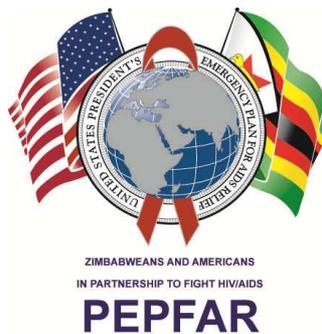


MAY 2013

NATIONAL INFECTION PREVENTION AND CONTROL GUIDELINES



Foreword

The purpose of the Guidelines is to provide health workers, managers and supervisors the standards and criteria against which to measure safe practice in infection prevention and control. Additionally, it provides relevant information for communities and those providing Home-Based Care.

The East, Central and Southern African College of Nursing (ECSACON) initiated the preparation of the Guidelines and supporting activities. A team of senior nurses, members of ECSACON, from Kenya, Malawi, Swaziland, Tanzania, and Zimbabwe designed an assessment tool for the collection of data on infection prevention and control practices. Subsequently, nurses from Malawi, Tanzania, and Zimbabwe conducted assessment studies in their countries.

The findings of the three countries studies were presented at the 32nd Conference of Health Ministers held in Swaziland in October 2000. The significance of the findings moved the Ministers to pass resolution (CRHC/RHMC32/R5), indicating that countries should be assisted to develop and/or strengthen their infection prevention and control practices.

In response to the resolution, World Health Organization Regional Office for Africa in partnership with the East, Central and Southern Africa Health Community (ECSA-HC) recruited a consultant Dr. Una V. Reid to assist countries in the development and/or strengthening of their infection prevention and control policies and guidelines, and to develop a related training programme. This work resulted in the prototype Manual of Infection Prevention and Control Guidelines, which provided a framework and details for the establishment of infection prevention and control in all health care facilities (government, mission and private), homes and communities. These Guidelines have now been updated by a multi-disciplinary team with the support of CDC- Zimbabwe.

The Guidelines are very comprehensive but simple to follow and are appropriate for use by all disciplines. They are designed with sections, which outline the different aspects of infection prevention and control that may be adapted/adopted to meet specific institutional or community requirements. However, like all guidelines, they should be considered a work in progress.

Infection prevention and control practices are a multidisciplinary endeavour, and require compliance by all categories and levels of staff. Such compliance is obligatory to the prevention and control of hospital associated/nosocomial and other infections in the health care facilities and settings, as well as in the community.



Brigadier General (Dr.) G Gwinji
Secretary for Health and Child Welfare

Acknowledgements

The Government of Zimbabwe, Ministry of Health and Child Welfare would like to extend its profound gratitude to all who contributed to the production of the 'Infection Prevention and Control Guidelines of Zimbabwe'.

The Ministry is grateful to ECSACON who initiated the process for the development of these guidelines and to Dr Una V Reid who prepared the first draft. WHO supported the review of this document and CDC-Zimbabwe supported the preparation of the final document and its publication.

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Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
AFB	Acid fast bacilli
AIIR	Airborne Infection Isolation Room
APIC	The Association for Professionals in Infection Control and Epidemiology
ARVs	Antiretrovirals (Drugs/treatment)
CDC	Center for Disease Control
CEO	Chief executive Officer
CQI	Continuous quality improvement
CF	Cystic Fibrosis
CSSD	Central Sterile Supplies Department
DEET	N,N-Diethyl-meta-toluamide
DOT	Directly observed therapy
DR-TB	Drug resistant TB
ESBL	Extended spectrum β -lactamase
ETO	Ethylene Oxide
HAI	Hospital acquired infections
HB _s Ag	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCF	Health Care Facility
HCV	Hepatitis C
HW	Health worker
HIV	Human Immunodeficiency virus
HEPA	High Efficiency Particulate Air (Filter)
HLD	High level disinfectant
HP	Hydrogen peroxide
ICAN	Infection Control Africa Network
ICAZ	Infection Control Association of Zimbabwe
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
IPCCO	Infection Prevention and Control Officer
IPCC	Infection Prevention and Control Committee
IUD	Intra-uterine device
LTCF	Long term care facility
MDR-TB	Multi-drug Resistant TB
MDRO	Multi-drug resistant organism
MOHCW	Ministry of Health and Child Welfare
MRSA	Methicillin Resistant <i>Staphylococcus aureus</i>
NICU	Neonatal Intensive Care Unit
OPA	Orthophthaldehyde
PA	Peracetic acid
PEP	Post exposure prophylaxis
PPE	Personal protective equipment
ppm	parts per million
SARS	Severe acute respiratory syndrome
SOPs	Standard Operating Procedures
TB	Tuberculosis
TWA	Total Weighted Average (permissible exposure limit; Occupational Safety and Health Administration)
UVGI	Ultraviolet germicidal irradiation
UTI	Urinary tract infection
VHF	Viral haemorrhagic fever
VISA	Vancomycin-intermediate resistant <i>Staphylococcus aureus</i>
VRSA	Vancomycin resistant <i>Staphylococcus aureus</i>
VRE	Vancomycin resistant enterococci
WHO	World Health Organisation
XDR-TB	Extensively drug resistant TB

