adhere to IPC protocols and wear protective clothing as indicated

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- Protective clothing must be disposed of immediately after use.
  - Patients in this category must be attended to last, i.e. after dealing with all non-infected patients.
  - All healthcare workers staff that are inadvertently exposed to an infected person should be thoroughly investigated.

## Category B

This applies to patients that require **Strict Isolation**. They are specialized units for patients with highly contagious diseases like rabies, anthrax, diphtheria and haemorrhagic fevers. The requirements for category B isolation should include:

- Cubicle away from other patients
- Protective clothing, such as plastic aprons, masks, gloves, eye goggles, gowns.
- Disposable plates, cups and cutlery.

In addition to Standard Precautions, the following measures should apply:

- Use disposable non-clinical items and do not recycle items like plates, cups and cutlery.
- Keep airborne contamination and patient handling to a minimum.
- Educate healthcare workers, and visitors on the risk involved when looking after such patients.
- There must be restricted access to the patient.
- All waste produced in this unit should be treated and handled as highly infectious.

Dead bodies from isolation “B” diseases should be put in body bags before removal from the wards.

## Category C

This is also referred to as Protective (reverse) Isolation. It applies to immune- compromised patients who must be protected from other patients and attending staff, e.g. patients on cancer treatment. *In addition to Standard Precautions, the following measures shall be observed:*

- Patients in this category must be attended to first before attending to all other patients.
- Hygienic hand wash, sterile aprons, gloves and head gear/cap, mask, etc. must be worn.
- All protective clothing shall be discarded after attending to patients.

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## General Isolation guidelines

The initial point of contact of a patient in hospital is usually Accident & Emergency (A&E) or Outpatient department (OPD). This is the first line of protection for a HCF to prevent cross-infection.

The aim of using a **triage** system is to promptly identify, segregate and isolate patients. This is essential because in a hospital setting these departments are often crowded and patients may have to wait for prolonged periods in a communal waiting area with other patients. It is recommended that both A&E and OPD use partitions at the reception as barriers to protect HCWs.

- Health care providers should collaborate in effecting the timely and appropriate application of isolation.
- All isolation wards should be clearly labelled.
- Explain procedure and need for isolation to the patient and family.
- Prepare a well-ventilated room/area for isolation with all necessary equipment.
- Display a 'NO VISITORS' sign clearly in the patient's isolation area.
- All infectious cases suspected or confirmed should be reported on the appropriate form and sent to the appropriate authority.
- The patient's charts and records should be kept outside the patient's room.
- Contact tracing should be done and investigations must be carried out especially for all visitors and relations when indicated.

## General considerations

- Post Isolation signage on the door.
- Remove all non-essential furniture; the remaining furniture should be easy to clean, and should not conceal or retain dirt or moisture.
- Appropriate Colour coded waste bins and dirty linen bins should be kept in the isolation ward/room.
- Place a puncture proof container for sharp disposal inside the isolation room.
- Keep adequate and separate equipment for cleaning or disinfection of the isolation room
- Ensure daily cleaning of the isolation room.
- Stock supplies and linen outside the isolation room.
- Patients should leave the isolation area only for essential purposes and appropriate barriers are used by the patient<sup>†</sup>
- Personnel in the area to which the patient is to be taken are notified of the impending arrival of the patient and of the precautions to be taken.
- Visitors should be restricted to one person at a time during visiting hours.

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## 5.5 Patient care equipment and utensils

- Contaminated, reusable critical medical devices or patient care equipment should be sterilized.
- Semi-critical medical devices or patient care equipment should be sterilized or disinfected after use to reduce the risk of transmission of micro-organisms to other patients. The article and its intended use, the manufacturer's recommendations, the health care facility policy, and any applicable guidelines and regulations determine the type of disinfection.
- Non-critical equipment contaminated with blood, body fluids, secretions or excretions should be disinfected and cleaned after use
- Contaminated disposable (single-use) patient care equipment should be handled and transported in a manner that reduces the risk of transmission of micro-organisms and environmental contamination in the health care facility.
- The equipment should be disposed of according to the institutions' policy and applicable regulations.
- Terminal cleaning and disinfection should be done when the patient no longer occupies the room.
- The room should be aired for at least 24 hours before the next admission.

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## CHAPTER 6

### 6.0 CLEANING, DISINFECTION AND STERILIZATION OF INSTRUMENTS

Instruments and materials used during procedures may serve as vehicles for the transmission of infection to both patients and healthcare workers if not properly processed and handled. The risk of transferring infections from these instruments and equipment is dependent on;

- The presence of microorganisms, their *numbers*, and their *virulence*.
- The *type of procedure* to be performed (invasive or non- invasive).
- The *body site* where the instrument or equipment is used.

Decontamination is a series of processes that effectively remove or destroy infectious agents and other contaminants to make items safe. The processes involve **cleaning, disinfection and sterilization**.

#### Spaulding's Classification

A risk assessment should be done for instruments that are to be reprocessed. This must be carried out in order to classify risk of infection transmission. This classification is used to understand the method of reprocessing required to ensure safety, break the chain of infection, and protect patients and HCWs from infections. The three classes are Critical, Semi-critical and Non-critical.

**Critical items:** These are instruments or objects that are introduced directly into the blood stream or into other normally sterile areas of the body. Examples include surgical instruments, IV cannulae, implants and lumbar puncture needles. The reusable items must be sterilised before use.

**Semi critical items:** These refer to instruments or objects that come into contact with intact mucous membranes but do not necessarily penetrate body surfaces, e.g. endotracheal tubes, anaesthetic breathing circuits, vaginal instruments, oral thermometers, endoscopes. These items should be sterilised before use. Where sterilisation is not possible, high-level disinfection should be used.

**Non-critical items:** These are items that either do not ordinarily touch the patient or touch only intact skin. Examples of these are walls, floors, bedpans, blood pressure cuffs, stethoscopes, and clinical thermometers. Depending on the particular piece of equipment or item, washing or wiping with a detergent or alcohol OR low level disinfection may be sufficient.

Proper processing of instruments and other objects that will be reused in clinical procedure is vital for reducing the transmission of infections. It is important to keep in mind that staff involved in processing instruments and objects are themselves at high risk of infections and must thus take

appropriate steps to reduce the risk. Infections in this regard can occur from exposure to blood and blood products, and other body fluids that pass through;

- i. Open cuts on their hands or forearm, chapped or cracked hands.
- ii. Injuries from needle sticks or other sharp instruments.
- iii. Splashing of blood and other body fluids onto mucous membranes like the eyes.

**Table 4: Spaulding classification**

<b>Spaulding classification system</b>			
<b>Device classification</b>	<b>Device examples</b>	<b>Spaulding process classifications</b>	<b>EPA product classification</b>
Critical (enters sterile tissue or vascular system)	Implants, scalpels, needles and other surgical instruments etc.	Sterilization – sporicidal chemical prolonged contact	Sterilant/ disinfectant
Semicritical (touches mucous membranes except dental)	Flexible endoscopes, laryngoscopes endotracheal tubes, and other similar instruments	High level disinfection Sporicidal, chemical , short contact	Sterilant/ disinfectant
Noncritical (touches intact skin)	Thermometers, hydrotherapy tanks	Intermediate- level disinfection	Hospital disinfectant with label claim for tuberculocidal activity
	Stethoscopes, tabletops, bedpans, etc.	Low level disinfection	Hospital disinfectant without label claim for tuberculocidal activity

## Cleaning

This is the first step in processing instruments and other medical devices. It involves physical remove of foreign materials, which may contain microorganisms from an instrument. Cleaning greatly reduces the number of microorganisms on items and is therefore a crucial step in processing instruments. If items are not cleaned, further processing (disinfection and sterilization) may not be effective because:

- Microorganisms trapped in organic materials may be protected and survive further processing
- Organic materials and dirt can make the chemicals used in some processing techniques less effective.

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It is important to use warm water and detergent when cleaning because cold water alone will not remove protein, oils and greases.

### **Disinfection**

This refers to the use of chemical agents to eliminate virtually all disease causing microorganisms (excluding bacteria spores) on objects and surfaces to a level that is not normally harmful.

### **Sterilization**

This is the destruction of all microorganisms including bacteria spores. This is achieved principally by autoclaving.

The steps in processing instruments are cleaning, sterilization or high-level disinfection and proper storage.

## Major steps in Reprocessing Instruments and Medical Devices

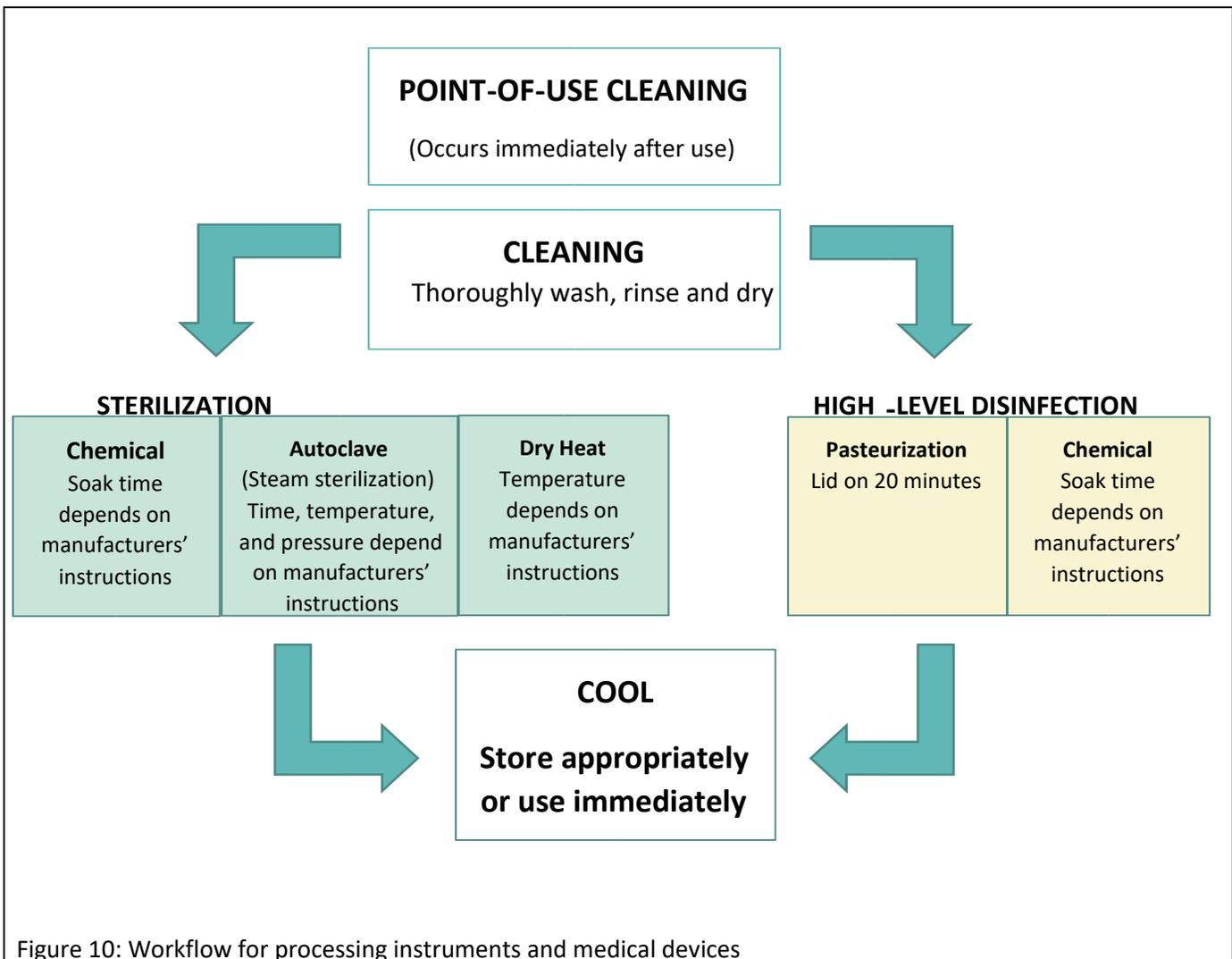


Figure 10: Workflow for processing instruments and medical devices

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## 6.1. Cleaning

### Point-of-use preparation of instruments and other devices

For effective re-processing of instrument, used devices must be prepared at the point of use to ensure safe transport and minimal risk to Central Sterile Supply Department (CSSD) staff. Pre-cleaning (e.g. soak or spray) prevents soil from drying on devices and makes them easier to clean. Where resources permit, pre-cleaning should be done as follow;

- Immediately after use, medical devices should be cleaned by following the guidelines listed:
- Wear appropriate PPE
- Separate contaminated devices and instruments from linen and disposable items and dispose of these items appropriately. Be sure to safely segregate sharps and dispose directly into sharps containers
- Remove gross soil from instruments by wiping with a damp, clean cloth.
- Rinsing with water.
- Place items in a basin with cold or room temperature water.
- Cover items with a moist towel with water (not saline) to prevent equipment from drying out
- Place items in a fully enclosed, leak and puncture-proof covered container prior to transporting for reprocessing.

### Point-of-Use Cleaning

Point-of-use cleaning at the end of the procedure is a critical step in device reprocessing, and one that is often overlooked. It is important because:

- Contact with blood for long periods (> 30 minutes) is corrosive to instruments; it can cause pitting and staining.
- Once blood dries on instruments, it is difficult to remove, especially if blood has entered into hinges, sockets, or lumens.
- Blood and body fluid (bioburden) compromises the effectiveness of the disinfection or sterilization process if it is not removed prior to high-level disinfection or sterilization by thorough cleaning.
- Removing bioburden makes instruments and devices safer for handling in the reprocessing area.

Therefore, clean instruments properly, as soon as possible after they have been used to prevent bioburden from drying on the instrument or device.

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## **Cleaning of instruments and other medical devices :**

Thorough cleaning should always precede disinfection and sterilization. There are two methods of cleaning. These are:

- Manual cleaning
- Mechanical cleaning

### **Manual cleaning :**

This refers to cleaning of devices using hands. It must be done with extreme caution by adhering to the following steps:

- Wear appropriate PPE such as utility gloves, plastic apron, face and eye protection and dismantle all items requiring disinfection or sterilisation before cleaning. Use tap water for the initial washing.
- Using a soft brush, enzymatic detergent (preferably, the liquid form) and water, firmly brush off all debris, keeping the brush below the surface of the water. Be sure to brush the grooves, teeth and joints of the items where organic materials can collect.
- Rinse items finally in clean water to remove all detergent. Any detergent left on the items can reduce the effectiveness of further chemical processing. Allow to air dry or dry them with clean towel before disinfection or sterilisation.

### **Mechanical cleaning :**

This involves cleaning of instruments using washing machines, washer-disinfectants and ultrasonicators.

- Staff must have adequate training on the use of the machines and must follow manufacturer's instructions strictly in operating them.
- Staff should use appropriate PPE
- If in doubt, seek advice on how to use the machine.

**NOTE: WHAT IS NOT CLEANED CANNOT BE STERILIZED**

## 6.2 Disinfection

Disinfection can be achieved by the use of disinfectants and antiseptics:

- **Disinfectant** – is a chemical agent used to kill or destroy most disease-causing microorganisms on non-living objects such as instruments and surfaces.
- **Antiseptic** – is a chemical agent safe enough to be used on the skin and mucous membrane to kill or destroy microorganisms. Antiseptics must not be to disinfect instruments.

Disinfectants and antiseptics always be used as specified by the manufacturer's instructions to obtain maximum effect. Suggested areas/items and samples of disinfectants and antiseptics that could be used is outlined in Table 5 below.

**Table 5 – Disinfectants and Antiseptic:**

Area/ Item	Disinfectant	Antiseptic
Dirty wound (wound dressing)		Normal saline; Potassium permanganate
Surgical scrub, skin disinfection		Povidone, Chlorhexidine (Hibiscrub), Chlorhexidine + Cetrimide (Savlon); 70% Alcohol rub(ethyl; isopropyl)
Cleaning blood spillage	Hypochlorite (Chlorine) 0.5%	
Skin		Diguanides, 70% Alcohol rub; Chloroxylenol (Dettol) Non-alcohol based preparations
Working surfaces	Alcohol, Chlorine + Detergent	
Floors	Phenols, Hypochlorite (Chlorine) 0.5%	
Chemical sterilisation of endoscopes	Glutaraldehydes, peracetic	
Hand washing		Detergents/soap; Antiseptic hand wash e.g. hibiscrub Quaternary ammonium compounds,
Serum, antibiotics preparation, culture media	Ultrafiltration	

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## Levels of disinfection

There are 3 levels of disinfection as follows, High, Intermediate and Low levels.

### High-level disinfection :

This kills all micro-organisms except bacteria spores. This can be done by boiling, steaming and using chemicals.

### Intermediate level disinfection

This kills mycobacteria, most viruses, bacteria and fungi. This can be done by boiling for 20 minutes at boiling point, using alcohols (70%)

### Low-level disinfection

This kills some viruses and bacteria. It does not kill mycobacteria. Examples of agents for low-level disinfection are Cetrimide, Savlon and soap (liquid or cake) or Chlorine 0.05%. An example is hand washing with soap and water. Always follow the manufacturer's instructions. Low level disinfection is not recommended for instruments.

### High-level disinfection of instruments

High-level disinfection(HLD) is indicated for processing instruments and medical devices that come in contact with non-intact skin and mucous membranes, but, ideally, not those that contact sterile areas of the body, including the vascular system (see table 3).

High-level disinfection is used to process reusable endoscopes because most endoscopes are made of materials that cannot withstand high-temperature reprocessing. HLD is also the third step in the processing of instruments. The effectiveness of HLD depends on both the:

- Amount and type of microorganisms, organic material (blood, other body fluids, tissue) and other matter present on the instrument or other medical items.
- Extent of protection the item gives the micro-organism (such as whether the item has grooves or other areas in which microorganisms can hide).

It is therefore very necessary to thoroughly clean instruments and other medical devices before HLD.

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## Methods of High-Level Disinfection of instruments

There are three methods of HLD namely, boiling, chemical and steaming. All facilities must have more than one method of sterilisation or HLD available to use as a backup when equipment break down, supplies run out or when electricity is not available.

### High-level disinfection by boiling

Boiling is a simple method of disinfection that can be performed in any location that has access to clean water and a source of heat. Boiling is HLD not sterilisation. The following are the steps in High Level disinfection by boiling:

#### Steps

- Clean all instruments and other medical devices to be boiled.
- Open all hinged instruments and disassemble those with sliding or multiple parts.
- Place bowls and containers upright, not upside down, and fill with water.
- Completely submerge all instruments in the water
- Cover the pot or boiler and wait for the water to rolling boil.
- When the water comes to a rolling boil, start timing: 30 minute at 77°C (170.6°F) or 20 minutes at 100°C (212°F). Use a timer to record when the boiling begins.
- Do not add or remove any water or item to or from the pot or boiler.
- Lower the heat to keep the water at a gentle, rolling boil. This is because, if you boil the water too vigorously the water will evaporate and the items may become damaged if they bounce around the container and hit the sidewalls and other items being boiled.
- After recommended time, remove the items using dry high-level disinfected pickups (e.g. lifters, Cheatle's forceps).
- Place the instruments or medical devices on a high-level disinfected tray or in a high-level disinfected container that is in the low-traffic area away from insects and dust.
- Allow to air dry before use or storage. Use items immediately or keep them in a covered, sterile or HLD container for up to one week.

#### Note:

- **Never leave boiled items in the water that has stopped boiling, they can become contaminated as the water cools down**
- **Add some vinegar to the water and boil for 10 minutes to remove lime salts deposits inside the boiler**
- **Use the same water for the throughout the day only adding only enough to keep the instruments below the surface**
- **Drain and clean the boiler at the end of the day**

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## High-level disinfection using chemicals

This method is used for heat-sensitive items or when heat source is not available. Special considerations must be taken when reprocessing reusable, storage containers, laparoscopes and other instruments used in suction and similar procedures. Do not soak in chlorine solution, since chlorine can damage them. The preferred chemicals for disinfecting/sterilising endoscopes are glutaraldehyde 2% and peracetic acid.

In most health care settings, the only chemicals available for HLD are chlorine, Orthophthalaldehyde (OPA) and glutaraldehyde. OPA is relatively fast-acting, and kills all vegetative bacteria, fungi, and non-enveloped and enveloped viruses. HLD does not kill all bacterial spores; therefore, it cannot be used to achieve sterilization. Most of the chemical disinfectants are compatible with most metals and plastics and can be used to process most endoscopes.

Glutaraldehyde can be used to achieve both HLD and sterilization of surgical devices and medical devices, based on exposure time. Glutaraldehyde has some disadvantages that make it a less desirable high-level disinfectant than OPA.

Glutaraldehyde is a known irritant to mucous membranes and can cause throat and lung irritation and asthma. Follow the manufacturer's instructions on activation. Once activated, it remains effective for 14 days. Some manufacturers have products that remain effective for 28 days. The minimum effective concentration should be tested on the first use and then daily to confirm that the concentration meets the minimum effective concentration.

Use a log to document each soaking cycle and minimum effective concentration test results.

### When using Chemical disinfectants:

- Wear appropriate PPE, including mask, goggles, apron, and gloves.
- Prepare the 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, put it in a clean container with a lid.
- Mark the container with the date the solution was prepared and the date it will expire.
- 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.
- Put items in a clean container with a lid. Always mark the container with the date the solution was prepared and the date it expires.
- 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.
- All parts of the instruments and other items should be under the surface of the solution.
- Place any bowls and containers upright, not upside-down, and fill with the solution.
- Do not add or remove any instruments or other items once time has begun.

- 
- Remove the instruments and other items from the solution using large, sterile pickups (lifters, Cheatle's forceps).
  - Rinse thoroughly with **distilled** water to remove the residue that chemical sterilants leave on instruments and other items; this residue is toxic to skin and tissues.
  - Place the instruments and other items on a sterile tray or in a sterile container and allow air drying before use or storage.
  - Use the instruments and other items immediately or keep in a covered, dry, sterile container and use within one week.

**Note: Boiled water is not sterile, because boiling does not kill endospores. Therefore, rinsing with boiled water can contaminate sterilized instruments and other items.**

### 6.3 Sterilization:

This is the destruction of all microorganisms including bacterial spores. 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:

- Physical methods: moist heat (e.g., steam sterilizer) and dry heat.
- Chemical methods: liquids (e.g., glutaraldehyde 2.5%, Peracetic acid, peracetic acid with H<sub>2</sub>O<sub>2</sub>).

Sterilization can be affected by:

- Improper cleaning
- Type, number and location of the microorganisms on the instruments
- Type and amount of organic material surrounding (Biofilm) the microorganisms
- Key parameters (temperature, humidity, pH, water quality, contact time, pressure, and chemical concentration).
- Lack of preventive and corrective maintenance of the equipment
- Human factors

Steam sterilization and chemical methods are the most commonly employed methods for sterilization at health care facilities in low- and middle-income settings. Moist heat (autoclaving/steam) 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.