Glossary

Acute Care Facility: A hospital where average length of stay is < 30 days, and where a variety of services are provided, including surgery and intensive care.

Antimicrobial Resistant Organism: A micro-organism that has developed resistance to the action of several antimicrobial agents and that is of special clinical or epidemiological significance. Organisms included in this group are Methicillin resistant *Staphylococcus aureus* (MRSA), vancomycin resistant enterococcus (VRE), penicillin-resistant pneumococcus, certain Gram negative bacilli resistant to all penicillin and cephalosporins, and multi-drug resistant *Mycobacterium tuberculosis*. Other microorganisms may be added to this list if antibiotic resistance is judged to be significant in a specific health facility or patient population, at the discretion of the infection control programme or local, regional or national authorities.

Antiseptic: A product with antimicrobial activity that is designed for use on skin or other superficial tissues; removes both transient and resident flora. The term is used for preparations applied to living tissue.

Asepsis: The process of preventing the access of micro-organisms.

Barrier Techniques: Use of single rooms, gloves, masks, or gowns in healthcare settings to prevent transmission of micro-organisms.

Biosafety: The application of combinations of laboratory practice and procedure, laboratory facilities, and safety equipment when working with potentially infectious micro-organisms.

Bloodborne Pathogens: Pathogenic micro-organisms that are present in human blood and can cause disease in human. These pathogens include, but are not limited to hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Carrier: An individual who is found to be persistently colonized (culture positive) for a particular organism, at one or more body sites, but has no signs or symptoms of infection.

Chemical Disinfectant: A chemical that causes the destruction or inhibition of most viruses and bacteria and fungi while in their active growth phase. The process does not necessarily kill all spores.

Cleaning: The physical removal of foreign material, e.g. dust, soil, organic material such as blood, secretions, excretions and microorganisms. Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents and mechanical action. Cleaning agents are the most common chemicals used in housekeeping activity.

Clinical Laboratory: Workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials.

Colonisation: Presence of micro-organisms in or on a host with growth and multiplication but without tissue invasion or cellular injury.

Commensal: An organism living on or within another organism, and deriving benefit without harming or benefiting the host.

Communicable: Capable of being transmitted from one person to another synonymous with "infectious" and "contagious".

Community-acquired Infection: Infection acquired outside a healthcare setting.

Contaminated: The presence or the reasonably anticipated presence of blood or potentially infectious materials.

Contaminated Laundry: Laundry that has been soiled with blood or other potentially infectious materials.

Contaminated Sharps: Any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Contamination: The presence of micro-organisms on inanimate objects (e.g. clothing, surgical instruments) or micro-organisms transported transiently on body surface such as hands, or in substances (e.g. water, food, milk).

Contagious: Capable of being transmitted from one person to another; synonymous with "infectious" and "communicable".

Critical Items: Instruments and devices that enter sterile tissues, including the vascular system. Clinical items present a high-risk of infection if the item is contaminated with any

micro-organisms, including bacterial spores. Reprocessing critical items involves decontamination and meticulous cleaning followed by sterilisation.

Decontamination: The use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particle and the surface of the item is rendered safe for handling.

Dental Item Classification: The classification of dental items as critical, semi-critical, or noncritical based on the pathways through which cross-contamination may occur and the location and technique of instrument use.

Disease: Clinical expression of infection; signs and/or symptoms are produced.

Disinfect: Means to inactivate virtually all recognized pathogenic microorganisms, but not necessary all microbial forms, on inanimate objects.

Disinfection: The inactivation of disease-producing micro-organisms. Disinfection does not destroy bacterial spores. Disinfectants are used on inanimate objects; antiseptics are used on living tissue. Disinfection usually involves chemicals, heat or ultraviolet light. Levels of chemical disinfection vary with the type of product used.

Engineering Controls: Controls (e.g. sharps disposal containers, self-sheathing needles) that isolate or remove the bloodborne pathogens hazard from the workplace.

Exposure: Reasonably anticipated skin, eyes, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. This definition excludes incidental exposures that may take place on the job, and that are neither reasonably nor routinely expected and that the worker is not required to incur in the normal course of employment.

Exposure Incident: A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Fomites: Those objects in the inanimate environment that may become contaminated with micro-organisms and serves as a vehicle of transmission.

Germicide: An agent that destroys microorganisms, especially pathogenic organisms.

Hand Antisepsis: A process for the removal or destruction of resident and transient micro-organism on hands.

Handwashing Facility: A facility providing an adequate supply of running portable water, soap and towel for drying hands.

Hand washing: A process for the removal of soil and transient micro-organisms from the hands.

Heavy Microbial Soiling: The presence of infection or high levels of contamination with organic material, e.g. infected wounds, faeces.

HBV: Hepatitis B virus.

HCV: Hepatitis C virus.

HIV: Human Immunodeficiency virus.

High-Level Disinfection: Level of disinfection required when processing semi-critical items. High-level disinfection process destroys vegetative bacteria, Mycobacteria, fungi and enveloped (lipid) and non-enveloped(non-lipid) viruses, but not necessarily bacterial spores. High-level disinfectant chemicals also called chemi-sterilants) must be capable of sterilisation when contact time is extended. Items must be thoroughly cleaned prior to high-level disinfection.

Hospital Disinfectant: An agent shown to be effective against specific micro-organisms such as *Staphylococcus aureus*, *Salmonella choleraesuis* and *Pseudomonas aeruginosa*. It may also be effective against other organisms and some viruses. The labels of all commercially available hospital disinfectants contain a claim of effectiveness for specific agents.

Immunocompromised: Increased susceptibility to infection. In this document the term refers to patients with congenital or acquired immunodeficiency or immunodeficiency due to chemotherapeutic agents or haematological malignancies.

Infection: The entry and multiplication of an infectious agent in the tissues of the host (a) unapparent (asymptomatic, subclinical) infection: an infectious process running a course similar to that of clinical disease but below the threshold of clinical symptoms (b)

apparent (symptomatic, clinical) infection: one resulting in clinical signs and symptoms (disease).

Infectious: Caused by infection or capable of being transmitted.

Infectious Waste: That portion of biomedical waste that is capable of producing infectious disease.

Intermediate-Level Disinfection: Level of disinfection required for some semi-critical items. Intermediate-level disinfectants kill vegetative bacteria, most viruses and most fungi but not resistant bacterial spores.

Isolation : The physical separation of infected individuals from those uninfected for the period of communicability of a particular disease.

Invasive Procedure: A surgical entry into the tissues, cavities, organs, or repair of traumatic injuries.

Long Term Care: The provision of health, social, personal care and housing services on a recurring or continuing basis to persons of all age groups with chronic health and mental conditions that limit their ability to carry out normal daily activities without assistance. Encompasses care in institutions, community-based settings and private homes.

Long Term Care Facility: Residential care that includes a variety of levels and types of care for clients who can no longer safely live at home (e.g. because of their need for medication supervision, 24 hour surveillance, assisted meal services, professional nursing care and/or supervision). Terminology varies, e.g. nursing home; chronic care, extended care unit.