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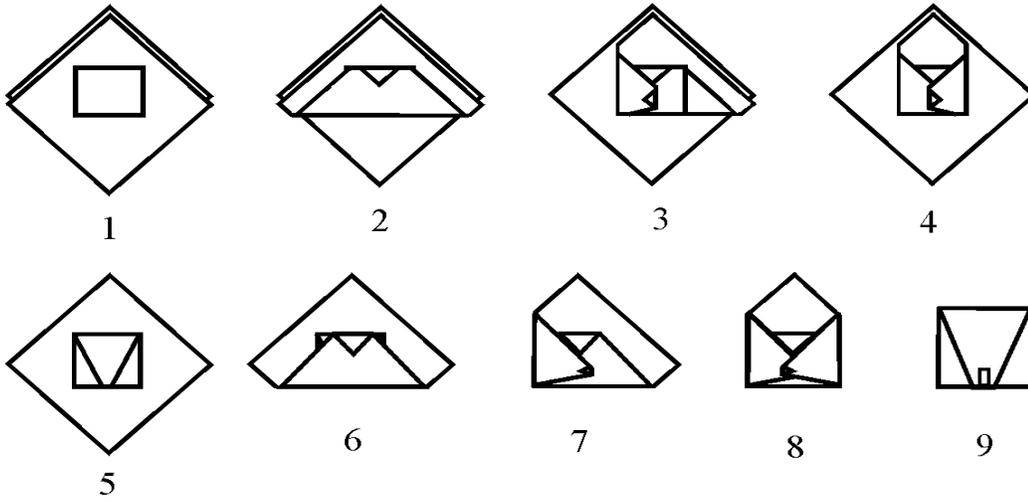
## **General principles of packaging**

- The main purpose of packaging instruments is to maintain sterility by protecting items from moisture, dirt, dust, and microorganisms until they are opened and used.
- The instruments should be packaged in such a way that it is easy to remove them from the sterilizer without contamination.
- The packaging should allow steam and heat or other sterilizing agents to come in contact with all surfaces of the instruments.
- The packaged instruments should meet the users' needs and safety during the procedure.
- The size of the packaging materials should properly cover all surfaces of the instrument.
- Packages to be sterilized should be labelled before sterilization. At a minimum the information on the label should include the following:
  - o Name of product/content.
  - o Expiry date and/or sterilization date.

### **Procedure for wrapping items for sterilisation**

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### Envelope Wrap



### Square Wrap

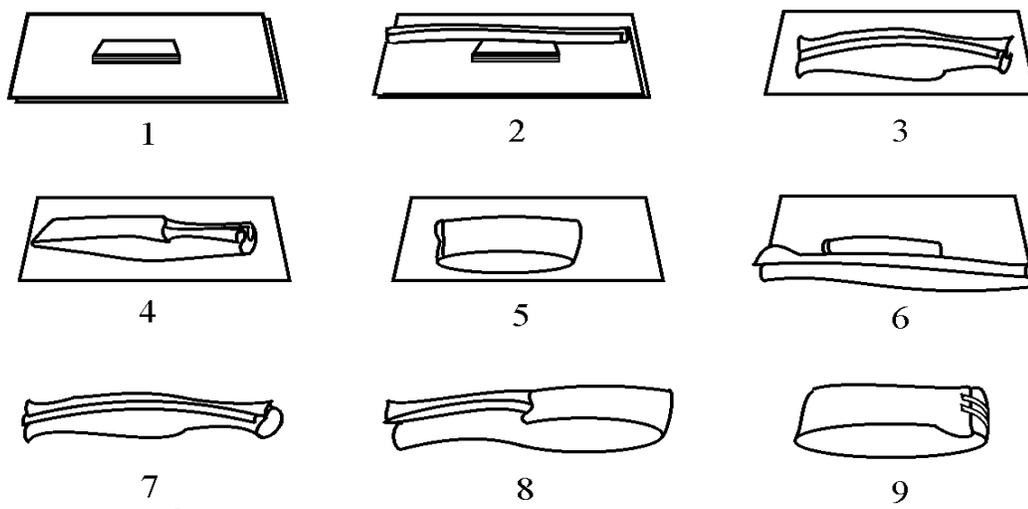


Figure 11 – Steps for wrapping packs for sterilization

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## General considerations for the safe operation and use of autoclaves :

- Clean and inspect all items before sterilization.
- Disassemble, open and unlock all instruments when packing them for sterilization.
- Do not load packs in the autoclave too close to one another.
- Position the packs in such a way to allow air circulation and proper steam contact with all surfaces.
- Wrap and label items according to the guidelines.
- Follow manufacturer's instructions for the operation of the autoclave.
- Make sure that the small drain strainer at the bottom of the sterilizer is not clogged. This could result in trapping air inside the sterilizer.
- Leave a space of 7-8 centimetres between the packages and the autoclave chamber walls.
- Place bottles, solid metal and glass containers on their sides with lids held loosely in place.
- Place instruments trays (mesh or perforated) flat.
- Do not overload the sterilizer or make packs too large.

## Sterilization by Heat :

### Dry Heat

Dry heat sterilization requires higher temperature for longer exposure periods to kill all microorganisms. Due to the high temperature required, only glass or metal objects can be sterilized by dry heat - *do not use this method for other items such as gauze or cotton which may melt or burn.*

### Recommended time and temperature

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

### Steps of Dry Heat Sterilization

- Follow manufacturer's manual
- Thoroughly clean and dry all medical equipment prior to sterilization.
- Put unwrapped instruments directly inside the autoclave.
- Heat the oven to the designated temperature. Once the oven reaches the designated temperature, start the timer. Do not open the door or add more instruments during the process. Once the desired time has been reached, turn off the oven.

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- Leave items in the oven to cool before removing.
  - Store items inside a sterile container. Proper storage is as important as the sterilization process itself. †

General considerations for the safe operation and use of dry heat sterilizers include:

- Keep the oven clean.
- The oven must have a reliable temperature gauge and where possible a timer. If no timer is available, a portable timer is required.
- Maintenance of dry-heat ovens should be part of every sterilization process. *If the oven does not reach the correct temperature, sterilization will not be achieved.*
- To check that the temperature gauge is working correctly, place a thermometer in the oven and compare the temperature reading with the one on the gauge. Do this on a weekly basis, record the findings and take any remedial action as required.
- Items should not be wrapped, stacked or overcrowded within the dry heat oven.

### **Steam Heat:**

Steam sterilization (autoclaving) is a process that uses saturated steam under pressure as the sterilants. It is the preferred method of sterilizing medical devices and can be used for all medical devices including cotton and gauze. There are several types of autoclaves. Always follow the manufacturer's instruction.

- Pre-vacuum sterilizers: These use a vacuum pump or water ejector to remove air from the chamber and packaged devices during the preconditioning phase and prior to sterilization; and operate at 132°C to 135°C
- Steam-flush pressure-pulse: These use a repeated sequence of a steam flush and pressure pulse to remove air from the chamber and packaged items; and operate at 121°C to 123°C, 132°C to 135°C, or 141°C to 144°C
- Gravity sterilizers: With this type, gravity is used to displace the air from the sterilizer chamber and packaged devices; and operate at 121°C or higher.
- Steam sterilizer requires adequate time, temperature, moisture, and contact to work effectively.

### **Sterilization by Chemicals**

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

- 
- Prepare the chemical solution by following the manufacturer's instructions or use a solution that was prepared previously, as long as it is not cloudy and not expired. Pour the solution in a clean container with a lid. Always mark the container with the date the solution was prepared and the date it expires.
  - 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; all parts of the instruments and other items should be under the surface of the solution. Place any bowls and containers upright, not upside-down, and fill with the solution.
  - Follow the manufacturer's instructions regarding the time necessary for sterilization to be achieved.

### **Sterilisation quality control**

Quality control procedures with appropriate supporting documentation should be in place to ensure that only sterilized items are used for the treatment of patients. All quality control systems should include:

- Automatic and continual display of the chamber temperature, pressure and the time for each sterilized load.
- A system to differentiate between sterilized and unsterilized items.
- Monitoring the procedure with appropriate indicators.
- The operator must check and record thermometer recording during each complete cycle. This is to ensure the attainment of a minimum temperature depending on the quantity and the compaction of the load, to achieve sterilisation of the entire load.

### **Indicators for monitoring steam sterilization process:**

This includes Heat sensitive tape or biological indicator monitoring

#### **Heat sensitive tape:**

Operators must use heat-sensitive tapes or other devices for each load that is processed to indicate the load has undergone the steam sterilisation process. Remember the tape only indicates that the proper temperature has been reached; it does not indicate it was heated for the proper time.

#### **Biological indicator monitoring:**

Operators must monitor the biological indicator placed at the centre of the load processed under standard operating conditions at least monthly so as to confirm that adequate monitoring has been

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met. Follow the manufacturer's instructions for using indicators. Keep a log of the results- date performed, test results, initials of the person doing the test.

**General care of all instruments:**

- Avoid oils that may protect bacteria during autoclaving; water soluble lubricant is recommended.
- Never use steel wool or abrasive powders on stainless steel instruments.
- Never label surgical instruments by impact marking because it can cause damage<sup>AFT</sup>

**Storage of sterilized items:**

Proper storage is as important as proper processing. After processing, items should be used immediately or stored in a designated area in such a way that they do not become contaminated. The shelf-life of sterile wrapped items is event related

**Shelf-life is affected by:**

- The type of packaging material
- The number of times the pack is handled.
- The number of people who handle the pack.
- The cleanliness and humidity in the storage area.
- The temperature of the storage area.
- Whether the packs were stored in open or closed shelves.
- Whether dust covers were used.
- Unused sterilized packs should be re-sterilised after 14 days. When in doubt about the sterility of a pack, consider it contaminated and the items be re-sterilized.
- Unwrapped items should be used immediately or kept in a covered sterile container for up to one week.

**Storage areas for sterilised items should be:**

- Restricted to authorized persons only.
- Kept clean and dry.
- Designed in such a way that items stored on shelves are 20-25 cm above floor level, 45-50 cm from the ceiling and 15-20cm from the walls.

NB: All personnel who work or access the storage area MUST put on appropriate PPE

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### **Care of disinfectant solutions:**

Although disinfectants are effective in killing microorganisms, their abilities are limited and can easily become contaminated. Disinfectants can become susceptible to contamination, and less effective when exposed to heat and direct light.

### **Disinfectants can become contaminated if:**

- The water used to dilute the solution is contaminated.
- The containers in which the solution is placed are contaminated.
- Resistant microorganisms from a contaminated item or the service provider's skin come in contact with the solution during use.
- The area in which solutions are prepared or used is not clean.

### **Storage of Disinfectants:**

- Disinfectants should be stored in accordance with the manufacturer's recommendations.
- The storage area should be restricted to authorized persons only.
- Storage containers should be properly stoppered.
- Do not pour back leftover disinfectants and antiseptics into the holding containers.

## **6.4. Role of Pharmacy in Managing Disinfectants and Antiseptics:**

The pharmacy department in every facility should be involved in the procuring, storing, distributing, preparing, and quality control programs for the appropriate use of disinfectants and antiseptics. No further dilution of disinfectants or antiseptics shall occur at the point of use. Where this is not applicable, appropriate instructions on how to dilute the disinfectant should be provided on the disinfectant container.

### **The following guidelines shall be applied:**

- Pharmacy should label disinfectants and antiseptics appropriately, specifying type, preparation, expiry dates and concentration.
- Pharmacy should put prominent precautionary signs and measures on all containers.
- Precautions regarding expiry dates of disinfectants and antiseptics should be strictly adhered to.
- Officials of the pharmacy should ensure that disinfectants are poured into labelled containers that are clean and dry.

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## CHAPTER 7

### 7.1 ENVIRONMENTAL CLEANING

Current scientific evidence suggests that a contaminated environment plays an important role in the spread of microorganisms, and if not thoroughly cleaned or disinfected on a regular basis, it may act as a reservoir for potential pathogens (Dancer, 2014).

The transfer of microorganisms to patients occurs through contact with *contaminated* environmental surfaces, and through *contaminated* hands, items and equipment. Regular cleaning and disinfection of the environment are essential to prevent transmission of pathogens. Standard manual cleaning and disinfection of surfaces can significantly reduce, but often does *not completely* eliminate pathogens

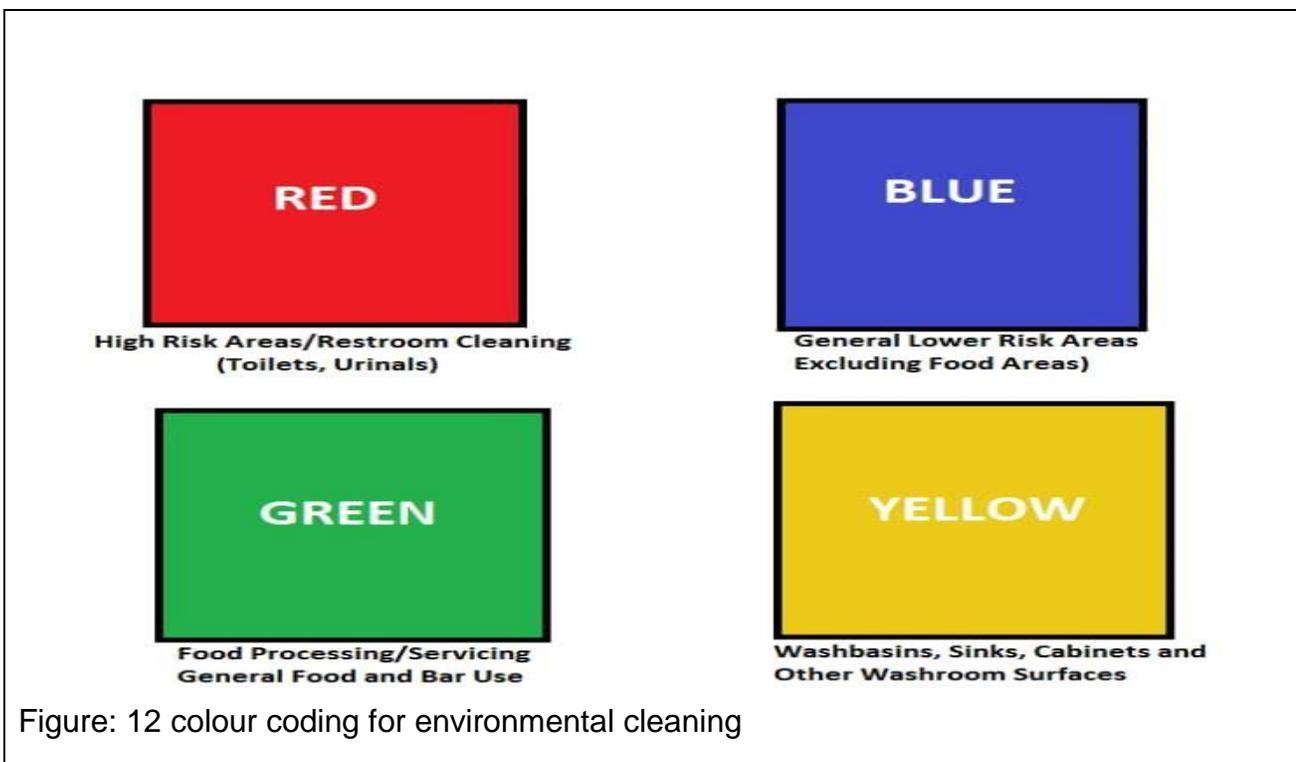
#### **General cleaning guidelines:**

The following guidelines should apply to provide a clean environment in all health care facilities using approved agents for cleaning:

- Hospital cleaning staff/contracted cleaning staff should be responsible for all cleaning in the health care facility. No client or guardian should be subjected to cleaning up any spills.
- Cleaning could be manual or mechanical.
- Clean and disinfect surfaces that are likely to be contaminated with pathogens. These are surfaces that are frequently touched such as bed rails, bed tables, door handles, light-switches
- All housekeeping staff must have a structured in-service training annually on IPC/ WASH.
- Ward/unit and housekeeping supervisors should draw up cleaning schedules and checklist for the different areas of the ward/unit. These should be posted at strategic points where all staff responsible for housekeeping can see and closely follow.
- Housekeeping staff should wear appropriate PPE when cleaning.
- Cleaning personnel should make sure that cobwebs are removed and all stains on the walls and vertical surfaces are removed
- Use a damp or wet mop or cloth for walls, floors and surfaces instead of dry dusting or sweeping to reduce the spread of dust and microorganisms.
- Scrubbing is the most effective way to remove dirt and microorganisms,
- Scrubbing should be applied in areas such as the bathrooms, toilets, floors, gutters.
- Clean surfaces from top to bottom so that debris falls to the floor and is cleaned up last. Clean the highest fixtures first and work downwards.
- Clean from least soiled to most soiled (from low risk area to high risk area).

- Change disinfectant cleaning solutions whenever they appear dirty. A solution is less likely to kill infectious microorganisms if it is heavily contaminated.
- Use of colour coding is essential for cleaning equipment's (buckets and mops) to avoid cross contamination. **GREEN** should be used for food processing/Service General Food and bar use, **RED** should be used for high risk areas /restroom (sanitary fittings and washrooms), **Yellow** should be used for wash basins, sinks, cabinets and washroom surfaces, and **BLUE** should be used for general lower risk areas excluding food areas.
- Always display a cautionary sign of “wet floor” when mopping.
- In the profession of cleaning, the best way to remember the definition of cleaning is **No Dust, No spots, No stains, No smells.**

### Recommended colour coding of environmental cleaning



Surfaces can be divided into two groups. These are shown in Table 6 below:

**Table 6: Groups of surfaces**

High-touch surfaces	Low-touch surfaces
<ul style="list-style-type: none"> <li>• <i>Frequent</i> contact with hands or '<i>high frequency hand touch surfaces have higher risk to be source of transmission</i> i.e. door handles, tabletops, work surfaces.</li> <li>• These areas require frequent (daily) cleaning.</li> </ul>	<ul style="list-style-type: none"> <li>• Minimal contact with hands, i.e. floors, walls, window ledges, window sills, ceilings and high shelves.</li> <li>• These areas require scheduled cleaning and when visibly soiled.</li> </ul>

As a rule of thumb, '*high (frequently)- touch surfaces*' must be thoroughly *cleaned* and *disinfected more frequently* than surfaces that have minimal contact with hands. In addition to these factors, frequency of cleaning and disinfection should take into account high risk units, e.g. Operating Rooms, Critical Care Units, neonatal, burns, Accident & Emergency, Labour & Delivery, renal and oncology units.

### General guidelines for cleaning in patient care areas

#### Wear appropriate PPE.

- Mop floors thoroughly and clean with disinfectant solution daily and as required.
- Start with clean areas then to contaminated areas.
- Damp-wipe countertops, tables, drip stands, beds, and trolleys with water and detergent to remove dust that has accumulated at the beginning of each work day.
- Clean operating and procedure rooms, examination tables, trolleys, countertops and any other potentially contaminated surface with a wet cloth soaked in disinfectant cleaning solution in between patients and clients.
- Clean spills of blood or other body fluids immediately.

#### Toilets and sluice rooms

These areas are usually heavily contaminated and should be cleaned as often as possible with a disinfectant cleaning solution and in accordance with an hourly cleaning schedule. Use a separate set of cleaning items to clean these areas.

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## **Cleaning spills of blood and body fluids on surfaces.**

- Clean up spills of potentially infectious materials immediately. Besides preventing the spread of infections, prompt removal also prevents accidents.
- Staff cleaning spills must wear appropriate PPE
- Cleaning agents should be readily available for spills and should be stored and sign -posted in an area known to all staff.
- All facilities must have a spill kit.

## **Procedure for spill management will depend on the following:**

- Nature of the spill, e.g. blood, urine and faeces.
- Possible pathogens that may be involved.
- Size of the spill i.e. spot, splash, large spill.
- Type of surface involved i.e. linoleum, carpet, wood, laminated, etc.
- Area involved i.e. preparatory laboratory, teaching areas, common access areas, etc.
- Likelihood of bare skin contact with the soiled area.

### **Small spills**

Disinfect using a disinfectant cleaning solution and clean.

### **Large spills**

First remove the visible organics matter with absorbent material e.g. disposable towel or paper and discard into an appropriate leak-proof bin. Disinfect with Sodium dichloroisocyanurate /0.5% chlorine disinfectant, mop and clean the area and allow to air dry.

### **Large spills of concentrated infectious materials**

- If it is a large spill of concentrated infectious materials, scoop the spill, then disinfect with Sodium dichloroisocyanurate solution and clean.
- Protect this area so that it does not create a hazard where someone could slip on the wet floor and get hurt.
- Disinfect it again with fresh disinfectant, clean and allow to air dry.
- Do not place a rag over the spill for cleaning up later, someone could easily slip and fall on it.
- Items used for cleaning must be cleaned. Items such as mops, buckets, and dusters should be disinfected, cleaned with detergent and water, rinsed in clean water and dried before reuse.
- Hands should be thoroughly washed and dried after gloves are removed.

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## Cleaning Surgical settings

Surgical settings include operating theatres, ambulatory surgical units, intensive care unit, physicians' offices where invasive procedures are done, intravascular catheterization laboratories, endoscopy rooms and all other areas where invasive procedures may be performed.

- Cleaning scheduled should be completed and signed for daily.
- Water must be clean and potable; once the water becomes visibly soiled, it must be changed for clean water.
- Areas outside the sterile field contaminated by organic debris must be cleaned as spills or splashes occur.
- Surgical lights and horizontal surfaces, equipment, furniture and patient transport vehicles must be cleaned between patients/clients with a clean duster and a low-level disinfectant.
- Floors should be cleaned with a disinfectant/detergent, between patients/clients or, depending on type of procedures carried out, at the end of the day.
- Counter tops and surfaces that have been contaminated with blood or body fluids capable of transmitting infection should be cleaned with disposable towels, using an appropriate cleaning agent and water as necessary, (e.g. after each procedure, end of the day, etc.), the surfaces then disinfected with a low-level chemical disinfectant or Sodium dichloroisocyanurate. Loose or cracked work surfaces should be replaced.
- All other areas and equipment in the surgical practice setting (e.g. air conditioning grills and/or filters, cabinets, shelves, walls, ceilings, lounges and locker rooms, drip stand/IV poles, IV pumps, suction canister, oxygen tubing, emergency trolleys, ventilators and ventilator tubing, stethoscope, light switches, telephones, cables, keyboards, toilet hand rails, ECG leads, beds, bedside rails, movable sliding rails) should be cleaned according to an established routine.
- Before any piece of portable equipment enters or leaves the operating theatre, it should be wiped with the approved disinfectant.
- Environmental cleaning checklist should be completed daily.
- Always follow manufacturer's instructions for dilution of disinfectant and contact time.
- Use PPE when cleaning as appropriately.

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## Important points to remember

Frictional cleaning/scrubbing is the most important way to remove dirt and microbes, for all environmental cleaning. To avoid soiling clean areas in the process of cleaning dirty ones, always:

- Cleaning equipment must be washed and dried.
- Change disinfectant solution after 24 hours OR as per manufacturer's direction OR when obviously dirty whichever is the sooner.
- Use separate equipment for cleaning contaminated areas, e.g. toilets, isolation rooms.
- Cleaning should start from top to bottom.
- Clean from least soiled to most soiled and from Low to High risk area.
- Change the cleaning solution and wash the equipment between areas or cubicles or when dirty.
- Dilute the disinfectant to the correct, prescribed concentration.
- Prepare and display simple clear routine housekeeping schedules and checklists for all personnel
- **During outbreaks, cleaning routines may be enhanced and cleaning materials and disinfectants may be changed**

## Cleaning non-patient-care areas

These are areas in the healthcare facility that deal with non-clinical service such as kitchen and administration where the risk of infections is minimal. In these areas routine domestic cleaning is adequate.