Low-Level Disinfection: Level of disinfection required when processing non-critical items or Mycobacteria on some environmental surfaces. Low-level disinfectants kill most vegetative bacteria and some fungi as well as enveloped (lipid) viruses (e.g. hepatitis B, C, Hantavirus, and HIV). Low-level disinfectants do not kill Mycobacteria or bacterial spores. Low level disinfectants-detergents are used to clean environmental surfaces.

Microorganisms: Bacteria bacterial spores, fungi, viruses and parasites.

NaDCC : Sodium dichloro-isocyanurate.

Non-critical Items: Instruments, equipment, or materials that touch only intact skin, but not mucous membrane, or do not directly touch the patient. Reprocessing of non-critical items require decontamination, cleaning and/or low-level disinfectant.

Healthcare-associated infection: An infection originating in the environment of a health facility that was not present or incubating at the time of patient admission.

Outbreak: An excess over the expected incidence of disease within a geographic area during a specified time period.

Occupational Exposure: Reasonable anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. Other Potentially Infectious Material Semen, vaginal secretions, cerebro-spinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; any unfixed tissues or organ (other than intact skin) from a human (living or dead). HIV contaminated cell or tissue cultures, organ cultures, and HIV or HBV-containing medium or other solutions and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral: Piercing of mucous membranes or the skin barrier through such events as needlestick injury, human bites, cuts, and abrasions.

Personal Protective Equipment (PPE): Specialised clothing or equipment worn by an employee for protecting against a hazard.

Physical Containment: The containment of a micro-organism or eukaryotic cell to prevent or minimize its contact with people and/or the environment.

Plain Soap: Detergent-based cleanser in any form (bar, liquid or powder) used for the primary purpose of physical removal of soiled and contaminating micro-organisms. Such soaps work principally by mechanical action and have weak or no bactericidal activity. Although some soap contains low concentrations of antimicrobial ingredients, these are used as preservatives and have minimal effect on colonising flora.

PPM: Parts per million.

Precautions: Interventions implemented to reduce the risk of transmission of micro-organisms from patient to patient, patient to health worker and health worker to patient.

Regulated Waste: Liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; pathological and microbiological wastes containing blood or other potentially infectious materials.

Sanitary Sewer System: A sewer system connected to a sewage treatment plant.

Semi-critical Items: Instruments, equipment or materials that come in contact with non-intact skin or mucous membranes but ordinarily do not penetrate them. Reprocessing semi-critical items involves decontamination and meticulous cleaning followed preferably by high-level disinfection (level of disinfection required is dependent on the item. Depending on the type of item and its intended use, intermediate-level disinfection may be acceptable.

Sharps: Needles, syringes, blades, laboratory glass or other objects capable of causing punctures or cuts.

Source: Individual Any individual, living or dead, whose blood or other potentially infectious materials may be a source or occupational exposure to the employee.

Sporicide: A chemical agent or thermal process that destroys bacterial spores.

Standard Precautions: An approach to infection prevention and control. universally applied to all patients, regardless of infection status, to reduce the risk of blood borne pathogen transmission.

Sterilize: The use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Sterile: Free from all living micro-organisms.

Sterilizer or Sterilant: An agent intended to destroy all micro-organisms and their spores on inanimate surface.

Sterilization: The destruction of all forms of microbial life including bacteria, viruses, spores and fungi. Items must be cleaned thoroughly and decontaminated before effective sterilization can take place.

Transmission-based precautions: Procedures that are put in place to prevent exposure to infectious microorganism based on route of transmission

Work Practice Controls: Controls that reduce the likelihood of exposure by altering the way one performs a task.

Universal Precautions: A protocol for infection prevention and control that treats all human blood and body fluids as if known to be infectious for HIV, HBV, and other blood borne pathogens. Has been replaced by Standard and Transmission-based precautions.

Introduction

Healthcare-associated infections (HAI) are an important public health problem because they occur frequently, cause morbidity and mortality and are a significant burden among patients, health-care workers and health systems. Outbreaks of HAI may have severe consequences in hospitals and transmission from former patients, visitors and staff can lead to outbreaks in the community.