These areas should be cleaned with a detergent and water daily, according to the cleaning schedule. Users of these areas should adhere to strict guidelines to prevent contamination and should avoid the use of the carpets. Should contamination occur, appropriate cleaning practices should be done as for patient /client care areas.

## Terminal cleaning and disinfection after discharge

Upon discharge of a patient, the room, cubicle or bed-space, bed, bedside equipment and environmental surfaces must be **thoroughly cleaned** before another patient is admitted.

- Terminal cleaning should be directed toward those items that have been in direct contact with the patient or in contact with the patient's excretions, secretions, blood, or body fluids.

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- Housekeeping personnel should use precautions to protect themselves during terminal cleaning.
  - All disposable items should be discarded in the appropriate receptacle.
  - Remove all linen, place in appropriate bag. If soiled, rinse to remove soiled material and place in appropriate linen bag
  - Reusable items that have come in direct contact with the patient or with the patient's body fluids should be reprocessed as appropriate.
  - Bedside tables, bed rails, commodes, mattress covers, and all horizontal surfaces in the room must be cleaned and disinfected
  - Routine washing of cubicle/wards, walls, blinds, and curtains is not indicated. These must be cleaned if visibly soiled.
  - Disinfectant fogging is not a satisfactory method of decontaminating air and surfaces and must not be used.
  - If Viral Haemorrhagic Disease is suspected, disinfect and dispose burn all materials used in patient care.
  - Special terminal cleaning procedures may be indicated for certain organisms, e.g. *Clostridium difficile* or diarrhoeal outbreaks. In such cases, thorough cleaning and disinfection with a disinfectant known to be effective against the micro-organism in question should be performed. Attention should be paid to frequently touched surfaces such as doorknobs, call bell pulls, taps, and wall surfaces, which have been frequently touched by the patient.
  - Leave room at least for an hour before the next admission

In general, no special cleaning techniques are required for rooms that have housed patients for whom additional precautions were in place.

### **Patient care equipment's**

- Contaminated, reusable critical items or patient care equipment should be cleaned and sterilized. Semi-critical patient care equipment should be cleaned and sterilized or disinfected after use to reduce the risk of transmission of micro-organisms to other patients.
- Non-critical equipment contaminated with blood, body fluids, secretions or excretions should be cleaned and disinfected. Contaminated disposable (single-use) patient care equipment should be disposed of according to the institutions' policy and applicable regulations
- Remove and dispose of PPE and perform hand hygiene as appropriate.

## Cleaning soiled and contaminated cleaning equipment

Wet cloths and mop heads are highly contaminated with microorganisms; the following are recommended

- Wash cleaning buckets, rags, brushes and brooms with detergent and water.
- Rinse with clean water
- Soak cleaning equipment, in 0.05% chlorine.
- Rinse with clean water.
- Dry thoroughly before re-placing them upside down. Never store wet mops in their storage area.

Table 7: Schedule for environmental cleaning:

Area/Surface	Frequency	Process
Floors	Thrice daily or more as needed	Use a clean wet mop and fresh detergent solution. A disinfectant cleaning solution should be used when contamination is present.
Sinks	Daily or more often as needed	Scrub with a separate, cloth or brush and a disinfectant cleaning solution
Toilets and latrines	Daily or more often as needed	Scrub with a separate mop, cloth or brush and a disinfectant cleaning solution.
Lamps, chairs, table tops and counters	Daily or when visibly dirty	Damp dusting- wipe with a cloth dampened in a fresh detergent solution
Walls, windows, ceilings and doors	Weekly or when visibly dirty	Spot clean using a damp cloth- wipe with a cloth dampened in a fresh detergent solution.
Procedure and Examination rooms	After every procedure and whenever visibly soiled	Wipe horizontal surfaces, equipment and furniture used for the procedures with a disinfectant cleaning solution. Linen or paper on the examination table should be changed after each patient.

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## 7.2 Pest control:

Cockroaches, flies, maggots, ants, mosquitoes, spiders, bedbugs, lice, mites and mice are among pest populations found in health-care facilities. Insects can serve as agents for the mechanical transmission of microorganisms, or as active participants in the disease transmission process by serving as a vector.

Although insects carry a wide variety of pathogenic microorganisms on their surfaces and in their gut, the direct association of insects with disease transmission (apart from vector transmission) is limited. Apply the following guidelines;

- Conduct regular inspections to detect the presence of pests in the facilities.
- Arthropod and vertebrate pests should be eradicated from all indoor environments, including health-care facilities.
- Eliminate food sources, indoor habitats, and other conditions that attract pests.
- Use pesticides for indoor fumigation to eradicate pests.
- Sealed windows like mesh wires in health-care facilities helps to minimize insect intrusion. When windows need to be opened for ventilation, ensuring that screens are in good repair and closing doors to the outside can help with pest control.
- A pest-control specialist with appropriate credentials can provide a regular insect-control program that is tailored to the needs of the facility and uses approved chemicals and/or physical methods.

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## CHAPTER 8

### 8.0 SUPPORT SERVICES

#### 8.1. Management of linen and textile

Linen refers to all reusable textile items that require cleaning and disinfection via laundry processes. This include bed linen, blankets, curtains, patient and staff clothing. Healthcare facilities soiled linen may be contaminated with microorganisms, however, the risk of disease transmission is negligible if it is handled, transported and laundered appropriately to avoid dispersal of microorganisms.

Infection in laundry workers after handling soiled linen has rarely been reported, and is usually ascribed to improper handling practices. If the provision of laundry services is outsourced, it is important that the IPC team should be involved in the contract- setting process for provision of such services.

Linen processing consists of all the steps required to:

- Collect
- Transport
- Sort
- Wash, dry, press and fold or pack
- Storage and delivery of clean linen

Regardless of where the soiled/dirty linen is processed, the following infection prevention and control recommendations must be applied.

#### **General guidelines in handling linen.**

- All laundry units must have:
  - Separate areas for sorting dirty/soiled linen, washing, drying, pressing, folding and storing.
  - Adequate ventilation (6 to 10 air change per hour)
  - Physical barriers (walls) between the clean and soiled linen areas
  - Sufficient containers/drums/laundry carts for the separation and soaking of used and soiled linen
  - All wards/service points must have two separate laundry carts for dirty and clean linen
  - Laundry and all wards/service points must have a daily updated inventory of linen
- Laundry staff must be trained in IPC and operation of laundry machines.
- Health care facility managers and supervisors should ensure that there are four (4) linen per bed for use in the different sections.

- 
- All units/wards should have separate laundry bags/cart for clean and soiled linen, which are appropriately labelled.
  - Wear appropriate PPE when handling linen

### **Collecting and sorting of linen**

- Place soiled linen in impervious (leak-proof) bags immediately on the unit/ward and transport to the laundry unit in an appropriate laundry cart.
- Linen should be handled as gentle as possible and with minimum shaking to prevent the spread of micro-organisms in the environment
- Soiled linen must be put in a linen bag or container with lids and should be marked
- Soiled linen should not come into contact with carrier's clothes or body during transportation.
- Do not sort soiled linen on the ward or patient care areas.
- Wear appropriate PPE when handling linen.

### **Laundering (washing) linen**

The laundering process is designed to remove organic soil and render the linen incapable of transmitting infections. No microbiology standards exist to define "safe" levels of bacteria in textiles because of the variability in microbial survival, degree of soiling, specific laundering techniques, fabric content, and ability of various organisms to adhere to certain fabrics. Manual washing of all healthcare facility linen is discouraged, but if this has to be done, specific guidelines should be followed.

## **Methods of Washing Linen**

### **Machine Washing**

- Wash heavily soiled linen separate from non-soiled linen.
- Adjust the temperature and time cycle of the machine according to manufacturer's instructions and the type of soap or other washing product being used.
- Linen must be washed separately from other linen.
- Both cold and hot water washing cycles that include bleach reduce bacterial counts in the linen.
- When the wash cycle is complete, check the linen for cleanliness.
- Rewash if it is dirty or stained (Heavily soiled linen may require two wash cycles).

### **Manual Washing**

- Wash soiled linen separate from non- soiled linen.
- Wash the entire linen in water with liquid/tablet/powdered soap to remove soiled materials.
- Use warm water if available.

- 
- Add Sodium Dichloroisocyanurate (NaDCC) to water to make 140 p.p.m. solution (refer to the dilution chart in appendix).
  - Check the item for cleanliness. Rewash if it is dirty or stained.
  - Rinse the item with clean water.

### **Drying, checking, pressing, folding, storage and transportation of linen**

#### **The procedure is the same for both manual and machine-washed linen.**

- Completely machine dry before further processing, if air-dry use direct sunlight, keep the fabric off the ground, away from dust and moisture.
- Check for holes and threadbare areas when linen is totally dry. Discarded or repaired item before reuse or storage.
- Iron linen before it is folded. If sterile linen is required, prepare and sterilize in wrapped packs.
- Once processing is complete, clean linen should be handled as gently as possible and stored in a covered area.
- A cart labelled “clean” should be used to transport processed linen.
- Surgical gowns and linen used in sterile procedures should be washed separately, dried, checked, ironed, folded and sent to **CSSD** for packing and sterilization.

### **Safety for laundry workers**

- Workers should use appropriate PPE.
- Heavy duty/utility gloves, should be washed after use, allowed to dry. Discarded gloves if punctured or torn.
- Hand washing facilities should be readily available.
- Personnel should wash their hands whenever gloves are changed or removed.
- Staff in wards should check sharps and other items when placing used linen in bags/carts.
- All staff, including laundry workers should be trained in procedures for handling of soiled linen.
- Laundry workers, as other health care workers, should be offered immunization against Hepatitis B and schedule must be followed.
- Laundry personnel should be responsible for the collection and delivery of soiled and clean linen.
- Injuries from sharps should be reported to the office of OHS and post-exposure followed

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## Administrative controls:

The following guidelines must be put in place

- All linen should be labelled for identification
- Each ward or unit should have its own inventory of linen
- Torn linen should be replaced or repaired
- Laundry staff should have a record of linen that is delivered indicating Date, Time, Ward, Amount of linen and the person delivering
- A similar record should be completed upon collection of linen from the laundry.
- All laundry machines should undergo periodical checks and preventive maintenance
- Personnel should make sure that they use the correct detergent into the machine

## 8.2 KITCHEN AND CATERING SERVICES

The kitchen is a restricted area; therefore, only authorized personnel should have access into it. Proper food handling is necessary for the prevention contamination and of foodborne diseases. All food- handling operations, including cooking and distribution, requires attention to raw materials, personal hygiene, kitchen hygiene and time/ temperature control. All food service staff should comply with guidelines on standard precautions, follow established dress codes and use appropriate barriers when preparing, transporting and serving food.

### Food safety guidelines

#### Personal and Hand hygiene

Contaminants found in soil, water, animals, and people can be carried on hands, wiping cloths, equipment, and utensils and can be transferred from these items to food.

- Kitchen should always have change room, bathroom and toilets. These must always be kept clean.
- Hand washing is mandatory when handling food and equipment.
- Hand washing should be performed after using the toilet.
- **Bathing before handling food is mandatory**
- The food handlers should always be in full PPE such as headgear, apron, safety boots
- All food handlers must use white uniform

#### Environmental cleaning

- Thoroughly clean all food preparation surfaces and equipment used for food preparation before after use.
- Protect the kitchen and food from insects, pests, and animals.
- Cleaning, dishwashing and disinfection procedures should be strictly followed and monitored.

- 
- Vendors should ensure the safety of food products during transportation and allowed into the kitchen

## Food storage

Raw foods may contain dangerous microorganisms that can be transferred to other foods during preparation and storage. Food stores should be clean, uncluttered and with good access to allow cleaning. No items should be stored on the ground. There must be sufficient space under shelves to allow cleaning. Shelves should be made of materials that is easy to clean.

## Storage Guidelines

- Separate raw meat and poultry products from other foods.
- Use separate equipment and utensils, including knives and cutting boards, for raw foods.



Figure 13 – colour of chopping boards

- Store prepared food separate from raw food.
- Maintained a daily temperatures log, cleaning schedule and routine inspection of contents of food storage fridges.
- Label food products with expiry dates and apply first in first out rule.

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**Kitchen refrigerator are restricted to food storage only.**

It is important to cook food thoroughly, especially meat, poultry products and eggs

Serve cooked food whilst hot at temperature greater than 60°C.

Food should be transported in covered containers.

Kitchen staff should do a head count of patients in the wards before food preparation.

**Precautions for food Handlers**

- No eating, drinking or smoking is permitted in food preparation area (Kitchen).
- Staff with communicable diseases- skin infections, respiratory infections and or gastrointestinal infections should not work in food handling units until they are cleared by a physician to resume work.
- Food borne or suspected food-related illness in food handlers or client should be reported to the IPC Focal Person for it to be investigated.
- Conduct six monthly routine medical check-ups for food service staff.

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## 8.3 LAST OFFICE AND POST- MORTEM CARE

The overall principle of after-death procedures is to present the body in an acceptable state for the bereaved to pay their last respects and to proceed with their after-death procedures or ceremonies.

The risk of transmitting infection from the dead is less than that from the living patients even if the death was from a communicable disease because the deceased person is no longer sneezing, coughing or breathing.

As a rule, standard IPC precautions should be continued after death because there is a risk of transmission of infectious diseases resulting from activities in the mortuary such as; body bathing, embalming and autopsy. All health care workers must adhere to IPC precautions at all times when handling dead bodies.

In addition, staff should advise relatives of the precautions they should follow when viewing and/or having physical contact with the deceased and when this should be avoided.

### Guidelines for handling dead bodies

- Wear appropriate PPE
- Where there is a danger of infection, a notification concerning additional IPC precautions should be attached to the body and the outside of the body bag in a way that is clearly visible with the identification form.
- The workrooms of Mortuary Attendants must be of acceptable standards according to local regulations.
- Eating, drinking, and smoking should be avoided in the mortuary and this must be adhered to.
- Staff with broken skin or lesions should report to their supervisor and *must* use impermeable waterproof dressings to cover the lesions.
- Training should be organized for all people who handle dead bodies including mortuary staff and undertakers.

### Recommended PPE for handling dead bodies:

- Reusable long-sleeved, cuffed gown.
- Water proof apron.
- Non sterile gloves/utility gloves.
- Mask
- Goggles
- Headgear

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## **Routine preparation of the body after death includes**

- Washing the body,
- Closing the eyes and mouth
- Plugging all orifices to prevent discharges  
covering wound with clean dressing.

NB: Embalming should be avoided in patients with infectious diseases

## **Transportation of dead body to the mortuary**

- Use appropriate PPE.
- Transfer to the mortuary should occur as soon as possible after death
- Cover the dead body with a shroud.

NB If the person has died of a communicable disease notification should be given to the mortuary staff.

## **Storage of dead bodies**

It is necessary that the dead body must be kept in cold conditions to prevent decomposition. If refrigeration is not available, the body can be kept cool using a cold table and installing fans. Store dead bodies at a temperature range of between 2°C to 4°C.

## **Post mortem care**

Post mortem examinations and collection of samples are essential to ascertain the cause of death. These procedures are associated with risk of transmitting infections and should be performed only when necessary and safety measures should be followed.

## **The following are some safety precautions**

- A minimum number of 4 should be involved in the procedure.
- The room should be well-ventilated.
- Appropriate PPE should be used.

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## CHAPTER 9

### 9.1 LABORATORY AND BLOOD BANK BIOSAFETY

Staff working in clinical laboratories and research units are at great risk of accidental injury or exposure because they handle potentially contaminated specimens from sick and seemingly well patients. These healthcare workers need to be aware of the potential hazards of these infectious agents and materials and know how to protect themselves, fellow workers and the environment.

This section describes the appropriate containment equipment, PPE and procedures to be used by laboratory staff at all times to reduce laboratory acquired infections. Laboratory biosafety involves containment principles, technologies, and practices implemented to prevent unintentional exposure to pathogens and toxins, or their unintentional release. Laboratory biosecurity involves protection, control and accountability for valuable biological materials within laboratories, in order to prevent their unauthorized access, loss, theft, misuse, diversion or intentional release.

Infections in the laboratory can be caused by pathogens being inhaled in aerosols when snap closing specimen containers, dispensing or pipetting infectious fluids and pathogens being ingested from contaminated hands. The biosafety guidelines are designed for the prevention of laboratory-acquired infections in general hospital settings. They are aimed at containing the biohazardous agents and educating laboratory workers about the occupational risks.

Biosafety level (BSL) guidelines function at four levels of increasing risk. (BSL-1 to BSL-4) The recommendations cover safe work practices, laboratory design, the use of appropriate personal protective equipment and waste management. Adherence to these biosafety guidelines reduces the risk of exposure and subsequent laboratory-acquired infections.

#### **Exposures to infections in the laboratory can be through:**

- Inhalation
- Ingestion
- Puncture wounds
- Contamination of skin and Mucous membranes

General Biosafety and IPC Guidelines are at three:

#### **Administrative Controls**

- Risk assessment
- Staff practices through availability of SOPs

- 
- Hand hygiene
  - Masks
  - Staff Training and Laboratory workflow of work procedures

### **Engineering Control**

- Spacious and well-ventilated rooms
- Hand washing facilities

### **Provision of proper PPE**

#### **General biosafety and IPC guidelines**

- Wear examination gloves when handling blood, body fluids and/or specimens containing pathogenic microorganisms.
- Do not eat, drink or smoke in the laboratory.
- Food should not be stored in refrigerators used for clinical or research specimens.
- No mouth pipetting is permitted; 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.
- Clean and disinfect work surfaces daily or when contaminated, such as after spills
- Wear protective face shields or masks and goggles if splashes and sprays 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 plastic bags or containers.

#### **Role of the Clinical Laboratory in IPC**

The clinical microbiology laboratory is an important arm of hospital IPC committee for effectiveness of an IPC program.

- Conducts antimicrobial resistance and accurate susceptibility testing.
- Specimen analysis to identify HAIs.
- Outbreak identification and investigation:

- 
- Alerting IPC team and clinical teams about new or unusual emerging organisms
  - Environmental sampling:
  - Analysis of specimen during occupation health activities such as; healthcare vaccination, post exposure prophylaxis.
  - Notification to IPC and clinical team if the cluster of infection is observed in the facility
  - Quarterly testing of healthcare facility water

## **Blood Safety**

Transfusing patients with blood and blood products is one the medical and surgical remedies. Malawi recommends that, at a minimum, screening of all blood donations to make transfusions safe should be mandatory for the following infections.

- HIV-1 and HIV-2: screening of both antigens and antibodies.
- Hepatitis B and Hepatitis C
- Syphilis (*Treponema pallidum*)
- Malaria antigen test
- Trypanosomiasis where Tsetse flies are endemic like Nkhota- kota and Chikwawa

Health workers working in Blood Banks and those giving the transfusions must be aware of risks with blood transfusion. Although there are high quality assays and systems available, the screening process cannot be considered to be totally effective. The presence of an infectious agent in a donation may not be detected due to:

- The collection of the donation during the window period of infection
- Poor assay sensitivity
- Laboratory error
- Inadequate quality management systems
- A prospective blood donor being infected with an infectious agent for which donations are not routinely screened.

### **To achieve the best results, the following guidelines should be followed**

- Accurate selection and retention of non-remunerated blood donors
- Accurate documentation of blood donor information
- Adherence to blood bank SOPs

- 
- Use test kits that have been approved by government of Malawi
  - Routine equipment maintenance
  - Processing and storage of blood according to national guidelines.

**Blood transfusion complications and HAIs can be prevented by**

- Avoiding unnecessary transfusions
- Screening all potential donors to minimize bloodborne infection (e.g., syphilis, HBV, HCV and HIV).
- Ensure that donor blood is collected aseptically. (Use a closed system to minimize contamination, and all steps in processing the blood are accomplished within this closed system).
- Storing blood and blood products at the correct temperature. Blood has an expiration date
- Avoid transfusing expired blood products.
- Taking all necessary steps to ensure that donor and patients' blood are compatible in terms of ABO grouping and Rh and that unexpected clinically significant antibodies in the donor's or patient's blood have been identified.
- Verifying that all information matching the blood with the intended recipient has been verified to prevent possible mistakes that could harm the patient.
- Following aseptic techniques during peripheral venepuncture when transfusing.
- Monitoring patient's vital signs during transfusion
- Immediately stopping transfusion when adverse reaction occurs
- Providing PPE to health workers.

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## CHAPTER 10

### 10.0 DENTISTRY

Dentistry is predominantly a surgical discipline, whose routine work is in an environment which is naturally wet and teeming with microorganisms not only from the oral cavity but nasopharynx, upper and lower respiratory tract. Dentists operate mainly in oral cavity with dental plaque as a major source of micro-organisms. (There are more than 700 known pathogens including HBV, HBC, HIV, Mycobacterium tuberculosis and staphylococci).

Infection risk in dentistry include

- Direct exposure caused by gingival crevicular fluid, debris from tooth preparation, and dental materials aerosolized during dental procedures and close proximity to the patient's oropharyngeal secretions.
- Droplet and aerosol-generating procedures such as the use of rotatory dental, surgical instruments, handpieces or ultrasonic scalers and air-water syringes which create a visible spray of water that can contain saliva, blood, microorganisms, and other debris.
- Contact transmission from splatters created during oral surgery procedures that may contaminated the environmental surfaces.

In most dental settings, breakdowns in basic IPC practices include unsafe injection and failure to heat sterilize dental handpieces between patients. It is therefore important to make IPC a priority.

#### **Aseptic Technique in the Dental Setting:**

It is a fundamental component of IPC/WASH in the practice of dentistry. These techniques help to break the cycle of infection and to eliminate cross-contamination. Practicing hand hygiene between patients and using appropriate PPE are vital in ensuring infection prevention.

#### **Rubber Dam:**

A rubber dam is primarily used to isolate a tooth or teeth and to keep them dry during a dental procedure. The routine use of a rubber dam provides an effective barrier for both dental HCWs and patients. Rubber dams and high-volume evacuation also minimize potential spatter during treatment and whenever the dental HCW has come in direct contact with patient's oral mucosa.

#### **Sterilization of Dental Handpieces:**

Processing of handpieces in sterilizer ensures that external surfaces are sterilized but for effectiveness of sterilization of internal structure, further thermal disinfection is required. Follow manufacturer's instructions for handpiece optimal care. When purchasing new hand pieces, ensure that they can withstand thermal disinfection and steam sterilization.

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### **Design of dental unit:**

The dental unit must be equipped with the necessary physical plant and equipment such as dental chairs, suction unit. The department must have its own Operating room, CSSD, Radiology and laboratory for dentures

### **IPC consideration in dental services:**

- Ensure that there is a separate sink for hand washing in all service areas
- The sink should not have a plug or an overflow and must be fitted with a remote running trap (i.e. the U bend is not directly under the plughole);
- A tap must run into the sink basin and not straight down the drain to avoid aerosol from the drainage system splashing back onto the user.
- If wall-mounted non-antimicrobial liquid soap dispensers are used. Ensure that the nozzle is kept clean.
- Do not use refillable containers as bacteria can multiply within these products and are therefore a potential source of contamination
- Monitor adherence of staff to IPC guidelines and dental SOPs

### **Dental instrument processing:**

#### **Classification of Dental Instruments:**

Dental instruments are classified into three categories—critical, semi-critical, or noncritical—depending on their risk of transmitting infection and on the need to sterilize them between uses (refer to Table on Spaulding’s classification).

**Critical:** These devices include forceps, scalpels, bone chisels, scalers, burrs, etc.

**Semi-critical:** Instruments that touch mucous membranes, but do not touch bone or penetrate tissue such as mirrors and amalgam condensers.

**Noncritical:** Equipment and environmental surfaces that come into contact only with intact skin such as components of dental x-ray.

#### **Disinfecting Heat-Sensitive or Permanently Attached Items**

- Cover these components with impervious barriers that are changed after each use.
- Carefully clean and then disinfect them with a chemical germicide according to manufacturer’s instructions.

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**Dental Laboratory:**

- Clean and disinfect materials and other items that have been used in the mouth, such as impressions, bite registrations, fixed and removable prostheses, and orthodontic appliances, before and after handling them in the laboratory
- Adhere to IPC protocols and guidelines when working in the Laboratory

**Dental Radiology:**

- Follow IPC standard precautions when taking radiographs
- In preparation for exposing periapical radiographs, place a polyethylene bag over the tube head to protect it from contamination when it is positioned for various exposures
- The exposure control switch should be protected with a plastic covering if a foot-activated switch is not available
- Remove and discard the gloves and process the non-contaminated film in the darkroom
- Lead apron should be used by both the patient and healthcare worker

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## CHAPTER 11

### 11.0 PREVENTION OF HEALTHCARE ASSOCIATED INFECTIONS

Health care associated infections (HAIs) is an infection that is contracted from the environment or staff of a health care facility by patients when receiving care. These infections are not present or incubating at time of admission. To identify HAIs, a timeframe for onset of an infection must be defined to differentiate an HAI from an infection acquired in the community. The Centre for Disease Control and Prevention (CDC), defines HAIs as infections that begin on or after Day 3 of hospitalization (the day of hospital admission is Day 1), or on the day after discharge (CDC 2018).

Health care-associated infections are the most frequent adverse events in health care delivery systems worldwide. They are a major cause of preventable diseases, deaths, and higher health care costs. Many HAIs are caused by microorganisms that are present on the patient's body (resident flora) or from transient sources such as HCWs' hands, contaminated equipment, or the environment. The spread of these organisms usually results from breaches in compliance with Standard Precautions, such as inadequate hand hygiene and environmental cleaning, lapses in disinfection and sterilization, and incorrect use of personal protective equipment, as well as inappropriately applied Transmission-Based Precautions, namely Contact, Droplet, and Airborne Precautions. Such breaches result in transmission of infections to and from patients (WHO 2016).

These HAIs occur globally and affect both developed and under developed countries. They are among the major causes of increased morbidity and mortality among hospitalized patients. HAIs results in prolonged hospital stay which increases the cost of service delivery by putting pressure on finances, medications, food and utilities.

The true burden of HAIs in LMIC including Malawi is unknown due to scarcity of microbiological data, inaccurate patient records, lack of electronic medical records and inadequate surveillance systems to track HAIs. From the limited surveillance that has been conducted in LMIC, it has been estimated that for every 100 hospitalized patients, 10 to 15 acquire at least one HAI. This compares to five to seven HAI patients for every 100 hospitalized patients in high-income countries.

#### **HAIs of public health concern in many settings include:**

- Blood stream infection, including central line-associated bloodstream infection (CLABSI)
- Surgical site infections (SSI)
- Urinary tract infection (UTI), including catheter associated urinary tract infections (CAUTIs)
- Hospital acquired pneumonia including Ventilator Associated Pneumonia (VAP)
- Infectious Diarrhoea and Clostridium difficile infections

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## **Factors contributing to Health Care-Associated Infections:**

Anyone can acquire an HAIs while receiving care but certain patient groups are at higher risk such; new-borns, elderly patients, and patients with underlying diseases that compromise their immune systems and make them chronically ill, such as HIV).

There are many factors associated with the occurrence of HAIs at a health care facility, including the infrastructure, available resources, staff compliance with IPC standards, and the type of patients treated.

## **Factors found to contribute to HAIs in LMIC include:**

- High patient-to- healthcare worker ratio
- Bed space less than 1 meter (3 feet) apart
- Low compliance with hand hygiene practices
- Lack of resources including rooms for isolation or cohorting (grouping together patients with the same infection)
- Lack of trained IPC practitioners and limited opportunities for staff training
- Increasing use of complex medical and surgical procedures
- Increasing use of invasive medical devices (e.g., mechanical ventilators, urinary catheters, central intravenous lines) without proper IPC training or laboratory support
- Inadvertent contamination of prepared supplies/pharmaceuticals (e.g., IV fluid, general medications)
- Suboptimal cleaning, disinfection, and sterilization practices
- Antibiotic resistance due to overuse of broad-spectrum antibiotics (Allegranzi et al. 2011)

## **Interventions to Prevent Health Care-Associated Infections**

Understanding the disease transmission cycle is a cornerstone in the prevention and control of infections. Knowledge about ways to break the disease transmission cycle can assist health care facilities in putting together prevention strategies to stop the spread of infections.

## **Key interventions for prevention of HAIs include:**

- Establishing systems to track targeted HAIs in a health care facility and sharing data with the staff and program managers
- Having dedicated staff for IPC and tracking of HAIs

- 
- Fully adhering to recommended general IPC practices, including Standard Precautions, Transmission Based Precautions, and hand hygiene.
  - Implementing interventions which target specific HAIs

## 11.1 INTRAVASCULAR DEVICES- RELATED INFECTIONS

These infections are also known as central line associated bloodstream infections (CLABSI) and peripheral vascular associated bloodstream infections. CLABSI and occurs commonly in Intensive Care Unit (ICU) and high dependence areas due to the invasive procedures.

Intravenous devices are an integral part of patient care. They provide a route for administering fluids, blood products, nutrients, and IV medications. They are also used for monitoring hemodynamic function and for maintaining vascular access in an emergency. The term intravenous catheter is used interchangeably with intravenous devices.

Intravenous catheters can cause catheter related blood stream infections by enabling microorganisms to gain direct access to the blood stream. Vascular catheter care needs to be optimized to prevent these infections. Amongst others, the infection associated with IV lines is one of the most common infective complications resulting in;

- Extra days of hospitalization
- An increase in mortality

The contamination of IV catheters can occur before use i.e. during device or IV fluids production, faulty sterilization or damage during manufacture or storage. Contamination may also be introduced during therapy and can occur due to;

- Contamination of the IV catheter at the time of insertion
- Break in aseptic technique during drug administration and insertion, mixture or administration of the IV fluid
- Contamination of part of the administration system
- Catheter contaminated with the hands of the operator

However, the most important reservoirs of microorganisms causing infections are the **insertion site** and the **device hub**.

- Procedure for insertion of peripheral venous
- Procedure for Inserting IV Catheter refer to annex

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## **General Measures for Prevention of Vascular Catheter Infections :**

In ensuring prevention of intravascular infection, the following measures should be taken:

- IV therapy must be prescribed by authorised health practitioner. The prescription must include the type of solution or medication, rate of infusion, duration, date, and time.
- Ensure that infusion fluid is free from contamination – no cloudiness, no sediments and not expired.
- Use aseptic technique during insertion of the catheters (hand disinfection, non-touch technique and use of sterile gloves).
- Selection of the catheter type, insertion technique and insertion site should be based on its association with lowest risk of complications for the anticipated type and duration of intravenous therapy.
- The insertion site should be disinfected with alcohol base antiseptic.
- Use sterile supplies for all invasive procedures such as cannula, needle, etc.
- Insertion site must be covered with sterile dressing as soon as possible.
- The infusion set and site of intravascular catheter must be changed after 72 hours.
- Keep infusion site clean, dry, free from contamination and well secure.
- Inspect I.V site daily and remove or reposition the device when signs of infection are noticed.
- Close injection ports that are not needed with sterile stopcocks.
- Change feeding, blood and blood products giving sets immediately after use.
- Dispose infusion sets and any remaining fluid when infusion is replaced or discontinued.
- Catheter needles should be disposed in sharp containers.

## **Central Venous Catheters**

- Practice aseptic technique during insertion
- Selection of the catheter type, insertion technique and insertion site should be based on its association with lowest risk of complications for the anticipated type and duration of intravenous therapy.
- Central venous catheter, peripherally inserted central catheter (PICC), haemodialysis catheter should not be routinely replaced to reduce the incidence of infection unless there are any signs of CLABSI, vascular insufficiency and thrombosis.

- 
- Use a CVC with the minimum number of ports or lumens essential for the management of the patient.
  - Cover the site with sterile, transparent, semi-permeable dressings to allow observation of CVC insertion site.
  - A chest x-ray should be done to ascertain the correct positioning of the CVC.
  - Practice strict aseptic precautions while manipulating and or repositioning of devices and accessing catheter.
  - Educate and train health care workers on central line insertion, handling and maintenance to reduce CLABSI rates.
  - Surveillance of CLABSI should be carried out in all critical care units.
  - Inspect catheter site on regular basis for signs of CVC infection and replace dressings that are wet, soiled, or dislodged.
  - Keep records of infections

## **CLABSI CARE BUNDLE**

### **Insertion bundle:**

This is a sterile procedure and all precautions should be followed to maintain sterility

Perform Hand hygiene and have the items enlisted below ready

- Sterile glove
- Sterile gown
- Headgear
- Face mask
- Sterile drape
- 2% chlorohexidine in 70% alcohol for skin disinfection

Make sure to record site, date, time and indication for insertion of the central venous line.

### **Maintenance bundle:**

- Hand hygiene compliance
- Daily review of central line necessity
- Prompt removal of unnecessary lines

- 
- Disinfection prior to manipulation of lines
  - Scrub access port or hub immediately prior to each use with appropriate antiseptic (70% IPA, CHG, provodine)
  - Use aseptic technique to access catheters
  - Replace wet, soiled or dislodged dress (using aseptic technique with sterile gloves)
  - Replace administration sets and needleless connectors
  - Perform daily assessments to determine need for CVL

## **11.2. CATHETER ASSOCIATED URINARY TRACT INFECTIONS:**

Catheter Associated Urinary Tract Infections (CAUTIs) are one of the most common HAIs. The majority of urinary tract infections (UTIs) are associated with the use of urinary catheters. Therefore, urinary catheters should only be inserted when there are clear medical indications. These include, but are not limited to:

- Relief of urinary tract obstructions.
- Urinary drainage in patients with neurogenic bladder dysfunction and urinary retention.
- Urologic surgery or other surgeries on attached/surrounding structures.
- Accurate measurement of output in critically ill patients.
- Radiological investigations.

### **Risk Factors for CAUTI:**

- Duration of catheterization >5 days
- Open drainage systems or break in the closed drainage system
- Failure to adhere to aseptic technique during insertion and maintenance
- Training level, competency and skill of the inserter
- Catheter insertion after 6<sup>th</sup> day of hospitalization

### **IPC strategies in CAUTIs:**

- Have clear clinical indications for catheterization
- Follow aseptic technique and use sterile equipment
- Minimize urethral trauma by using the smallest gauge catheter available

- Allow free flow of urine.
- Urinary drainage bags must not be on the floor to prevent backflow of urine.
- The urinary drainage bag should be put on a holder attached to the bed frame or a stand and should be below the level of the bladder
- Do not perform Bladder irrigation or washout unless it is undertaken on advice of urologist
- Patient should be done on care of catheters and urinary bags
- Healthcare workers should be educated on importance of catheterization, insertion methods and care of indwelling urinary devices

Table 8 – Urinary catheter bundle

Insertion bundle	Maintenance bundle
<ul style="list-style-type: none"> <li>• Verify need prior to insertion</li> <li>• Insert urinary catheter using aseptic technique</li> <li>• Maintain urinary catheter based on recommended guidelines</li> </ul>	<ul style="list-style-type: none"> <li>• Document daily assessment of catheter care</li> <li>• Temper event seal is intact</li> <li>• Catheter secured to patient</li> <li>• Hand hygiene performed before patient contact</li> <li>• Daily meatal hygiene with soap and water</li> <li>• Drainage bag emptied using a clean container</li> <li>• Unobstructed flow is maintained</li> </ul>

### 11.3. SURGICAL SITE INFECTIONS:

Surgical site infections (SSIs) remain the most frequent type of healthcare associated infections (HAIs) in low and middle income countries and the second most frequent type of HAIs in Europe and the US (WHO, 2016). Surgical site infections occur within 3 days of the operation or before the first dressing. However, some infections after prosthetic/ implant surgery may *not* be recognized for weeks or months.

**Surgical site infections** are classified into

- Superficial incisional
- Deep incisional
- Organ/ space SSI.

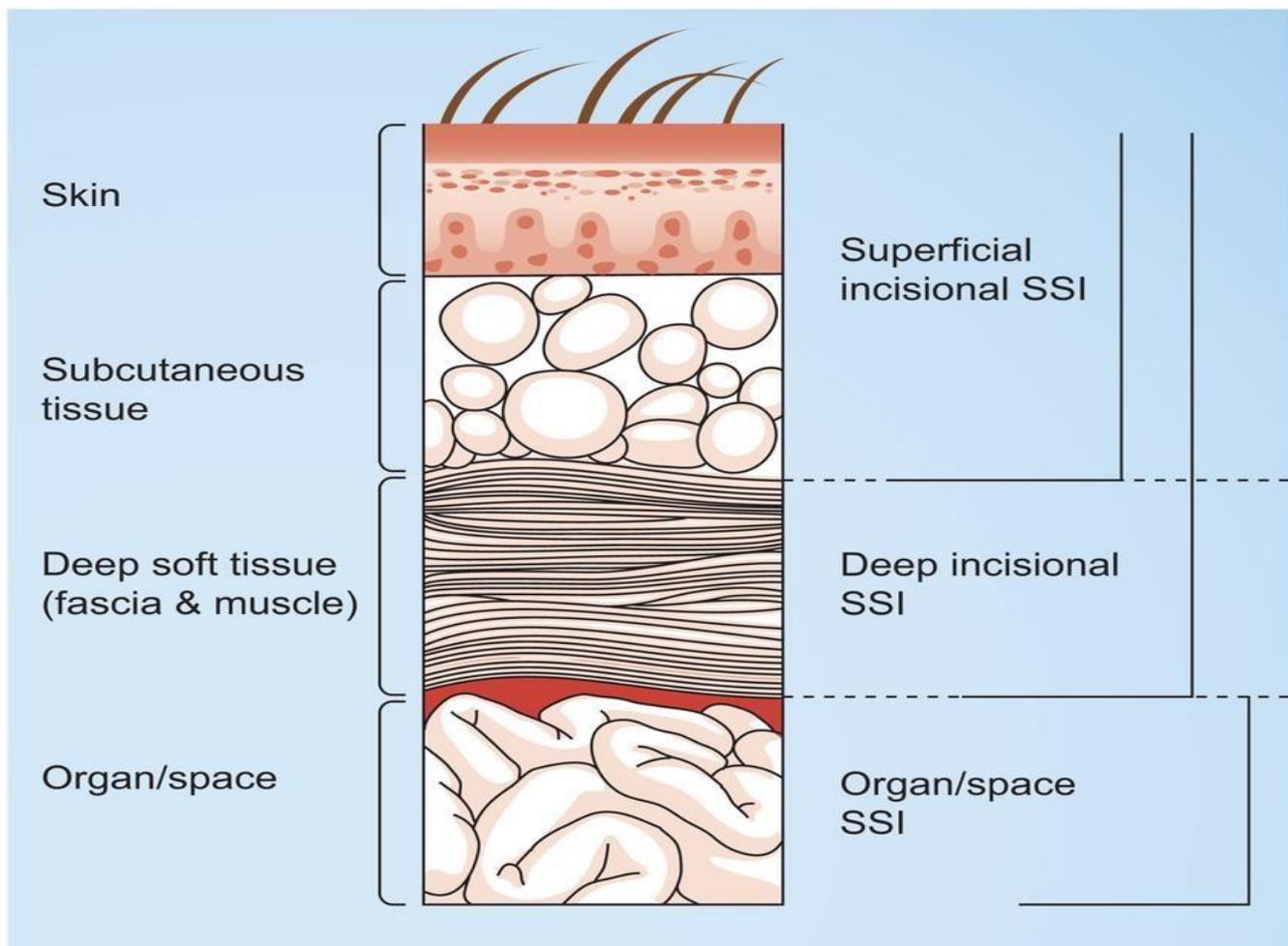


Figure 14 - Classification of surgical site infections

**Risk Factors that Increase Vulnerability to SSI:**

**Patient factors:**

- Age
- Pre-existing infections
- nutritional status
- comorbidities
- immunosuppression

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**Environmental factors:**

- Use of inadequate or non-sterile equipment
- Inadequate skin preparation and care
- Tissue trauma due to poor surgical skill or technique
- Increase traffic into the operating room.
- Inappropriate choice, timing and dose of antibiotic prophylaxis
- Breach in aseptic technique
- Prolonging and pre- and post-operative stay in the surgical ward
- Use of inappropriate wound dressing technique
- Surgical wound categories such as a contaminated or dirty procedure
- Transplant or implants.
- Surgical procedure that may result into haemorrhage or haematomas
- Unsuitable theatre environment such a high temperature levels and unhygienic condition

## General preventive measures of Surgical Site Infections:

### Pre-operative care:

- Antibiotic prophylaxis should conform with the guidelines of the facility.
- Underlying conditions should be treated and stabilized before surgery
- Pre operating shaving should be done with hair clipper immediately before surgery
- Educate and train theatre teams in the prevention of surgical site infections (SSI).
- Control excessive numbers and movements of staff in the operating theatre
- Staff should change into clean theatre clothing (scrub suites) once they enter the theatre area. **Theatre clothing** should be worn outside the theatre.
- Surgical hand scrub should be performed before each patient procedure
- All the patient should take a bath before going to theatre

### Intra operative:

- Ensure all surgical equipment's are sterile.
- Surgery lists should be scheduled based on clinical urgency.
- Patient skin must clean with antiseptic solution using proper technique
- Infected/ dirty cases must be scheduled at the end of the list to allow sufficient time for cleaning, disinfection, and safe disposal of clinical waste.
- Staff working in the OR with bacterial skin infections should *not* be allowed in the or until the lesion is treated and healed.
- Limit the number of personnel entering and leaving the theatre.
- Normal body temperature of the patient must be maintained
- Perform a thorough surgical scrub before the first operation 3 – 5 minutes and subsequent washes between operations for 2 minutes.
- Avoid the use of nailbrushes as they may damage the skin and encourage shedding of squamous epithelial cells from the skin.
- Clean and disinfect all surfaces such as the surgery tables, trolleys between patients.
- Keep the environment clean and adequately ventilated.

## 11.4. Sterile field in Operating room:

### Create and maintain sterile field by:

- Ensure that the surgical team are wearing sterile gowns and gloves.
- Proper skin preparation technique *with friction applied* on intact skin using alcohol base antiseptic solution.
- Using a sterile forceps and gauze soaked in sterile antiseptic solution with a *separate sponge* for each round.
- Cleaning with antiseptic solution from the incision site toward the periphery
- Avoiding pooling of antiseptics used for skin preparations
- Placing sterile surgical drapes around the procedure site and on a trolley that will hold sterile instruments and other items needed during the procedure.
- Items below the level of the draped patient are outside the field and are considered not sterile.

### Maintain sterile environment by:

- Placing only sterile items within the sterile field.
- Not contaminating sterile items when opening, dispensing or transferring them.
- Not allowing sterile personnel to reach across the unsterile areas or touch unsterile items.
- Recognizing the provider's sterile area.
- The edges of a package containing sterile items are considered unsterile.
- Moving only within or around the sterile area or field
- Ensuring unsterile' personnel must *not* touch any sterile items and equipment.
- Using aseptic technique to open sterile packs.
- Not performing incisional wound irrigation before of clean wounds.
- Limiting number of staff in the OR to the maximum of 10.
- Restrict unnecessary entry of personnel in the OR to reduce microbial bio burden.
- Keep the doors to the OR *closed* at all times to maintain positive pressure, and to avoid mixing of the corridor 'dirty' air with the OR 'clean' air.
- Street clothing must be changed for clean OR attire.

- Operating room (OR) scrubs should not be worn outside the OR area.
- Masks should cover the mouth and nose at all times.

### **Operating room PPE:**

All staff scrubbed or non-scrubbed must wear PPE while in the operating room.

The following PPE are recommended:

- Gown which is impermeable with cuffed- wrist, if permeable, then plastic aprons should be worn under gowns which should be cuff length
- Always use sterile surgical gloves to prevent transfer of microorganisms from HCWs to patients during surgery, and for protection against the risk of transmission of blood borne pathogens.
- Used sterile gloves should not be washed or disinfected before disposal.
- All members of the scrub team should wear a *single use disposable fluid- repellent* surgical face mask to protect themselves from blood splatter and aerosolized blood and body and to prevent contamination of both the surgical wound and sterile instrument resulting in surgical site infection.
- A *new* mask must be worn for each operation.
- Masks should be tied securely to fit comfortably and cover the nose and mouth.
- When removing the mask, it should be handled by the strings only and discarded after use.
- Protective eyewear, or face shields should be worn during procedures which are likely to generate droplets and aerosols of blood and body fluids to prevent exposure of the mucous membranes of the mouth, nose, and eyes.
- All members of staff entering the theatre must wear their hair in a neat style with hair completely covered by a close-fitting cap.
- Beards should be fully covered by a mask and a hood of the balaclava type, which is tied securely at the neck.
- Footwear should be enclosed to protect HCWs from fluids, accidentally dropped sharps and other contaminated items. Open footwear must *never* be worn in the OR. **Plastic shoe covers** should *not* be used for protecting footwear.

### **Environmental cleaning in OR:**

- Environmental cleaning of the OR must be done following the guidelines of cleaning between procedures and terminal cleaning.

- Used equipment (stools, tables, trolleys, monitors) should be cleaned using warm water and detergent preparation. All high touch surfaces like operating table and instrument table should be cleaned and disinfected.
- The floor of the OR should be cleaned with a detergent preparation at the end of each session, and scrubbed daily at the end of the list.
- Routine use of disinfectant is required in the removal and disinfection of blood and high-risk body fluids. Spillages on the floor should be cleaned as soon as possible.
- Walls should be cleaned at the end of the day.
- Ceilings are rarely heavily contaminated and for general housekeeping purposes, they should be cleaned monthly or when it is visibly soiled.
- Lint- free (fur- free) cloth is recommended for operating theatre cleaning.

### **Postoperative Care:**

- Minimize post-operative stay in hospital unless it is for medical reasons.
- The patient should be cared for in a clean environment to protect them from colonization with microorganisms.
- Wound dressing must be done using aseptic technique and dressings should not be opened before 48 hours postoperatively unless infection is suspected.
- Restrict postoperative antibiotics to clinically indicated cases only.
- For infected cases, appropriate antibiotics should be given as treatment based on the local guidelines.

**Table 9: Care bundle for surgical site infection**

Preoperative phase	Intraoperative phase
<ul style="list-style-type: none"> <li>• The patient has showered (or bathed/washed if unable to shower) preoperatively using soap</li> <li>• If hair removal is essential, it is removed using clippers not by shaving using razor blade and timed as close to the operating procedure as possible</li> <li>• Appropriate prophylactic antibiotics were administered within 20 minutes prior to incision while <i>considering the half- life</i> of the antibiotic</li> <li>• All jewellery, nail polish, and artificial nails should be removed.</li> <li>• Surgical team should perform a surgical scrub before each operation</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure all surgical items and equipment are sterile</li> <li>• Maintain asepsis throughout the surgical procedure</li> <li>• Prepare patient's skin with appropriate antiseptic solutions and allow to air dry. Where applicable ask about sensitivity</li> <li>• Limit the number of people and doors being opened</li> <li>• Maintain normothermia, measure core body temperature, and maintain active warming (unless the active cooling is part of the procedure)</li> <li>• Maintain room temperature of 24°C</li> </ul>

**SSI care bundle:**

**C – Clippers**

**A – Antibiotic prophylaxis**

**T – Maintain normothermia pre, intra and postoperatively**

**S – Maintain blood glucose**

**11.4. HOSPITAL- ACQUIRED PNEUMONIAS**

Hospital-acquired pneumonia (HAP) is a respiratory infection developing 48hours or more after hospital admission. If the HAP is associated with mechanical ventilation, it is termed as ventilator- associated pneumonia (VAP). Some causes of HAP are extreme age, impaired immunity, mechanical ventilation, immobility/positioning, sedation, lack of oral care, foreign body, contaminated instruments, e.t.c.

Clinical features for the diagnosis of HAP are based on three main features;

- Systemic signs of infection
- New or worsening pulmonary infiltrates
- Bacteriological evidence of infection supplemented by other investigations (WBC, chest x-ray)

These criteria can be combined with direct bronchoscopy assessment, if possible. Current surveillance data of HAP are mainly collected on VAP and as a result the true incidence HAP in non-ventilated patients is grossly underreported. The risk of HAP increases in patients on mechanical ventilation than non-ventilated patients. It is estimated that the presence of VAP increases hospital stay which attributes to mortality. IPC interventions have been known to reduce VAP.

### **Strategies to Prevent HAP:**

- Education and training of staff to promote implementation of evidence-based IPC practices
- Early mobilization of patient to achieve better patient outcomes after surgery, and in ICU.
- Preoperatively, patients should be encouraged to stop smoking.
- Treatment of any existing infection should be done promptly
- Teach coughing exercises and breathing techniques pre and postoperatively.
- Administer appropriate analgesics to control postoperative pain.
- Clean and disinfect all respiratory equipment to prevent cross infection.
- Antibiotic stewardship program must be implemented to reduce costs, prevent adverse side effects and the emergence of Multi-Drug Resistant Organisms (MDRO).
- Remove all unnecessary items around the patient to help ease cleaning and/ or disinfection of the environment, items, and equipment.
- Keep patient's surrounding area clean, dry, and dust free at all the times.
- Nurse patients in semi-recumbent position by elevating the head of the bed to a 30– 45° angle provided there is no contraindication.
- Interrupt daily sedations to assess patient's readiness for extubation.
- Conduct regular oral care every 6 hours for patients who are receiving mechanical ventilation.

**Table 10. VAP care bundle:**

Head of bed elevation 30 or 45 degrees unless contraindicated
Daily oral care with chlorhexidine (Add percentage)
Chlorhexidine rinse every 12 hours (Add strength)
Sedation protocol ordered
Sedation vacation documented
Cuff pressure of ETT documented BD daily
Daily sedation interruption and daily assessment of readiness to exudate
Prophylaxis for peptic ulcer disease
Prophylaxis for deep vein thrombosis

**Summary:**

The burden of HAIs in LMIC is very high. HAIs negatively affect the health system and the patient by causing longer stays in health care facilities and increase the cost of care. Efforts to prevent HAIs will help to reduce health care costs, save staff time, reduce morbidity and mortality among patients, and improve the quality of care and health outcomes.

## CHAPTER 12

### 12.0 SURVEILLANCE OF HEALTHCARE ACQUIRED INFECTION AND AMR

Surveillance is defined as an ‘ongoing systematic collection, analysis and interpretation of health data essential for planning, implementation and evaluation of public health practice (Dramowski, 2016). Surveillance of healthcare- associated infections (HAIs) is important in evaluating the effectiveness of IPC/WASH measures and is the foundation for an effective IPC program in the healthcare facilities. Surveillance methods should be flexible enough to accommodate changes within healthcare facilities.

Ministry of Health, in collaboration with relevant key stakeholders should develop a national HAIs surveillance system which comprises definition of which types of HAIs to monitor as well as related protocols and tools. The surveillance system allows for reporting of outbreaks of infection in healthcare facilities so that appropriate interventions and support by national satellite and district structures can be provided when necessary. A national standardized reporting system should be developed in line with global guidance to enable the extraction of data on HAIs and Anti-Microbial Resistance (AMR) for local use. At health facility level, regular reports of comparative data of HAIs and AMR should be made available to clinicians to enable them make better empirical treatment choices to assess implications of their treatment choices and IPC practices.

#### Objectives of Surveillance

- To establish endemic or baseline HAIs rates as part of a benchmarking exercise.
- To compare HAI rates within and between healthcare facilities.
- To reduce infection rates by convincing HCWs to change and adopt evidence- based IPC practices.
- To implement cost- effective interventions based on local priorities, resources, and institutional objectives.
- To Identify, monitor, and control outbreaks.
- To evaluate the success and sustainability of interventions.
- To Increase awareness among health care workers about health care associated infections and antimicrobial-resistance.
- Monitor trends: incidence and distribution of health care associated infections and their prevalence.
- Identify possible areas for improvement in patient care and further epidemiological

studies.

- Identify the need for strengthening IPC/ WASH activities, and evaluate the impact of preventive measures.
- Disseminate to stakeholder's information that has been gathered.

### **12.1. Process of surveillance**

All types of surveillance require IPC committee (IPC team, clinical microbiologist and/ hospital epidemiologist), IT support (hard and softwares), administrative and clerical staff for input of data, statisticians, and good quality microbiology laboratory support. Before embarking on any surveillance, it is essential that definitions of surveillance targets must be agreed upon with the HCWs and resources be identified, taking into consideration the availability of trained personnel, laboratory facilities, and patient workload. To ensure consistency and accurate interpretation of surveillance data, HCWs and the IPC team must be trained in the interpretation of HAI definitions and all data that is collected must be validated.

The process of surveillance must incorporate the following stages:

#### **Data Collection:**

This involves the process of gathering and measuring of information on variable of interest in an established systematic fashion that enables one to answer stated research questions, test hypothesis and evaluate outcomes. A minimum surveillance data set should include details of the infected individual, such as name, date of birth, gender, hospital record number, ward, name of the consultant (if the HAI is especially SSI), date of admission, date of onset of infection, date of discharge or death, the site of infection/ colonization, and microorganism(s) isolated with antibiotic susceptibility or confirmation of infection by other methods. This data should include information on medical treatment and procedures at the time of infection. Undertake a root cause analysis of the cause of HAI, the information relevant to *why* the infection may have occurred would need to include the patient's underlying medical risk factors, clinical outcome and an assessment of whether the HAI or the incident was preventable.

#### **Data validation:**

Validation means checking the accuracy and quality of data source before using, importing or processing it. Different types of validation can be performed depending on destination constraints or objectives. This also is a form of data cleansing.

## **Data Analysis:**

It is a process of inspecting, cleansing, transforming and modelling data to discover useful information for decision making. The purpose is to extract useful information from data and make a decision based on the analysis.

## **Data Interpretation and giving of feedback:**

Data interpretation is the process of bringing sense out of data that has been processed. Data interpretation may be present in various forms such as bar graphs, line charts and tabular forms. Giving of feedback means presenting data on accomplishments that you have obtained from evaluation to those relevant stakeholders such as line staff, administrators, board members, volunteers e.t.c.

Key interventions for prevention of HAIs include

- Establishing systems to track targeted HAIs in health facilities and sharing data with all relevant personnel for action.
- Having dedicated IPC/WASH staff to track HAIs.
- Adhering in full to recommended general IPC practices.
- Implementing interventions targeting specific HAIs.

## **12.2. Methods of Surveillance:**

Surveillance is an expensive and a time- consuming activity. It is therefore essential that the objectives targeted at *preventable* HAIs are determined at the very outset. The type of surveillance method depends on the local factors, e.g. the type and size of HCF, case mix, and availability of other resources.

Different methods of surveillance exist, if the aim of the surveillance is to look for trends in rates, then incident data must be collected (i.e. only on new cases of HAIs for the reporting period). However, if aimed at the magnitude of the problem then prevalence data of HAI is the correct approach.

**Incidence surveillance** is ideal but is time consuming and expensive. However, it provides an accurate method of establishing whether a change, or trend, in the number of HAIs has occurred.

**Prevalence surveillance** can be done once or twice a year, which can give you a snapshot of the magnitude of the problem.

*Targeted surveillance* aims at high- risk areas such as intensive care, neonatal and burns units. Targets could be device- associated infections (IV, urinary catheters), SSI, and surveillance of

multidrug- resistant organism (MDROs). This is the most cost- effective and manageable method, which can be used in HCFs as a matter of priority.

*Laboratory- based and ward liaison surveillance* is the surveillance method most commonly used by the IPC team. This method involves the follow up of positive microbiology results/reports by review of patient records and liaising with ward nursing and clinical staff to consider if any patient had infections. MOH has provided a guide on the list of alert conditions and alert microorganisms to HCFs based on local epidemiology and prevalence of new and emerging communicable.

**Note:** Incidence surveillance must be used in conjunction with a search for positive reports from the microbiology laboratory for *alert organisms* which may result in a case review of patients or a search for other carriers, colonized and/ or infected patients by ward and unit visits. It is the *responsibility of the ward staff* to notify the IPC team of all the suspected cases of infection, either during the ward visit or by telephone to the IPC team.

**12.3 Calculating HAI rates**

Meaningful infection rates can only be calculated by using *both* the numerators (specific HAIs) and denominators (all *patients at risk* for the specific HAI) data and should reflect the ‘exposure risk’, i.e. the number of indwelling device days, surgical procedures, and number of patient days in the unit/ hospital. For surveillance purposes, the analysis of numerator data alone is meaningless unless process control charts are used. The HAI rates can be calculated as follows

Surgical site infections	=	$\frac{\text{Number of surgical site infections} \times 100}{\text{Number of surgical procedures}}$
Device-associated infections	=	$\frac{\text{Number of device - associated infections} \times 1000}{\text{Number of device days}}$
Multidrug-resistant organisms	=	$\frac{\text{Number of infections with e.g. MRSA} \times 1000}{\text{Number of patient days}}$
Standardized infection ratio	=	$\frac{\text{Number of observed HAIs} \times 100}{\text{Number of expected HAIs}}$

The standardized infection ratio (SIR) is a statistical tool used to track HAIs over time and can be used at a national, regional, or facility level. The advantage of using SIR is that it compares the

actual number of HAIs at each hospital, to the predicted number of infections and adjusts for various facilities and/ or patient- level factors that contribute to HAI risk within each facility.

SIR greater than 1.0 indicates that more HAIs were observed than predicted; conversely, SIR of less than 1.0 indicates that fewer HAIs were observed than predicted and it can be applied to various HAIs.

## 12.4 Types of Surveillance

There are two types of surveillance, outcome and process surveillance:

### Outcome surveillance

Outcome surveillance focuses on specific HAIs (e.g. SSIs and catheter-associated urinary tract infections). The aim of outcome surveillance is to *count* the number of HAIs. It shows the *trend* or the *magnitude* of the problem, but will not provide information regarding what factors might be contributing to the HAIs.

It is important to bear in mind the following issues when doing outcome surveillance:

- Agree on definitions and their application with all the stakeholders. The definitions should not be altered during *or* between surveillance periods, as this makes it difficult to compare rates with any degree of certainty that the change was not due to methodology rather than risk of HAI.
- Surveillance data must be *fed back* to the clinical team in a *timely manner*. For surgical site infections (SSIs) surveillance, the data must be *risk adjusted* by variables that can confound the rates, such as the duration of the procedure (less than the 75th percentile of duration and 75th plus).
- It is essential for inter- and intra- hospital comparisons
- Provide feedback to the HCWs

Infections acquired in healthcare settings can be grossly underestimated, especially if the number of patients is high and there is no post discharge follow up of patients in the community.

Simple feedback on the rates of SSIs provides minimal information to surgeons. However, feedback of any HAI surveillance information does increase awareness of the problem and generate anxiety amongst the clinical team that patient outcomes are being monitored.

## Process surveillance

Process surveillance tends to focus on monitoring patient care practices (e.g. compliance with hand hygiene, timing of prophylactic antibiotics during surgery and use of aseptic technique for central line insertion). It is a series of clinical steps taken that lead to an outcome, such as lower HAIs. If all the steps in the process occur correctly, then the desired outcome will prevent the adverse incident and infection. Therefore, *monitoring of compliance* with best and evidence-based clinical practice is a key

to its success. If the best practice is implemented and the infection rate is still high, monitoring of compliance and performing root cause analysis will determine any deviations in adherence to the best practices so that appropriate steps can be taken.

Some HCFs collect data based on review of only a few selected patients for each HAI care bundle, this type of surveillance will not provide the information on whether the task is *actually* performed or, if it was performed correctly.

Process monitoring in HCFs relies on ticking the boxes on the checklist by an individual. Experience has shown that the collection of data by the clinical team on process monitoring in the ward may introduce bias due to 'tick box' mentality. Process surveillance of regulated clinical processes (e.g. insertion of indwelling devices) can be very effective if an independent observer is present at the time of procedure to ensure reliability of data.

## HAIs of public health concern

Surveillance should include preventable conditions and HAIs that are preventable and most relevant to the local context. They include the following;

- Infections that may become epidemic (e.g. measles, cholera, scabies).
- Infections in vulnerable populations such as neonates, the immune-compromised and patients with burns.
- Infections caused by resistant microorganisms like multidrug-resistant TB (MDR-TB), MRSA.
- Urinary tract infection (UTI), including catheter-associated urinary tract infection (CAUTI).
- Blood stream infection, including central line-associated bloodstream infection (CLABSI).
- Surgical site infection (SSI).
- Hospital acquired pneumonia (HAP), including ventilator-associated pneumonia (VAP).

## Public reporting of HAIs

Mandatory public reporting is a very controversial issue and in some countries is demanded by consumers, government, and insurance companies, in the belief that such an exercise will help HCFs to track performance and help reduce HAIs. If such comparisons are used, then it is

essential that careful consideration is given to determine the choice of peer to be compared against.

Surveillance data may not be comparable if there is no comparable peer, if the nationally agreed definition is not used in the same manner across peer groups, and training and education are not provided to those responsible for the collection of data.

Independent validation of data is required to avoid introducing bias. There will always be different confounding factors between peer groups or even across surveillance periods. Failure to consider these methodological variations will result in poor data interpretation. Even when attempts are made to *risk-adjust* data, readers are reminded of the limitations of adjustment. Erroneous conclusions that may lead to ‘gaming’ of data by HCFs that are required to meet key performance indicators that include a threshold of HAIs.

Introduction of HAI targets are successful when commitment is matched with additional resources from the senior management national and facility level. Leaders must be made responsible to make a shift in the approach to prevent HAIs making IPC/WASH everybody’s responsibility.

## **12.5 Outbreak Management**

An outbreak is defined as the occurrence of infections at a rate greater than that expected within a specific geographical area and over a defined period of time. In the HAI outbreak context, geographical area may be hospital, wards, or operation theatres. When there are more cases of infection with the same organism than would normally be expected in one area or period of time, this constitutes an outbreak.

It is important to investigate an outbreak immediately, as the availability and quality of microbiological evidence and epidemiological data diminishes rapidly with time between illness and investigation.

### **Commonly detected outbreaks include:**

- Diarrheal (e.g. vibro cholerae, salmonella, campylobacter, norovirus)
- Respiratory (e.g. influenza)
- Skin (e.g. scabies (*Sarcoptes scabiei*), chickenpox (varicella), measles (rubella))

### **Objectives of Outbreak Management**

- To investigate hospital acquired infection.
- To reduce morbidity and mortality.
- To reduce financial implications and protect the institutional image.

- To improve in patient care practices.

Investigations and implementation of strategies to contain and control an outbreak will vary with the availability and timeliness of information and seriousness of the outbreak. All outbreaks, however minor, should be investigated thoroughly and the outcomes documented.

Response to Outbreak will be according to

- The nature of disease
- The virulence of the microorganisms
- The vulnerability of the affected patients/ population.
- Steps in investigation of an outbreak

## **Steps in investigating an outbreak:**

### **Identification :**

It is an important step to limit transmission of microorganisms among patients by health care workers. A potential problem may be initially identified by nurses, physicians, microbiologists, or any other health care worker. Outbreaks can be identified through the following:

- Establishing background rate of disease.
- Observed number of cases in excess of the usual number and cases.
- Examining surveillance data.

Every outbreak identified must be verified and confirmed for the presence of an outbreak.

### **Notification & confirmation of an outbreak:**

When an outbreak is identified by health care worker:

- Notify the appropriate individuals and departments in the institution of the problem. It may include Head of unit, Director of Hospital, IPC/ WASH Coordinator/ Committee, Rapid Response Team or any designated authority immediately.
- Form a Rapid Response Team (RRT) consisting of Head of clinical and nursing, QM focal person, IPC team, epidemiologist, clinical microbiologist, DEHO and others as defined by circumstances.
- Review information on the number of potential cases, available microbiology, severity of the problem, and demographic data of person(s), place and time.
- Confirm the clinical diagnosis based on the symptoms and laboratory reports with the help of clinicians and microbiologist.

**Case definition:**

A case definition should be developed by establishing a set of standard criteria to decide whether or not a person has the disease of concern. It must include a unit of time and place and specific biological and/or clinical criteria. Clinical Microbiologist & senior physician should be responsible for finalizing the case definition.

**Data collection:**

A data collection form for case-finding should be developed for finding the cases. Collect the following type of information;

- Demographic characteristics (e.g. age, sex, physical address, contact details, national identity, admission area).
- Clinical information e.g. duration of clinical features associated with the outbreak.
- Content of data collection forms may vary depending on the outbreak.

The detailed description includes:

- Time (date and time of onset; admission details in various wards, record relevant events in a timeline)
- Place (information on possible source of agent and nature of exposure e.g. travel history)  
Person (age, sex, occupation, national identity and Residence)

At the end of the descriptive analysis, it should be possible to:

- Identify groups at risk: number of people affected, time of onset and place of onset and personal characteristics.
- Identify the source and route of infection: This information will help to suggest the intervention so as to control the outbreak or halt the occurrence of new cases.
- Use standard precautions and appropriate transmission-based precautions.
- Provide health information and advice.

**Formulate and Test a hypothesis**

Develop hypotheses from the information gathered on potential source and route of transmission. Test the hypothesis to find a likely source and route of transmission. If no source is found and cases continue formulate another hypothesis. Compare the frequency of a risk factor

in a group of cases (i.e. individuals with the HAIs infection) and in a group of controls (i.e. individuals without the infection) infecting agents.

### **Implement ongoing control/ preventive measures:**

The aims are:

- To control the current outbreak by interrupting the transmission cycle.
- To prevent future occurrence of similar outbreaks.

### **Communication:**

During the investigation of an outbreak, timely and updated information must be communicated to the hospital management, MoH, public health authorities, the general public and the media. A final report on the outbreak investigation should be prepared and shared with relevant audiences/authorities.

### **Investigation and response to surveillance reports on infections:**

#### **Single case of HAI:**

When a single case of HAI is observed, the Infection Prevention and Control team should investigate and establish whether the cause has been a breakdown of procedures or whether it is a new admission. This should be followed by isolating the patient. Measures should be made to educate/train staff, patients and guardians. When the cause has been established, the IPC Team should review the steps in the process with the unit staff to ensure that the policy is understood and properly implemented.

The IPC/WASH team should contact the clinical care team to discuss and advise on the possible implication of the outbreak. The patient should be managed according to established clinical guidelines.

#### **Two or more cases of HAIs**

In case of two or more cases of HAI (potential or actual outbreak), full investigation should be conducted. If an outbreak is confirmed, it should be communicated to all staff and specific actions to be taken will be stated. All steps for investigating and responding to a single case (see *above*) should be implemented plus the steps listed below:

- A unit may have to be closed down to prevent further spread or to allow the outbreak to be investigated fully and/or to establish the source of the outbreak. If closure of unit(s) is necessary, the staff should be made fully aware of the consequences and the unit(s) should be re-opened as soon as the outbreak is contained.

- The IPC/WASH Committee/team should critically review all aspects of investigations in order to identify problems so that future errors can be prevented. On conclusion of the investigations, a formal written report should be distributed to all departments.

### **Procedure for Investigating Outbreaks in health facilities**

An increase in the isolation of an infectious organism or any clustering of clinical cases should form the basis for investigating outbreaks in the hospital. The aim of investigation is to:

- Determine how the outbreak occurred.
- Treat the infected patients/persons.
- Prevent spread of the infection with minimum disruption to activities of patients and staff.
- Recommend appropriate measures to prevent future occurrences.
- Conduct contact tracing if it is proven to be external to the health facility.

The steps may vary depending on the nature of the problem. However, **the first and second steps** must be done before proceeding.

#### **Step 1:**

Establish or verify that an outbreak exists. Do the following:

- Verify diagnosis and/or causative agent of reported case(s).
- Characterize the nature of the disease e.g. signs and symptoms, laboratory findings  
Obtain the appropriate laboratory specimens to identify specific disease agent.

#### **Step 2:**

Confirm the existence of an outbreak:

- Define or estimate the extent and magnitude of the problem, keeping within the range of a specific time period appropriate to the nature of the infection.
- Compare current rates with the usual or baseline rate for the time frame.
- Determine the need for outside assistance/consultation.
- Institute early and appropriate prevention or control measures.
- Obtain specimens and preserve culture medium.

#### **Step 3:**

Continue surveillance for additional cases.

**Step 4:**

Characterize cases by person, place and time to determine if the outbreak is from a common or propagated source.

**Step 5:**

Institute and evaluate other control measures, update and educate the staff as to findings, etc.

**Step 6:**

Provide and disseminate reports as required and maintain pertinent records.

## **12.6 Antimicrobial Resistance:**

Antimicrobial resistance (AMR) is the ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it (WHO, 2017). It can also be defined as the ability of pathogens to grow in the presence of drugs or chemicals that would normally kill them or slow their growth. AMR has been detected in all parts of the world and currently it is one of the greatest challenges to global public health (WHO, 2014). It is estimated that failure to address the problem globally could result in 10 million deaths by 2050 (O’neill, 2016).

Antimicrobial resistance may be due to irrational use of antibiotics (e.g. excessive, noncompliance, or under-usage) and the use of fake antibiotics. To ensure that information on bacterial resistance is obtained and used to improve services, the following should be done:

- All microbiological methods (gram stain, culture and sensitivity e.t.c) should be standardized to ensure uniformity and comparability of results in all health care facilities.
- All specimen requests to microbiological laboratories should state clearly whether the specimen is from a client with a suspected HAI.
- Data on antibiotic sensitivity and resistance should be collected routinely in all HAIs and these should be reviewed, analyzed and disseminated monthly or as need arises.

Prevention and spread of AMR is essential not only in healthcare facilities (HCFs) but also in the community as there are multiple factors which are responsible for spread of Multi Drug Resistance Organisms (MDROs). These include:

- Lack of awareness and education amongst antibiotic prescribers
- Misuse of antimicrobial agents in humans, animals, and agriculture
- Availability of antibiotics over the counter
- Availability of poor- quality and/ or counterfeit antimicrobial agents

- Absence/lack of capacity in laboratory to accurately identify and detect resistance
- Inadequate IPC/WASH infrastructure in HCFs
- Lack of access to clean water and sanitation
- Lack of proper surveillance programs for MDROs at local and national level

Rational use of antibiotics and antiviral agents is important for preventing and controlling the development of resistant strains of microorganisms and the spread of infections. The following principles must guide the use of antibiotics:

- Antimicrobials should be prescribed rationally.
- Prescribers must follow national guidelines on the use and choice of antibiotics and antivirals for treatment and prophylaxis (refer to the Malawi National Drug Policy and the current edition of Standard Treatment Guidelines of the Ministry of Health).
- There must be national antimicrobial policy
- Drug and Therapeutic Committees, in conjunction with IPC teams, should develop operational policies on antibiotics and antivirals use.
- The committee should monitor the use of antibiotics in all health facilities. This policy should contain information on use of antibiotics and antivirals for prophylaxis and the choice of these for empirical and targeted therapy of major infections.
- Data on antibiotic use should be routinely collected for surveillance at all levels of healthcare delivery.
- HCWs especially prescribers must be sensitized on the use of antimicrobials
- Public awareness/sensitization on antimicrobial use should be done rigorously

## **12.7 Antimicrobial Stewardship:**

Antimicrobial stewardship (AMS) is a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces antimicrobial resistance and decreases the spread of infections caused by multidrug-resistant organisms (APIC, 2016). Antimicrobial stewardship [AMS] is one of the key strategies to overcome antimicrobial resistance (AMR). It involves the careful, judicious and responsible management of antimicrobial use. CDC has defined “Antimicrobial stewardship” as-

- The right antimicrobial,
- For the right patient,
- At the right time,
- With the right dose,
- The right route,
- The right duration
- Causing the least harm to the patient and future patients.

## Goals of Antimicrobial Stewardship

To reduce antimicrobial resistance

- Restricting antibiotics results in reduction of antibiotic pressure which in turn prevents the development of antimicrobial resistance.
- Restricting antibiotics can reduce colonization or infection with Gram-positive or Gram-negative resistant bacteria

To improve patient outcomes

- Improve infection cure rates
- Reduce surgical infection rates
- Reduce mortality and morbidity
- Reduce hospital stay

To improve patient safety by, reducing antimicrobial consumption, without increasing mortality or infection-related readmissions

To reduce healthcare costs towards antimicrobial expenditure without adversely impacting quality of care

## Strategies to promote appropriate use of antimicrobial agents

- Educate clinical staff on prescribing preferably by a clinical microbiologist or infectious diseases physician.
- Prescribe narrow spectrum antibiotics, where possible, with minimum recommended duration or scale down from broad to narrow antibiotics once microbiology results are out.
- Restrict prescription of critical antibiotics, especially carbapenems, glycopeptides (vancomycin), lipopeptide (daptomycin) and linezolid.
- Distribute approved guidelines to all medical staff, preferably as a simplified pocket guide.
- Updated guidelines should be readily available and accessible by all in the wards and clinical areas.
- Microbiology laboratories should introduce *restricted reporting* to encourage use of narrow spectrum antibiotics which are part of the local antibiotic formulary.

## **Implementation of Antimicrobial Stewardship Program (AMSP) :**

### **Leadership:**

The most important prerequisite for implementing AMSP is a strong leadership. Efforts of physicians, microbiologists, and IPC/WASH team to establish AMSP only succeed with active involvement and support by hospital leadership. The role of management is:

- Commitment to the program - Hospital managers should show leadership while implementing AMSP by actively pushing the program. This will enhance adherence to the policy guideline by clinicians and other stakeholders.
- Program funding - Hospital leadership should support with funding for activities.
- Freedom and power to AMS team- Hospital managers should provide the liberty, freedom, and power to the members of antimicrobial stewardship team to execute the policy.

### **Assess the situation:**

The hospital managers should analyze the situation and what problems they want to address. There are many international guidelines available but these need to be adapted to the local context. The following should be assessed first before implementing AMSP:

- The diagnostic support available e.g. infrastructure and human capacity.
- Availability of rapid microbiology diagnostic tools and biomarkers is recognized as a key intervention in implementation of antimicrobial stewardship in hospitals.
- The laboratory must be improved before the start of implementing AMSP in hospitals.
- Additional budget must be made for procuring needed resources for these investigations.

### **Assess the pharmacodynamics support available:**

- Monitoring of serum antibiotic level by high performance liquid chromatography (HPLC)
- Monitoring antibiotic quality by HPLC

### **Assess the manpower support:**

- Dedicated physician
- Fully functional IPC committee
- Stewardship nurses
- Clinical Pharmacists
- 24/7 reporting facility for culture and sensitivity by microbiology

### **Assess the information technology support available:**

Fully functional Health Information System (HIS), including Laboratory information system will augment the stewardship program.

### **Set up AMS Team:**

Antimicrobial Stewardship team (AMS) must be multidisciplinary that will be involved in executing the interventions and evaluating the adherence to AMSP. The members of AMS team must include: Physician, Stewardship nurses, IPC Team, Clinical microbiologist, Clinical pharmacists, Quality management focal person, Patient safety focal person, and Pharmacy department.

Leadership of an AMS team must be either a physician who is trained in infectious diseases or infection prevention and control specialist or a microbiologist with training in infection control. In hospitals without a physician or microbiologist, any clinician/nurse with special interest in infection control and antimicrobial stewardship can function as a leader. Antimicrobial steward team should be responsible for reviewing the antimicrobial prescriptions and giving a second opinion especially on the higher-end antibiotic usage. Availability of more than one antibiotic steward(person) in any one hospital will provide flexibility in providing round the clock support.

### **Frame Antimicrobial Policy:**

- Every hospital should frame the antimicrobial policy for their hospital in the form of a '**Handbook of Antimicrobial Use**'.
- Departments at every health facility should frame the antibiotic treatment regimens for the infectious diseases under that system.

## CHAPTER 13

### 13.0 INFECTION PREVENTION AND CONTROL IN SELECTED CONDITIONS

#### 13.1 Preventing maternal and newborn infections:

The risk of health care associated infection in pregnant women is low compared with other types of hospitalized patients because most pregnant women are healthy and well nourished. A few mothers are subjected to a variety of invasive and diagnostic procedures experienced by most other hospitalized patients. Mothers having caesarean sections, the surgery is usually uncomplicated however, they are more likely to become infected than mothers who deliver vaginally.

Maternal infections/ sepsis remain a cause of maternal deaths and is the leading cause of serious maternal complications of childbirth. Implementing high quality services and excellent IPC/ WASH practices contribute to lowering of maternal and newborn infections.

#### **Predisposing factors for Maternal infections include:**

- Reproductive tract infections e.g bacterial vaginosis, Chlamydia, gonorrhoea
- Second stage caesarian section
- Prolonged/Obstructed labour
- Infection of the fetal membranes (chorioamnionitis) diagnosed prior to delivery
- Prolonged ruptured membranes (>24 hours).
- Trauma to the birth canal (vaginal or perineal lacerations and urethral tears),
- Manual removal of the placenta due to retained placenta
- Episiotomy
- Urinary tract infections
- Poor socioeconomic status
- Premature rupture of membranes
- Nutritional status (Obesity, Malnutrition etc.)
- Underlying medical conditions (Diabetes,)
- Poor IPC practice

### **Predisposing factors for Neonatal Infections**

- Subjecting newborns to multiple invasive procedures (e.g., vacuum extraction, endotracheal tubes or umbilical artery catheters).
- Poor umbilical stump care
- Poor hand hygiene practices by mothers, care givers and staff
- Maternal infection with HIV, chlamydia, gonorrhoea, Hepatitis group B streptococcal infections
- Inadequate Antenatal treatment of maternal syphilis, gonorrhoea and chlamydia and group B streptococcal infections

### **Reducing the risk of maternal and newborn infections**

IPC/ WASH guidelines are designed to reduce the risk of maternal and newborn infections during and following either vaginal or caesarean delivery. The following practices can make the procedure safer for the mother, the infant and the healthcare provider

#### **Antenatal:**

- Get the mothers tested for sexually transmitted infections (STDs) i.e. HIV, Syphilis and Hepatitis
- Treat all underlying infections
- Promotion of good nutrition (avoiding foods that contain harmful bacteria e.g. unpasteurized milk, undercooked meat).

#### **During labor and vaginal delivery:**

- Provide a clean environment.
- Use sterile vaginal examination packs and delivery kits.
- Limit cases for student training to those patients in active and progressive labor.
- Limit the number of digital vaginal examinations (VEs) by doing VEs every 4 hours in active labor for low *risk patients*.

#### **Prior to delivery.**

- Do not shave the perineal/ pubic hair to reduce the risk of infection.
- Perform hand hygiene before and after each vaginal examination.

- Wear PPE because splashing of blood and blood-tinged amniotic fluid is expected
- Use sterile gloves when doing vagina/ examination
- Clean the perineal (vulva, perineum, and anal region) with an antiseptic using 6 swab technique.

#### **During delivery**

- Apply standard precautions.
- Avoid unnecessary episiotomies.
- If resuscitation of the infant is required, use mechanical suction e.g. penguins.
- If manual removal of the placenta is required,
  - Prophylactic antibiotics should be administered
  - Long cuff elbow length surgical gloves should be used to avoid contaminating the forearm

#### **After delivery**

- Put the placenta in the clean basin and place all waste items (e.g., blood-stained gauze) in a leak proof, covered segregated waste container, before removing gloves.
- Administer prophylactic antibiotics for 3<sup>rd</sup> and 4<sup>th</sup> degree perineal tear repairs
- Place sharps (suture needles) in the puncture-resistant sharps container.
- Perform hand hygiene.

#### **Cesarean section:**

Cesarean sections should be performed using the same standards as for any other general surgical procedures. Make sure that there is always an indication for cesarean sections. Unnecessary cesarean sections may lead to maternal and neonatal mortalities, SSI and hospital stay.

#### **To minimize postoperative wound infections:**

- Preoperative antibiotic prophylaxis should be administered within 30minutes before making a skin incision.
- Vaginal cleansing with povidone-iodine 1% immediately before caesarian section
- Avoid shaving prior to surgery, if it is necessary, clip the hair.
- Incise the skin with a scalpel blade rather than electro-cautery.
- Apply a sterile dressing on the wound.
- Use a clean vaginal pad after the mother is cleaned.
- Maintain aseptic technique.

## **Postpartum care of the mother**

Minimizing the risk of HAI in mothers during the postpartum period includes the following:

- Perform hand hygiene before any activity or procedure.
- Instruct the mother not to touch the episiotomy wound.
- Teach the mother to wash hands when handling perineal pad.
- Encourage the mother to breast feed to avoid breast engorgement.
- Encourage ambulation.
- If delivery was by cesarean section.
  - Ambulate the mother in the first 12 hours
  - check urine is flowing and urine collection system is intact
  - Remove the indwelling catheter within 24hours to prevent urinary infection

## **Postnatal care of the newborn**

- Mother, caregiver must perform hand hygiene before holding or caring for the infant.
- 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.
- Wipe the infant's skin dry to avoid hypothermia.
- Bathing or washing the newborn should be done after 24 hours.
- Do not apply anything on the cord stump, except Chlorhexidine 4% drops.
- Fold the diaper below the cord stump.
- If the cord stump gets soiled or dirty, gently wash it with boiled and cooled water. Add soap to the water, rinse the cord and dry with a clean cloth.
- Provide a follow up plan to the mother in case the cord stump starts to drain blood or pus.

## **Water, Sanitation and Hygiene in maternity units**

- Provide clean toilets, shower rooms and warm water.
- Provide equipment for menstrual hygiene.
- The toilet should have waste a covered waste bin for disposal of sanitary pads.
- Provide hand hygiene facilities with soap.
- Ensure an overall cleanliness of the maternity unit.

## 13.2 TUBERCULOSIS

TB remains one of the top ten causes of death worldwide and accounts for more than 10 million new cases with an estimated 1.4 million deaths worldwide. In 2016, a total of 8144 TB cases among health care workers were recorded in 60 countries (WHO, 2018).

Recent increases in tuberculosis notification among health care workers (HCWs), as well as hospital-based outbreaks of multidrug-resistant TB (MDR-TB) among HIV-infected patients and extremely drug-resistant TB (XDR-TB), have led to greater concern about the risk of *Mycobacterium tuberculosis* (*M. tuberculosis*) transmission in health care settings. The Ministry of Health sees the issue of TB-IPC as very important.

The emergence of drug-resistant tuberculosis (DR- TB) is of great concern. Cases of TB must be notified to the District health office to ensure that contact tracing is carried out in the community.

Notification should be done immediately by telephone followed by written communication. Contact tracing should *only* be considered in the case of smear- positive (open) pulmonary TB and should be limited to close contacts of the index case and individuals with impaired host susceptibility.

All patients with suspected/ confirmed pulmonary TB (esp. DR- TB) *must* be isolated in a single room with airborne precautions.

- Advise the patients about the cough and sneezing, etiquette.
- Visitors must be limited to those who have already been in close contact with the patient before the illness.
- Always apply Airborne precautions when managing patients
- All patients with TB and their visitors should be segregated from other patients until the contacts have been screened and pronounced non- infectious.
- Contact with staff and visitors should be kept to a minimum without compromising patient care.
- Doors must be kept closed.
- Patient with suspected/ confirmed respiratory TB should be not admitted to an open ward, especially one where immune- compromised patients (e.g. HIV infected, transplant or oncology) are nursed.
- Cough inducing procedures must not be performed in an open bay/ ward
- Isolate all patients with DR- TB in a negative pressure ventilation room until three negative acid and alcohol fast bacilli (AFB) results of sputum are available.

- When the patient is required to leave a TB isolation room, they should wear a surgical mask to cover their mouth and nose.
- HCWs should wear an N95 or FFP2 respirator when entering the room and during bronchoscopy, prolonged care of a high- dependency patient, during cough- inducing procedures, physiotherapy, lung surgery and when performing the last offices.
- The patient should remain in isolation for at least 2 weeks provided that the patient is compliant with treatment.
- Isolation of patients must continue for all patients with DR- TB in a negative pressure ventilation room until three AAFB sputum results are negative.
- Follow transmission base precaution before moving the patient in an open ward.
- Terminal cleaning of the room must be done when a patient is discharged. Do not fumigate the room.

Control of TB is based on three fundamental principles.

### **Administrative controls:**

This is the first and most important level of IPC to prevent droplet nuclei from being generated and thus reducing the exposure of HCWs and patients to *M. tuberculosis*.

### **Triage:**

Patients presenting in OPDs shall be triaged to quickly identify those with symptoms of TB. The method of triaging shall include:

- Screen all patients attending OPD with a cough to look for symptoms of TB.
- Educate the patient on cough etiquette.
- Separate the patient from others to limit spread of infection.
- Rapidly provide services for them.

### **Investigate for TB and all diagnosed TB patients should be notified:**

- Rapid diagnosis of presumptive cases of potentially infectious TB patients,
- Prompt initiation of appropriate anti-tuberculosis treatment
- Application of respiratory hygiene to prevent cross- infection
- Risk Assessment
- Developing an infection control plan in resource limited areas
- Establishment of Surveillance programs

- Avoiding unnecessary hospital admissions
- Early discharging patients with TB as soon as possible
- HCW should be educated regarding effective TB infection control measures  
All diagnosed TB patients should be notified.
- All PLWHIV (People Living with HIV) should be screened for TB using the Malawi HIV/AIDS guidelines

### **TB-specific environmental controls :**

These environmental controls aim at reducing the concentration of droplet nuclei in the air by maximising natural ventilation and controlling the direction of airflow. Environmental controls for reducing TB transmission include:

- Patient areas should have all windows and doors fully open to ensure adequate ventilation (6 to 12 air changes per hour).
- Use ceiling or extraction fans where natural ventilation is not available.
- Check and maintain schedules for mechanical ventilation systems.
- Isolated MDR- TB cases in negative pressure rooms when available or put a patient in a private room with open windows.
- Patients should be managed in well-lit areas, with easy access to exit for persons and equipment.
- Safety cabinets should be used in laboratories where sputum culture for TB is done.
- There should be adequate ventilation in OPDs.
- There should be a minimum of 1 metre between beds on TB Wards.
- All admitted patients should have separate beds.
- Install UVGI lights in patient waiting areas and test the effectiveness of the bulbs biannually

### **Personal protective measures for TB care:**

Personal protective measures include: wearing surgical masks and respirators. Respirators (N95 or FFP2) are better than surgical masks but are expensive, therefore their use must be limited only to high risk areas such as in the care of MDR TB patients or when performing high risk aerosol-generating procedures. HCWs must be fit-tested before using respirators. Train HCWs on donning and doffing.

### 13.3 VIRAL HEMORRHAGIC FEVERS

Viral hemorrhagic fevers (VHFs) are caused by different viruses. These cause diseases that range from mild to severe degree of presentation. VHFs present a significant risk to all countries due to the easiness of international travel and mixing of people from all regions of the world. VHF is associated with high mortality, has limited or no treatment options, has potential for person-to-person and specimen-to-person spread.

The diagnosis of VHF should be considered in a patient who has febrile illness and has returned from tropical Africa or a VHF endemic country within the last 3 weeks. When VHF is suspected, it is essential that proper history must be taken and other infectious diseases, e.g. malaria, typhoid, bacterial sepsis, acute gastroenteritis, must be excluded as a part of differential diagnosis. Although diseases like Dengue and Yellow fever are not transmitted directly from person to person, they must still be considered as a differential diagnosis.

Persons who are at risk are those who have had unprotected contact with blood, other body fluids, secretions, or excretions of a person or animal with VHF and those with possible exposure when working in a laboratory that handles hemorrhagic fever

#### **Recommended precautions for management of VHF patients :**

- Patients should be cared for in a category B (refer to isolation guidelines in chapter 4) isolation room.
- Use Standard and Transmission based Precautions in the management of patient.
- Caretakers should use barrier precautions to prevent skin or mucous membrane exposure.
- All persons entering the patient's room should wear appropriate disposable PPE.
- Prior to leaving the room of a patient with suspected VHF, safely remove and dispose of all protective gear, clean and disinfect shoes that are soiled with body fluids.
- Access to the room should be restricted to authorized persons.
- Maintain a log of all people (both clinical and non-clinical) who enter the room.
- Laboratory investigations should be for essential diagnostic evaluation.
- Wastes should be put into a biohazard bag and should be sent directly for incineration

- Notify the head of the health facility about the VHF suspected or confirmed cases to aid in contact tracing.
- Transportation of specimens should be done in line with biosafety laboratory service level 4

### **Management of exposure to VHF:**

- Persons with percutaneous or muco-cutaneous exposures to blood, body fluids, secretions, or excretions from a patient with suspected VHF should immediately wash the affected skin surfaces with soap and water.
- Mucous membranes (e.g., conjunctiva) should be irrigated with copious amounts of water or eyewash solution.
- Exposed persons should undergo medical evaluation and follow-up care, including fever monitoring twice daily for 21 days after exposure.
- Consultation with an infectious diseases expert is recommended for exposed persons who develop fever within 21 days after exposure.

### **Recommended safety precautions:**

Since Ebola Virus Disease (EVD) cases are more likely to be discovered during contact follow-up, contact tracing teams should take precautionary measures:

- Avoid direct physical contact like shaking hands or hugging.
- Maintain a comfortable distance (more than 1 metre) between persons.
- Avoid entering the residence.
- Avoid sitting on chairs offered to you.
- Avoid touching or leaning against potentially contaminated objects.
- Avoid eating or drinking when visiting contacts.
- Do not wear PPE in advance when going for home visits
- If you must take the contact's temperature:
  - Put on disposable gloves.
  - Avoid touching the patient and maintain 1 metre distance.
  - Use the infrared thermometer to take their temperature.

- If using the mercury thermometer, take temperature from the back of the patient.
- If the contact is visibly ill, notify your emergency response team supervisor.
- As part of the overall safety of the response team, all members of the contact tracing team should monitor their own temperature every morning.
- Follow recommended decontamination procedures

### **13.4 ACUTE RESPIRATORY DISEASES (ARD):**

Acute respiratory diseases (ARD) are upper or lower respiratory tract illnesses and are usually infectious, resulting in a spectrum of illnesses ranging from asymptomatic or mild infection to severe and fatal disease. There are many pathogens which cause ARD e.g. Rhinovirus, Severe Acute Respiratory syndrome-associated coronavirus (SARS-CoV) and Influenza virus. Only guidelines on Avian Influenza virus and SARS-CoV are provided.

#### **Avian influenza :**

Avian influenza (Bird Flu) is a disease caused by an influenza virus that occurs naturally among birds but can cause disease in humans. This virus can be transmitted via large respiratory droplets. Given the uncertainty about the exact modes by which avian influenza may be transmitted between humans, additional precautions may be prudent for health care workers involved in the care of patients with confirmed or suspected avian influenza.

The following IPC measures are recommended for Avian Influenza:

- All suspected patients who present to a health care setting with fever and respiratory symptoms should be managed in accordance with the avian influenza clinical management guidelines of the Ministry of Health.
- All categories (i.e., suspected, probable, or confirmed) of avian influenza cases that report to the health care facility must be admitted straight into isolation wards/rooms/area.
- The admitting clinician must notify the IPC focal person or the rapid response team.

In addition to Standard Precautions, the following should apply:

- Contact precautions
- Airborne precautions
- Isolation precautions
- Respiratory hygiene

These precautions should be continued for 14 days after onset of symptoms.

## **Surveillance and monitoring of HCWs:**

- HCWs exposed to avian influenza virus should carry out self-monitoring for the development of fever, respiratory symptoms, and/or conjunctivitis (i.e., eye infections) for 1 week after last exposure.
- HCWs who become ill should seek medical care and, prior to arrival at the health facility, should notify their health care provider that they may have been exposed to avian influenza.
- All symptomatic HCWs should be given treatment within 24 hours of reporting to the health facility.
- Employees should notify occupational health and infection control personnel at their facility.
- IPC/WASH should keep records of staff exposed to avian influenza

## **Severe Acute Respiratory Syndrome (SARS) :**

Severe Acute Respiratory Syndrome is a disease caused by the SARS coronavirus.

Transmission of SARS coronavirus (SARS-CoV) occurs:

- Through close interactions with infected persons
- Contact with respiratory droplets expelled when a patient coughs or sneezes.

The aim of IPC in this instance is to ensure early recognition of patients at risk and to prevent transmission of SARS-CoV to health care workers. The following precautions are recommended;

- Posters and audiovisuals (in appropriate languages) shall be posted at the entrance to outpatient facilities instructing patients and visitors to practice respiratory hygiene/cough etiquette.
- During periods of increased respiratory infection in the community, surgical masks at the health facility should be offered to persons who are coughing.
- Coughing persons should sit 1 meter from others in common waiting areas.
- Triage and management of patients with possible SARS-CoV disease should be done.

In addition to Standard Precautions, health care workers should practice droplet precautions when examining a patient with symptoms of a respiratory infection.

## **Patient placement:**

The following should apply in the placement of patients with SARS

- Admit patients to isolation in a well-ventilated room.
- Designate “clean” and “dirty” areas for isolation materials.
- Limit the amount of patient-care equipment brought into the room to that which is medically necessary.
- Provide each patient with patient-dedicated equipment (e.g., thermometer, blood pressure cuff, and stethoscope).
- Limit staff to the number sufficient to meet patient-care needs,
- Use staff who have been specially trained to care for patients with SARS.
- Apply precautions regarding transportation and visitation of patients in isolation with airborne infections.
- Follow visitors who have been in contact with the patient before and during hospitalization.
- Take appropriate precautions when performing aerosol-generating procedures.
- Contain all specimens appropriately (bag them, if necessary), and have a completed laboratory requisition slip attached. Information on the requisition slip should indicate that the patient is suspected to be infected with SARS-CoV.
- Alert laboratory personnel to the possibility of SARS-CoV to ensure safe handling procedures.
- Manage exposed persons according to the standard management protocol for SARS.

### **13.5 VIRAL HEPATITIS (*HEPATITIS B AND C*):**

Transmission of Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) in the workplace occurs in the following ways:

- Accidental exposure to blood or body fluids or bloody splashes via mucous membrane (eye, mouth).
- Percutaneous exposure to blood or body fluids through broken skin.

- Needle sticks or sharps injury with a needle or sharp instrument that is contaminated or potentially contaminated with blood or body fluids.
- Exposure of intact normal skin to a large volume of blood
- Human bites.

Hepatitis B and C can be prevented through reducing occurrence of exposure and complying to standard precautions.

### **Procedure for post-hepatitis B exposure prophylaxis:**

Health personnel exposed to blood or body fluids by needle stick, cuts or bites should do the following;

- Wash the area thoroughly with soap and water immediately.
- HCWs should be tested for Hepatitis B surface antigen and Hepatitis B antibody.
- If the antibody titre level is low or negative, start immunisation or give booster dose of Hepatitis B.
- Repeat tests after 1 month and then 6 months after the first test.
- If the titre is still low, repeat the Hepatitis B immunisation.
- Those who do not respond to Hepatitis B immunisation after a 3<sup>rd</sup> dose should not be assigned to high risk areas e.g. OR, Obstetric and Gynaecological units.

### **Treatment for HBV:**

Treatment for HBV is available and several methods exist. A few are listed here for easy reference.

- Lamivudine 150 mg orally twice daily or 300mg daily.
- Tenofovir 300 mg orally daily.

# CHAPTER 14

## 14.0 ENVIRONMENTAL AND ENGINEERING CONSIDERATIONS IN HEALTH FACILITY DESIGN:

Health facilities should be designed to reduce the risk of transmission of infections. The layout of physical structures and installation of equipment influences the implementation of infection prevention and control practices. Therefore, it is important that the design of health facilities should comply with IPC requirements. Input from the IPC team at the planning stage and throughout the entire life of the construction project is essential not only in design and commissioning of new HCF, but also during any major renovation of wards, units or building.

Early involvement of the IPC team in the process is essential to identify potential IPC issues and provides an opportunity to design solutions prospectively. It is also important that the IPC team should visit the construction site on a regular basis to ensure that agreed plans are being implemented.

The design of the HCF will be influenced by the following:

- The disease profile of the local community
- Number of staff
- Type of population and catchment area – Gini Index (poverty) and Disease profile
- The location of the healthcare facility (HCF) – Climate, Geographical area
- The size of the facility
- The services to be provided (primary; secondary; tertiary)
- Services & Amenities- Portable water, Electricity, Waste removal, Roads and Public transportation

The layout of physical structures and installation of equipment shall conform to standards set by the MoH. Regardless of the size of the facility, issues to be addressed by the infection control team should include storage areas, equipment cleaning areas, ventilation of general and specialist areas, hand-washing, toilets and bathroom facilities, furnishing, fittings appropriate finishes. It is critical to ensure that there is no cross-contamination during the workflows eg handling, transporting, processing, and storage of instruments.

### General ward design:

The design of wards and sections of HCFs should allow routine cleaning to be carried out efficiently. Unnecessary horizontal, textured, and moisture-retaining surfaces, or inaccessible areas where moisture or soil will accumulate, should be avoided. All surfaces should be smooth and impervious. To prevent dust accumulation in *horizontal surfaces* cupboards rather than open shelves are recommended.

In equipment/ instrument processing areas, work surfaces should be non-porous, smooth, and easily cleaned. All equipment must be placed such that surfaces must be accessible for cleaning.

**Walls and ceilings:** All surfaces, including walls and ceilings should have a smooth, impervious surface that is easy to clean with minimal likelihood of dust accumulation. In general, microorganisms *do not* readily adhere to walls or ceilings unless the surface becomes moist, sticky, or damaged. Walls and ceilings are a source of microorganisms that cause HAIs when not designed according to specifications. Wall coverings should be fluid resistant and easily cleaned, especially in areas where contact with blood or body fluids may occur, e.g. delivery suite, operating room, post-mortem room, and laboratory.

If ceiling tiles are used, then they should be kept dry, as wet tiles support microbial growth. Damaged ceiling tiles must be replaced or repaired immediately if broken. Installation of false ceilings should be avoided, especially in clinical areas as it harbours dust and pests that may contaminate the environment.

Finishing around plumbing fixtures should be smooth and water resistant, with pipe penetrations and joints sealed.

**Floor:** All floors should have non-slip finishes. In clinical areas, floors should be made of smooth, impermeable, seamless materials, such as welded vinyl. Use of carpet in clinical areas must be avoided because it harbours large numbers of microorganisms, e.g. coagulase negative staphylococci, *Bacillus* spp., fungi, VRE, and MRSA. In addition, carpets are expensive to clean, maintain and difficult to disinfect, it becomes smelly with time and when a vacuum cleaner is used it contributes to airborne dispersal of microorganisms in the environment,

**Out- Patient areas:**

The waiting areas should be large, airy with natural ventilation with a provision for segregating patients who may have transmissible infections to implement early isolation of the patient. Mechanical ventilation with negative pressure control must be installed in waiting areas for patients/ clients with respiratory conditions. The consultation rooms must be designed with large windows, doors, adequate lighting, easy access and space for equipment and persons including hand hygiene facilities. Cough rooms must be included in the design but must be located away from service areas.

**In-Patient areas:**

The risk of cross-infection and overcrowding in the ward should be avoided. Design, accessibility, and space in patient areas should contribute to ease of cleaning, maintenance, and access to equipment around the patients' bed.

Bed space is influenced by the type of ward, staff activity, and type of patients. It is important that there must sufficient space for clinical staff caring for patient without encroaching into another patient's bed space Adequate space between beds not only for patient care activities but also to avoid cross-contamination and infection between adjacent bed spaces. Studies have established that most activities carried out at the bedside can be accommodated within the dimensions of 3.6metres (DH,2013).

It is recommended that spacing between beds must be at 2.0 m - 2.5 m (WHO 2017) 3.6m in high care areas such as ICU, HDU and other units that provide specialized care for reasons of circulation space and the equipment used in these areas. Space between beds must be separated by curtains that are washable and changed after each patient.

Patient bed layout: HCFs design must include adequate numbers of single rooms with hand wash basins and en-suite toilet and shower facilities.

The single rooms can be utilized for isolation of patients with MDROs and for the privacy of those near death. The ward must also be designed to allow bed grouping and bays of 4-6 beds. This helps with cohorting (keeping groups of patients with a similar infection, separate from susceptible patients) when there is an outbreak. Furniture used by staff and patients (beds, mattresses, chairs, tables) in the service areas must withstand cleaning and disinfectant used in HCF. Fabric furniture should be avoided because of the potential of soiling with blood and bodyfluids.

All ward designs must consider the following spaces:

- Ward kitchen
- Space for resuscitation trolley
- Storage space for: – Clean items & equipment, Controlled drugs, Bulky equipment (such as commodes and hoists), Linen
- Utility rooms: – Dirty utility (“sluice”), Cleaners’ equipment and Waste holding and collection area
- Have designated facilities for storing outer garments and personal items (staff change rooms)
- Place for eating and drinking for staff.
- Have adequate and easily accessible hand hygiene facilities.
- Have rest-rooms for staff.

Natural light is recommended, but the following are the existing lighting standards for the hospitals.

## **Electricity:**

Adequate, accessible, appropriate and safe electric supply should be provided:

- 24 hours all year round
- A back-up source like generator or solar plant
- There should be regular maintenance

	<b>Hospital Area</b>	<b>Recommended level of lighting</b>
Common / public areas	Entrance	200 Lux
	Reception	300 Lux
	Atrium	100 Lux
	Waiting areas	200 Lux
	Toilets	200 Lux
	Exit signage	5 Lux
Wards/ Patient caring areas	General lighting in wards	100 Lux
	Reading lamps	200- 300 Lux
	Examination lighting	500-750 Lux
	Night lighting	5 Lux
	Nursing station	200-300 Lux
Lighting for special rooms	OT	8000 to 100000 Lux
	Recovery room	400 Lux
	MRI centre	100 lux
	Ophthal dept	300- 1000 Lux
	Delivery suit	750-1000 Lux
Service areas	Manifold	300 Lux
	CSSD and laundry	200 Lux
	Kitchen	200 Lux
	Mortuary	100-1000 Lux
Circulation/ Other common areas	Corridors	100-200 Lux
	Stairs	100 Lux
	Lifts	100 Lux

Figure 15: Hospital area recommended level of light

## **Ventilation:**

Ventilation in HCFs is provided for environmental patient comfort and for the control of infection. Air conditioning or ventilation systems in critical areas such as operating theatres, isolation rooms, and in special treatment or procedural areas should maintain the inflow of fresh air and allow the temperature, humidity, and purity (from dust, infectious agents, and gases) of the air to be maintained within prescribed limits. Adequate ventilation seeks to reduce the concentration of micro-organisms in the air. For adherence to these reasons.

- Ventilation should be appropriate for each working area. Natural air circulation is recommended and where possible air should flow from patient areas to the outside atmosphere, preferably NOT towards the corridors.
- Where required, ventilation equipment should maintain the inflow of fresh air, temperature, humidity and purity of the air within prescribed limits. For example, negative pressure airflow with a minimum of six air exchanges per hour is recommended for operating theatres. Similarly, procedure area should have negative pressure airflow with 15 total air changes per hour, of which three should be outside air.
- Fume extraction facilities and biological safety cabinets should be installed and used for areas where unsafe concentrations of airborne contaminants are generated (e.g. incinerators, kitchen, steam and gas sterilizers) or where risk group microorganisms are being handled (e.g. isolation rooms and laboratories).
- Ventilation systems must be monitored and serviced by the department of maintenance of the hospital or contractor. Maintenance schedules must be documented and carried out according to pre-specified schedules and specifications.
- The wards should be installed with windows which can be opened, avoid dark, still areas without natural air movement when designing HCF.

## **Surfaces:**

Surfaces should be made of material which can be easily cleaned with disinfectant cleaning solution. Surfaces should be:

- Level and smooth, as well as have minimum joints where bacteria can accumulate.
- Unaffected by spilled liquids.
- Durable enough to withstand repeated cleaning with disinfectant solution.

All surfaces including the surfaces should be made of materials that will facilitate effective cleaning and disinfection.

## **Traffic pattern in the facility:**

To prevent cross-infection, the design of the facility will need to take into consideration the following:

- Patient movement should cause minimal exposure of patients to each other, guardians and visitors
- Visitors' traffic routes should minimize contact with patients
- Staff who are required to wear protective clothing should have ready access to locker space without entering protected areas
- Movement of all supplies and equipment whether clean, sterile or contaminated should be done in closed containers that will not allow supplies to fall from the container to the floor
- The design should put special areas like operating room, labour and delivery, waste storage, nursery, clinical laboratories out of the major traffic routes

## **Position of sinks for hand washing:**

Hand washing sinks should be positioned in such a way to facilitate hand washing practices among healthcare workers.

- Sinks should be placed in areas that are convenient and easily accessible such that they can easily be used for hand washing before and after patient contact.
- Adequate number of sinks should be provided for use by health workers, patients and their relatives. There should be at least two hand washing basins in wards with 10 beds
- Adequate space should be provided around the sinks for soap dispensers and garbage bins.
- Sinks should be made of non-porous material, round shape inside with dimensions of 25cm by 35cm depth and without overflow, should be of elbow, foot or automatic operating taps, uPVC traps and plastic gadgets
- Should be a wall-mounted basin fixed at 120cm above floor.
- Soap dispensers should be in a non-refillable type and positioned so that any spills from the dispenser during operation can be captured into the basin for infection control and ease of maintenance, and spills onto floors should be avoided.
- Waste bin should be a round black/blue pedal bin of 12 liters (340mm (height) x 270mm (diameter)
- Wash hand basins are not used for other purposes. For example, they must not be used for disposal of any amount of liquid waste nor soaking and cleaning clean any items and equipment

## **Supplies and equipment:**

Storage areas for medical supplies and equipment should:

- Be free of any infestation i.e. rodent-free
- Be away from sinks and drains to avoid splashing and high humidity

- Have adequate space between equipment to facilitate cleaning of equipment and staff movement as well as to eliminate pests' hiding places
- Be well ventilated and adequate lighting

In addition to the above, special attention should be paid to the following:

- Contaminated equipment and supplies should be kept away from clean/sterile equipment and supplies
- Contaminated equipment and supplies should not be stored for long periods
- Dust covers or other protective coverings should be used to avoid contamination by dust and moisture

## **Central Sterile Supply Department (CSSD)**

All health facilities should aim to process instruments and other reusable items in a central location. Facilities where procedures are performed should have a Central Sterile Supply Department (CSSD) that is dedicated to cleaning, disinfection, and sterilization of the instruments and other medical devices. Basic criteria for the layout of the CSSD should always have a dirty and clean areas clearly demarcated with no cross over between clean and dirty areas. Building new CSSDs or renovating existing structures should take into account national and international recommendations and regulations. A well-designed CSSD will ensure restricted access to all unauthorized staff, water supply, steam supply, good ventilation, good surfaces and adequate space for good workflow to ease transportation to and from the place of use and delivery of necessary supplies A CSSD should have the following demarcated areas:

### **Dirty area (wash area)**

- Receiving Area – for receiving used items and cleaning of soiled instruments/items.

### **Clean area:**

- Inspection, assembly and packaging Area
- A storage room for unsterile textiles (the linens used as drapes and wraps, gauze and cotton) and instruments. The room should install open wire racks which allow air circulation Each set of racks must be labelled with name of packs or instruments. A check list of items held in sterile stores and the date stock was checked and replaced
- Sterilization Area for high-level disinfection and sterilization.
- Area for storage with cabinets for storage of sterile and disinfected items to protect them from dust and contamination
- Dispatch area
- Change Rooms with toilets and bathroom rooms and a sink for hand washing
- Benches/ tables for wrapping items

Staff changing area with independent access to both clean and dirty areas

### **The following are recommended:**

- Two sinks in the soiled area, one for removing gross contaminants and the other for rinsing instruments.
- A sink dedicated to hand hygiene.
- Covered bins
- Good ventilation (e.g. airflow from the clean/sterile storage area to dirty area with exhaust to outside to prevent contaminants from flowing into the clean area). If an air-conditioned room with an exhaust is not available, as in many resource-poor settings, local exhaust can be achieved by placing a fan in the window to assist airflow.
- Windows to enable natural lighting
- The facilities for staff should include changing area for males and females, CSSD working clothes (Scrub suits) and closed shoes, Protective clothing placed outside each exit to work area, Toilets and hand wash basins, Office for administration, Meeting/ training room, Storage for stationary and Documents such as manuals and SOPs
- Instrument processing areas should be separated from procedure rooms and the Operating Theatre (OT) room.
- The workflow (i.e., the physical flow of instruments from one place to another) prevents cross-contamination.

### **If only a single room is available:**

- Physical separation of clean and contaminated work areas is required.
- Soiled equipment should be received and cleaned in an area of the room well away from where instruments are high-level disinfected or sterilized and stored. These functions should be at least 1.2 meters (4 feet) consider size of the room from one another.
- Physical barriers such as screens or makeshift walls could be installed to prevent splashing from the cleaning area to the preparation and packaging or sterilization areas.
- The flow of instruments should always be from dirty to clean. Clearly mark the “dirty” and “clean” areas with signs and/or painted lines on the floor to delineate the clean and dirty areas.

To ensure sterility and safety in CSSD, staff should remain in the designated area of work (clean or dirty) for the entire shift- no crossing over during a shift. Staff should be rotated through all stations/ areas to familiarise and get expertise of work in the department. Guidelines and Standard operating procedures for each step and activity must be provided to all staff. The in-charge must keep a log of activities that should be tracked in case of SSI and validation records up-to-date.

## **Surgical operating theatre/ room:**

This is a room or suite of rooms in a hospital site designed for safe performance of surgical operations. Patients undergo operative treatment in pregnancy or childbirth or for the prevention, cure, relief or diagnosis of disease by medical practitioner who are appropriately trained and qualified to carry out the regulated activity of surgical procedures.

The following areas should be clearly designated to help ensure recommended treatment to take place in aseptic conditions:

- Changing room and work station for staff.
- Staff Kitchen
- Staff toilets and bath room.
- Area for surgical hand scrub and putting on PPE.
- Designated instrument processing area/room (with separated clean and dirty areas).
- Space with cabinets for storing sterile and high-level disinfected items.
- Preoperative holding room/ Reception.
- Anaesthetic rooms for pre-anaesthetic procedures and offices for administrative errands for the anaesthesiologists.
- Theatres large enough to allow movement of staff in the room without contaminating the staff performing surgery or the sterile field.
- Recovery area for patient observation after surgery.
- The operating theatre environment requires lightning that illuminate the surgical site. The lights that are fitted must be adjustable, bright and controlled to allow good visibility of tissue colours and vessels.
- Operating theatre air should ideally be filtered to reduce the concentration of airborne pathogens generated by staff.
- Design the OT with mechanically ventilated clean air and positive pressure to ensure that air from the OT flows into the corridor and other adjacent areas. Air conditioning systems should ensure that a minimum of 12 air changes per hour of filtered air is delivered.
- Routine bacteriological testing of operating room air is unnecessary. It should be performed when commissioning a new theatre and may be useful when investigating an outbreak.
- Regular planned preventive maintenance of the medical/hospital equipment plus air conditioner.
- The storerooms should be well lit, ventilated, dry and have even temperatures.
- Walls and floors should be tiled. Floors could either be granolithic or terrazzo in order that they can easily be cleaned.
- Stores should be fixed with shelves. These could be built with wooden shelving slate or marble topped benching or easily movable and adjustable metal racking with stainless-steel-topped tables. These could be fixed with castors so that they can be moved easily.
- Cold storage facilities should be provided and should include refrigerator.
- There should be separate fridges for the storage of medication and food and drinks

## Water supply system:

HCFs are ranked among institutions which have a relatively high-Water Use Intensity and hence, require to have access to adequate supply of water at all times in order to maintain daily patients' care services and other operations. Contaminated water constitutes one of the most effective pathways for mass transmission of pathogens to a large population. Working with key persons in the health facility and community to provide and maintain safe water for patient and health care use is an important part of IPC/ WASH. Adequacy of water should be in terms of quantity, quality, reliability and accessibility. To prevent spread of infection at the HCF, piped and portable water should be easily available for drinking, food preparation, hand washing, patient bathing and cleaning, disinfection and sterilization.

The following is recommended:

- Water quality surveillance must be conducted to ensure that there is total absence of risks from microbiological, chemical and physical contaminants.
- Water must be treated using recommended procedures by Ministry of Health to eliminate disease-causing microorganisms and turbidity.
- The water must be free from tastes, odours, or colours that would discourage consumption of the drinking water.
- Water points must be protected from sources of pollution and contamination.

## Water quantity in the HCF

**Table 11. Minimum water quantities required in the health-care setting:**

Service Area	Quantity of water
Out-patient	5 litres/consultation
In-patients	40–60 litres/patient/day
Operating theatre or maternity unit	100 litres/intervention
Dry or supplementary feeding centre	0.5–5 litres/consultation (depending on waiting time)
Wet supplementary feeding centre	15 litres/consultation
Inpatient therapeutic feeding centre	30 litres/patient/day
Cholera treatment centre	60 litres/patient/day
Severe acute respiratory diseases isolation centre	100 litres/patient/day
Viral haemorrhagic fever isolation centre	300–400 litres/patient/day

Access to water: Sufficient water-collection points and water-use facilities must be available in a HCF to allow convenient access to hygiene and sanitation medical activities.

Where water tanks are installed for storage:

- The tanks should have tight covers to prevent dust, animal droppings as well as from entering, as these accelerate the growth of algae and other microorganisms.
- Routine emptying and cleaning of tanks every three months is recommended.
- The tank should be made from rust free material.

Distribution of Water points/taps in HCFs should take into account the following aspects;

- A reliable drinking-water point should be accessible for staff, patients and caregivers/guardians at all times.
- A reliable water point should be available at all critical points within the HCF including operating theatres, wards, consulting rooms, dressing rooms, etc. and in service areas such as sterilization, laboratory, kitchen, laundry, bathrooms, toilets, waste disposal area and mortuary.

There must be four hand washing basins in wards for every 20 beds. There must be two bathrooms for 40 users in inpatient settings. Laundry facilities, with soap or detergent, hot water and a disinfectant should be available for inpatient settings

### **Sanitation and Hygiene:**

The main purpose of having improved sanitation and hygiene in HCF is to prevent diseases by breaking the transmission of pathogens or disease-causing organisms found in human excreta and waste-water from entering the environment and posing a threat to people's health.

Hygienic facilities/services will serve to prevent infections and minimize spread of diseases within the HCFs, by protecting staff and patients. They also maintain the dignity of vulnerable people including pregnant women, the seriously sick patients and people with physical disabilities.

There should be at least 1 toilet for every 20 users for inpatient setting. At least 4 toilets per outpatient setting. Separate toilets for patients and staff. Toilets should also be separated according to gender (male, female and children).

### **Recommended public toilet for health care facilities:**

Due to public health concerns in HCFs the flush toilets either pedestal or squatting type should be provided. In other words, each HCF should aim for the water-based sanitation systems.

However, due to serious water availability constraints in most of the rural areas in Malawi, it is recommended that a VIP latrine option can be used.

### **Designing and construction of sanitation facilities:**

Providing adequate sanitation infrastructure and services requires careful planning and selection of appropriate designs for a facility. Designing of sanitation facilities should be part of the initial HCF planning. However, where sanitation infrastructure and services are inadequate it is equally important to plan for construction of new ones or upgrading the existing facilities.

As mentioned in the preceding section, three types of toilets are recommended for HCFs depending on the following factors:

- Facility size and catchment population (with future projections)
- Type of services being offered at a facility
- Availability of reliable water supply
- The existence of supporting sanitation infrastructure such as a public sewer
- Socio-cultural norms of users
- The cost of the sanitation infrastructure
- Any other environmental technical and social considerations that might apply
- Inclusion of people with difficulties in mobility i.e. people with disabilities and critically ill patients.
- Female sanitation facilities to make provisions for menstrual hygiene management.

Bathrooms are important infrastructure for both patients and HCWs for preventing and controlling transmission of diseases.

To improve hygiene practices within HCFs it is necessary to have adequate numbers of bathrooms which correspond to the level of bed capacities and staffing levels with the ratio of patient per bathroom of 1:20.

- A proper bathroom within the HCF should have the following basic qualities: A minimum surface area of 3.25m<sup>2</sup>
- Well drained non slippery floor, seamless floors and impervious walls
- Mixture taps for both cold and hot water
- Adequate lighting and ventilation for user safety
- Inclusive infrastructure that is furnished with wall mounted seats, functional emergence alarm call system and free room for wheelchair maneuvering

Separate bathrooms for HCWs and patients that are clearly labeled to identify the type of users and sex. HCFs are required to have accessible toilets which are specifically designed to accommodate groups of people with special needs according to their disability. Designs of sanitation facilities should essentially be inclusive to accommodate groups of people with special needs as follows;

- Facilities need to have hand rails and guiding systems (ramps) as well as proper lighting to enable people with visual impairment use the facilities.
- The design of a toilet should include wider doors, hand rails, raised and or foldable seats for easy access by people using wheel chairs and crutches
- Female toilets are to include facilities for menstrual hygiene management.

### **Guideline for design of hospital laundry:**

HCF laundries should be well designed with good drainage system easy to clean and must conform to the following standards and qualities:

- The laundry should not be located in a site which is directly accessible to the kitchen.
- The design of the laundry should facilitate the creation of dirty and clean areas to prevent cross contamination.
- A separate hand hygiene sink for staff with wall mounted dispensers for soap and paper towels should be provided.
- All staff at the laundry should be vaccinated against Hepatitis B virus and Tetanus Toxoid
- There should be a changing room for staff
- Washable smooth walls, edges, corners and projections with glazed ceramic tiles should be fixed up to 0.5m high.
- The laundry room should have a smooth ceiling, washable surface and enough height to allow installation and repair.
- Laundry containers/skips should be part of a routine cleaning schedule.
- Fume extractor fan should be installed inside the building

### **Qualities of a bathroom in HCF:**

- A minimum surface area of 3.25m<sup>2</sup>
- Good drainage with non-slippery floor
- Impervious walls
- Mixture taps for both cold and hot water
- Adequate lighting and ventilation for use and safety
- Furnished with wall mounted seats and handles with functional emergence alarm call system with free room for wheelchair maneuvering
- Separate bathrooms for HCWs and patients and clearly labelled to identify the type of users and sex

### **Toilets and washroom**

Adequate, accessible, and appropriate toilets are provided for patients, staff, and caregivers:

- At least one toilet per 20 In-patients plus one

- Physically challenged friendly toilet.
- The door size should be a meter wide to allow a wheel chair
- Should have side hand rails and alarm system
- The access passage should be a ramp and not steps
- Pedestal toilet
- There must be separate toilets for males and females.
- Toilets are built according to local resources, cultures, and practices.
- There is one bathroom for every 20 users in inpatient areas.
- Adequate preferably non interrupted water supply and proper drainage system.

## 15.0 APPENDICES

### 15.1 Procedure for inserting an intravenous line/cannula

- Counsel the patient on the nature of the procedure to reduce anxiety and get consent
- Put patient in a comfortable position.
- Collect all necessary equipment.
- Select a correct size cannula that will fit easily into the vein to reduce immediate trauma and later thrombophlebitis.
- Perform hand hygiene and dry hands thoroughly.
- Select an appropriate site
- Disinfect IV insertion skin site with 70% isopropyl alcohol impregnated swab for *at least 30 seconds prior* to puncture.
- Allow the site to dry before inserting the cannula.
- *Do not touch the puncture site* once the vein has been selected and the skin prepared
- Put on non- sterile gloves
- *Do not touch the shaft* of the cannula with the fingers during insertion
- Insert the cannula as swiftly as possible and always using an aseptic Technique.
- If the first insertion is not successful, the procedure should be repeated with a *new* cannula on a different site and seek help from colleague when having difficulties.
- Look out for the flashback of blood and then advance the cannula as you withdraw the needle slowly
- Apply sterile, transparent, semi-permeable dressing, or sterile gauze
- Secure cannula to avoid movement
- Label the site with the insertion date
- Connect the IV administration set using aseptic technique
- Ensure that all sharps are safely discarded in a sharps bin
- Remove gloves
- Perform hand hygiene.

**NB change the infusion site after 48 hours.**

## 15.2 Procedure for Urinary Catheterization

- Explain procedure to the patient to reduce anxiety and get consent
- Screen bed and close nearby window
- Fold linen to bottom of the bed and leave patient covered with a blanket
- Place drape towel under the buttocks
- Have an assistant available
- Have an assistant available (if possible).
- Ensure you have sterile materials at the point of care:
  - Sterile indwelling urinary catheter (single-use).
  - Sterile drape.
  - Sterile syringe filled with sterile water.
  - Clean examination gloves and sterile gloves.
  - Sterile gauze or sponge-holding forceps.
  - Single use lubricant.
  - Urine bags.
- Position patient in supine/dorsal
- Wash hands with soap and running water and wear examination gloves.
- Assistant pour solution into galipot and then opens the catheter and drops it in a sterile receiver.
- Expose the tip of the catheter
- Clean peri-urethral area with antiseptic such as 2 % aqueous chlorhexidine gluconate or 10 % povidone-iodine
  - a. For female catheterization swab each labia majora with downward movement using five swab technique
  - b. Separate the labia using the thumb and the index finger of left hand until procedure is completed
  - c. Swab the middle over the urethra last
  - d. With a sterile gloved right hand pick the sterile catheter and lubricate
  - e. For males, swab the tip of the penis and then hold the penis firmly with the left hand
  - f. Keep the other end of the catheter in the receiver and insert into the urethral orifice (4-5cm for females and males 16cm) in an upward and backward direction using strict aseptic techniques
- When urine is obtained, withdraw catheter gently, if not for retention
- If catheter is to be returned, a Foley's is used, balloon is inflated with required amount of sterile water according to size
- Insert spigot or connect urine bag as indicated and secure the urine bag to the bed to avoid ascending infection
- Wash hands and put on sterile gloves and insert the catheter
- Secure catheter with sterile water to avoid movement in the urethra.
- If urine sample is required, collect with sterile syringe and needle from sampling port of the urinary catheter after cleaning the area with alcohol.

- If irrigation is required to remove clots, aseptic technique must be used.
- Connect drainage bag and it should be placed below the level of the bladder and not above the waist. The urine collection bag should not be allowed to stand on the floor to maintain closed drainage system as much as possible.
- Empty drainage bag into a receptacle used for that patient only.
- Avoid changing catheters routinely to reduce risk of infection and trauma.
- For operative patients with an indication for an indwelling catheter, the catheter should be removed before 24 hours if it is no longer required
- For patients with an indication for long term indwelling catheterisation, urinary catheters should be replaced every four weeks or as clinically indicated.
- Remove gloves and perform hand hygiene before and after emptying draining bags.
- Document all procedures involving the catheter and drainage system in the medical or nursing notes. At the minimum, these should include:
  - The date.
  - The type
  - The size of catheter.
  - The volume of water in the balloon.

### **15.3 Procedure for Vagina Examination**

- Explain the procedure to the patient to gain her cooperation
- Obtain consent from the patient
- Clean trolley and disinfect top shelf
- Place sterile pack on top shelf and sterile glove
- Screen bed to provide privacy
- Close the window next to the patient for privacy and comfort
- Wash hands with soap and water and dry them
- Open pack, arrange equipment and pour antiseptic solution in bowl in readiness for procedure
- Assist patient into lithotomic position and expose vulva for easy access
- Hand rub
- Put on sterile gloves
- Put 6 swabs into bowl of solution to prevent cross infection
- Swab each labia majora with a down ward movement using one swab per stroke; then swab the labia minora and rest of vulva using same down ward movement to clean vulva
- Insert cotton wool tampon into vaginal onto the cervical os
- Using circular motions cleanse from cervical os outwards to clean the inside of vagina
- Dry vulva
- Change gloves
- Apply pad as necessary
- Remove gloves and wash hands
- Ask woman to dress and leave her comfortable
- Document procedure done and the findings
- Wheel trolley to the treatment room
- Clean, disinfect and dry the equipment and trolley using the correct PPE
- Wash hands

#### 15.4 Procedure for vaginal delivery

- Clean vulva with chlorhexidine 0.05% according to six swab technique and confirm full dilation
- Assistant to check foetal heart rate
- Note time
- Allow woman to bear down with a concentration
- Observe the perineum for signs of tears and perform an episiotomy when necessary
- Place the fingers of the left hand on the occiput if right handed, to flex the head in order to allow small diameters to distend the perineum
- Maintain downward flexion of the head until crowning occurs .
- When the head emerges ask the woman to pant
- Hold the head by temporal bones and extend the head to deliver siniscript, face and chin
- Quickly, check cord around baby's neck, if present clamp and cut the cord and free baby from strangulation
- Clean baby's eyes, mouth and nose with sterile piece of cloth or gauze
- Wait for restitution (internal rotation of the shoulders accompanied by external rotation of the head) to occur
- With both palms on each side of the the baby's head or bi-parietal bones, apply gentle downward traction
- As the woman bears down, direct the head downwards towards the anus to deliver the anterior shoulder then lift the baby gently towards the mother's abdomen to deliver the posterior shoulder
- Deliver the rest of the baby by lateral flexion towards the mother's abdomen. Note time of birth
- Dry the baby vigorously using sterile towel to stimulate the baby
- Cover the baby with clean dry towel
- Clamp the cord in two places, 2 cm from the baby's abdomen and 3cm from the first clamp
- Cut the umbilical cord in between the clamps with a sterile scissors, or blade under cover of sterile gauze to prevent spurting Keep baby wrapped in a dry clean towel/cloth, while on the mother's abdomen to promote bonding. Allow skin to skin contact

### 15.5 Delivering the baby; steps during the second stage

- Quickly palpates to determine nuchal cord; if it is loose, slide it over the baby's head; if it is very tight, clamp it in two places and cut it before unravelling it from around the baby's neck
- Allows spontaneous external rotation without manipulation
- Carefully holds the baby's head in both hands and applies downward traction until the anterior shoulder has emerged (**no neck holding**)
- Guides the baby's head and chest upward until the posterior shoulder has emerged
- Holds the baby by the trunk and places it on a dry towel on the mother's abdomen
- Dries baby gently, assesses the baby's breathing, changes wet towel for a clean dry one,
- Pass the baby to the mother for early skin-to-skin contact
- Clamps the cord in two places near the umbilicus and cuts the cord

### 15.6 Surgical wound dressing:

- Explain the procedure to the patient to gain cooperation and consent
- Screen the bed and close nearby window for privacy
- Assist the patient to lie in the most appropriate and comfortable position considering the site of the wound and the patient's condition for easy access and promotion of comfort
- Expose only the area to be dressed for privacy and dignity
- Wash hands with soap and running water for 40 to 60 seconds and dry them then put in gloves to prevent cross infection
- Loosen and remove outer dressing and discard in pedal bin in readiness for dressing
- Remove gloves and scrub hands vigorously with soap and water for at least 3 minutes
- pick sterile towel and dry hands and put on sterile gloves
- ask assistant to open sterile pack and expose sterile content using cheattle forceps
- arrange the sterile equipment appropriately
- pour antiseptic solution into galipot
- remove inner dressing using sterile dissecting forceps and drop into the pedal bin
- discard the forceps into kidney dish unto the bottom shelf
- place sterile towel appropriately around area to be dressed
- use dressing forceps and swabs dipped in an antiseptic solution to clean the wound
- swab the wound from inside out using each swab only one stroke and discard, if infected, start from clean dirty area
- repeat until wound is clean
- remove any loose dirt tissue
- dry the wound with gauze swab
- apply sterile dressing with forceps
- discard the forceps into kidney dish unto bottom shelf
- secure dressing with strapping
- leave patient comfortably

## 15.7 Procedure for blood transfusion

- Explain the procedure to the patient to gain cooperation and consent
- Place the mackintosh under the arm to be used to protect the linen
- Check vital signs of the patient for baseline
- Screen the bed to ensure privacy
- Two nurses should check the bottle before putting up blood for the following
  - Patients full name
  - Hospital number , ward and laboratory form
  - Blood group and rhesus factors
  - Date collected and expiring date. This is to avoid giving wrong and expired blood to patient
- Assemble all necessary equipment on trolley
- Bring the trolley with equipment to the patients bed side
- Maintain aseptic technique throughout the procedure
- Connect the blood giving set to the blood bag and suspend to the drip stand
- Wash hands with soap and water
- Expel air from the giving set and clamp to avoid continuous overflowing of blood
- Hand Hygiene
- Dry them with clean towel or air dry and put on gloves
- Assistant should apply a tourniquet to the limb
- Clean the insertion site with spirit swabs
- Insert a cannula or butterfly needle into the identified vein and make sure that blood comes out into the inserted cannula or butterfly needle
- Release the tourniquet and withdraw needle slowly
- Connect blood giving set to the cannula / butterfly needle
- Regulate the flow according to drop per minute
- Secure cannula/ butterfly needle in position with strapping
- Splint and immobilize the limb if necessary
- Observe patient for first 15 minutes and continue hourly for reaction
- Leave the patient in a comfortable position and thank them for their cooperation
- Dispose and decontaminate used equipment

## 15.8 Procedure for lumbar puncture

- Explain procedure to patient for cooperation and consent
- Wash your hands and put on gloves
- Position the patient appropriately
- Ask the assistant to hold the patient in flexion, taking care not to flex the neck to keep a clear airway
- Clean and drape the area
- Find a space between L4 and L5 along an imaginary line drawn from the top border of the iliac crest
- Infiltrate local anaesthesia about 1 cc or ml
- Insert the needle slowly through the skin into the identified space point towards the umbilicus until you have a feel of entering the Dural space and the CSF starts to flow
- Observe for flow, colour and consistency
- Collect more than 20 drops
- If blood stained CSF wait for some few drops in case you think it might clear later or try a space up
- Strap the punctured area after the procedure
- Fill the point, label the sample and send to lab
- Wash hands with soap and water

**15.9 Pre-operative checklist:**

#	Preparations	Remarks		
		Yes	No	N/A
1	Check if the procedure was explained to the patient			
2	Patient should be able to explain the procedure and ask where not clear			
3	Check consent form if signed by patient, witness and clinician			
4	Check surgical site marking			
5	Starve the patient for midnight			
6	Check patients name on theatre list			
7	Give pre-op medications			
8	Remove dentures and jewels			
9	Commence IV fluids (if indicated)			
10	Check vital signs			
11	Take file and radiographs if necessary			
12	Catheterize patient if indicated			
13	Check if FBC grouping and cross match are done			
14	Check if anaesthetic assessments are done			
15	Check patient has taken a bath			
16	Provide patient gown			

## 15.10 Reference guide for bio-safety levels

Biological Safety Levels (BSL) are a series of protections relegated to autoclave-related activities that take place in particular biological labs. They are individual safeguards designed to protect laboratory personnel, as well as the surrounding environment and community.

Knowing the difference in bio-safety lab levels and their corresponding safety requirements is imperative for anyone working with microbes in a lab setting

Bio-safety level	BSL-1	BSL-2	BSL-3	BSL-4
Description	-No containment -Defined organisms -Unlikely to cause disease	-Containment -Moderate Risk -Disease of varying severity	-High containment -Aerosol transmission - Seriously/Potentially lethal disease	- Max containment Exotic, 'High-Risk Agents' -Life-threatening disease
Sample organisms	E-Coli	Influenza, HIV, Lyme Disease	Tuberculosis	Ebola Virus
Pathogen type	Agents that present minimal potential hazard to personnel and the environment	Agents associated with human diseases and pose moderate hazard to personnel and the environment	Indigenous or exotic agents, agents that present a potential for aerosol transmission, & agents causing serious or potentially lethal disease	Dangerous and exotic agents that pose a high risk of aerosol transmitted laboratory infections and life threatening disease

### 15.11 . Chemicals for High Level Disinfection:

Disinfectant	Effective Concentration	Antimicrobial Activity					Time Needed	
		Bacteria	Spores	Mycobacterium	Virus		HLD	Sterilization
					Enveloped	NonEnveloped		
Chlorine	0.1%	+++	+++	+++	+++	+++	20 Mins	
Glutaraldehyde	2%	+++	+++	+++	+++	+++	20 Mins	10-12 Hrs
Ortho-phthalaldehyde (OPA)	0.55%	+++	+++	+++	+++	+++	20 Mins	
Hydrogen Peroxide	7.5%	+++	±	±	+++	±	30 Mins	
Phenols	2%	+++	++	+++	++	+		
Peracetic Acid	0.3%	+++	+++	+++	+++	+++	10 mins	
Formaldehyde	8%	-	-	-	+++	-	20 Mins	24 Hrs

+++ = Good

++= Moderate

±= Variable

-Not active

## 15.12 Types of Ventilation

	<b>Advantage</b>	<b>Disadvantage</b>
Natural	<p>Suitable for mild &amp; moderate climates</p> <p>Low maintenance costs Capable of high ventilation rates</p> <p>Controllable by occupants</p>	<p>Effectuated by climate</p> <p>Difficult to design</p> <p>Reduces comfort level if hot, humid or cold</p> <p>Inability to provide negative pressure in isolation areas</p>
Mechanical	<p>Suitable for all climates &amp; weather</p> <p>Can be controlled</p>	<p>Expensive to install &amp; maintain especially negative pressure vent</p>
Mixed	<p>Suitable for all climates &amp; weather</p> <p>Energy saving</p> <p>Flexible</p>	<p>Expensive</p> <p>Difficult to design</p>

## 15.13 PREPARATION OF DISINFECTANT

**Sodium Dichloroisocyanurate (NaDCC e.g Presept):**

CONCENTRATION OF DISINFECTANT		DILUTION METHOD			USAGE
		0.5gm tablet	1.25gm tablet	2.5gm tablet	
10,000 ppm	1%	17 tablets in 0.5 litres (L) of water	14 tablets in 1L of water	7 tablets in 1L of water	Spillage management Wiping & cleaning of blood/body fluids
5,000 ppm	0.5%	9 tablets in 0.5L of water	7 tablets in 1L of water	9 tablets in 2.5L of water	Environmental surfaces disinfection
1,000 ppm	0.1%	4 tablets in 1L of water	3 tablets in 2L of water	4 tablets in 5L of water	Linen and general cleaning
150 ppm	0.015%	1 tablet in 2L of water	1 tablet in 5L of water	1 tablet in 10L of water	

### Formula for preparing dilute chlorine solutions

$$\text{Total parts (TP) (H}_2\text{O)} = \left[ \frac{\% \text{ Concentrate}}{\% \text{ Dilute}} \right] - 1$$

$$\text{Total parts (TP) (H}_2\text{O)} = \left[ \frac{5\% \text{ Concentrate}}{.5\% \text{ Dilute}} \right] - 1 = 9 \text{ Total parts (TP) (H}_2\text{O)}$$

To make a 0.5% chlorine solution from 5% bleach,  
mix 1 part bleach to 9 parts water.

### Formula for Preparing a Chlorine Solution from a Powder

$$\text{Gram/Liter} = \left[ \frac{\% \text{ Dilute}}{\% \text{ Concentrate}} \right] \times 1000$$

$$\text{Gram/Liter} = \left[ \frac{.5\% \text{ Dilute}}{35\% \text{ Concentrate}} \right] \times 1000 = 14.2 \text{ Gram/Liter}$$

To make a 0.5% chlorine solution from  
a 35% chlorine powder,  
mix 14.2 grams of powder to 1 liter of water.

15.14 Contact precautions poster

## Contact Precautions

VISITORS/ VISITING STAFF



**REPORT TO NURSE IN CHARGE BEFORE ENTERING THIS ROOM**

	<b>HAND</b>	Use alcohol rub or wash hands before leaving the room
	<b>Aprons Gloves</b>	Wear an apron when entering the room. Wear gloves for direct or indirect contact with the patient or excretions and secretions
	<b>Door</b>	Keep door closed at all times if patient in isolation
	<b>Before leaving</b>	Decontaminate equipment when it leaves the room. Discard gloves and apron and carry out hand hygiene before leaving the room

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15.15 Droplet Precautions poster

## Droplet Precautions

VISITORS/ VISITING STAFF



**REPORT TO NURSE IN CHARGE BEFORE ENTERING THIS ROOM**  
**INSTRUCTION BEFORE ENTERING THE ROOM**

	<p><b>HAND</b></p>	<p>Use alcohol rub or wash hands before leaving the room</p>
	<p><b>Mask</b></p>	<p>Wear water resistant mask when working within 1 metre of the patient</p>
	<p><b>Aprons Gloves</b></p>	<p>Wear an apron when entering the room. Wear gloves for direct or indirect contact with the patient or excretions and secretions</p>
	<p><b>Door</b></p>	<p>Keep door closed at all times if patient in isolation</p>
	<p><b>Before leaving</b></p>	<p>Decontaminate equipment when it leaves the room. Discard gloves, apron and mask. Carry out hand hygiene before leaving the room</p>

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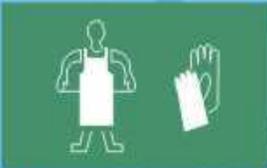
15.16. Airborne Precautions Poster

## Airborne Precautions

VISITORS/ VISITING STAFF



**REPORT TO NURSE IN CHARGE BEFORE ENTERING THIS ROOM**  
**INSTRUCTION BEFORE ENTERING THE ROOM**

	<b>HAND</b>	Use alcohol rub or wash hands before leaving the room
	<b>Respirator</b>	Wear N95 respirator (FFP3) for MDR/ XDR-TB patients Aerosol generating procedures
	<b>Aprons Gloves</b>	Wear an apron when entering the room. Wear gloves for direct or indirect contact with the patient or excretions and secretions
	<b>Door</b>	Keep door closed at all times.
	<b>Before leaving</b>	Decontaminate equipment when it leaves the room. Discard gloves, apron and masks. Carry out hand hygiene before leaving the room

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## 16.0 Reference

Gokhale R.A, Galang R.R., Pitman J.P., & Brooks J.T. (2017). A tale of 2 HIV outbreaks caused by unsafe injections in Cambodia and the United States, 2014-2015. *American Journal of Infection Control* 45 (2), 106.

[www.cdc.gov/hicpac/cauti/001](http://www.cdc.gov/hicpac/cauti/001)

**Seafield:** Infection Prevention Society in association with NHS Improvement, 2017, IHI *How- to Guide: Prevent Surgical Site Infections, How- to Guide: Prevent Surgical Site Infection for Hip and Knee*

**Arthroplasty.** Cambridge, MA: Institute for Healthcare Improvement; 2012, and WHO *Surgical Site*

*Infection prevention programme.* World Health Organization, 2016.

<http://www.cdc.gov/getsmart/healthcare/inpatient-stewardship>

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[www.msjonline.org](http://www.msjonline.org)

*Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care-WHO Interim Guidelines”* <http://www.who.int/csr/resources/publications/WHO>