The primary objective of infection prevention and control is to prevent the spread of infection in healthcare facilities and settings; thereby assisting health workers in the provision of quality healthcare. These infection prevention and control guidelines provide administrators and health workers with information to enable them to implement infection, prevention and control effectively in order to protect themselves as well as patients and visitors from transmission of infections.

These infection prevention and control principles and guidelines are based on research findings and recommendations from expert authorities, as well as on professional judgment. Where necessary, these have been modified to meet local requirements.

Purpose of the Guidelines

These guidelines were developed to provide a central reference for all healthcare facilities/settings and health workers. The principles and guidelines are expected to change in response to new knowledge and technology. The reduction of risks of healthcare-associated infections depends largely on the performance of appropriate patient care practices. Health workers may be motivated to follow these practices if adequate infrastructure and supplies are provided, if they are appropriately supervised, and if they are given adequate training followed by periodic in-service education.

Continuous or periodic evaluation of patient care practices, preferably under the supervision of the Healthcare Facility Infection Prevention and Control Committee, might assure continued performance of correct practices. Good management practices at the institution/department and ward/unit levels are the key to effective infection prevention and control practices.

These guidelines have been prepared specifically to assist infection control practitioners in the prevention, control and management of healthcare-associated infections and to ensure that healthcare administrators understand the significance of infection control programmes. An infection control programme puts together various practices which, when used appropriately restrict the spread of infection. It is a tool for advocacy of quality health care. They have been designed for use by supervisors, team leaders, administrators and all health workers in any health facility in Zimbabwe be it public, private, mission or local government.

Scope of the Guidelines

The comprehensiveness of infection prevention and control may differ according to the type of care and scope of services provided at the healthcare facility and setting (i.e. critical care, primary care).

The technical content of these Guidelines include the Epidemiology of Healthcare-Associated Infections, Standard and Transmission-Based Precautions, Disinfection and Sterilization (Reprocessing of Medical Equipment and Instruments), Environmental Cleaning and Disinfection, Healthcare Facility Medical Waste Management, Surveillance of Healthcare-Associated Infections and Risk Management (Health Worker Health).

The suggested levels of responsibility and authority for setting up and managing infection, prevention and control programmes within health facilities and settings, including Home-Based Care, are outlined in Section I and in **Annex 1**.

Section I: Organisation of infection prevention and control at health facilities

The major preventive effort should be focused in hospitals and other health care facilities. Health facilities are encouraged to have:

- A facility infection control programme
- Annual infection control work plans
- An infection prevention and control team

Infection Prevention and Control Teams are health workers involved in carrying out the day-to-day infection prevention and control programme activities. Ideally, the infection control team consists of at least one infection prevention and control officer (IPCO) who has received training.

Infection prevention and control teams or individuals provide technical support, e.g. developing and accessing policies and practical supervision, evaluating material and products, overseeing sterilization and disinfection, ensuring the sound management of medical waste and implementing training in infection prevention and control.

Health Facility Management is encouraged to support Infection Prevention and Control teams by:

- Ensuring that IPC team members have resources and the authority to implement IPC;
- Delegating technical aspects of hospital hygiene to appropriate staff (e.g., nursing, housekeeping, maintenance, lab);
- Ensuring that different units/disciplines within the facility understand and execute their roles and responsibilities relating to IPC;
- Ensuring implementation of measures to prevent biological risks to staff during the healthcare process.

Infection Prevention and Control Committee (IPCC)

Each health facility should have a multidisciplinary committee that deals with infection prevention and control issues with each member of the committee making inputs as they relate to his /her discipline in order to share information and to cooperate. The committee could include medically trained microbiologists, clinicians, management representatives, and other health workers representing, pharmacy, sterilizing service, housekeeping and training services. (See Annex 1 for responsibilities of the IPCC and the IPC Officer).

Section II: Epidemiology of healthcare – associated infections

The most common types of healthcare-associated infections include infections of surgical wounds, the blood stream, the urinary tract and the lower respiratory tract. In some settings, puerperal endometritis and gastrointestinal infections are also common.

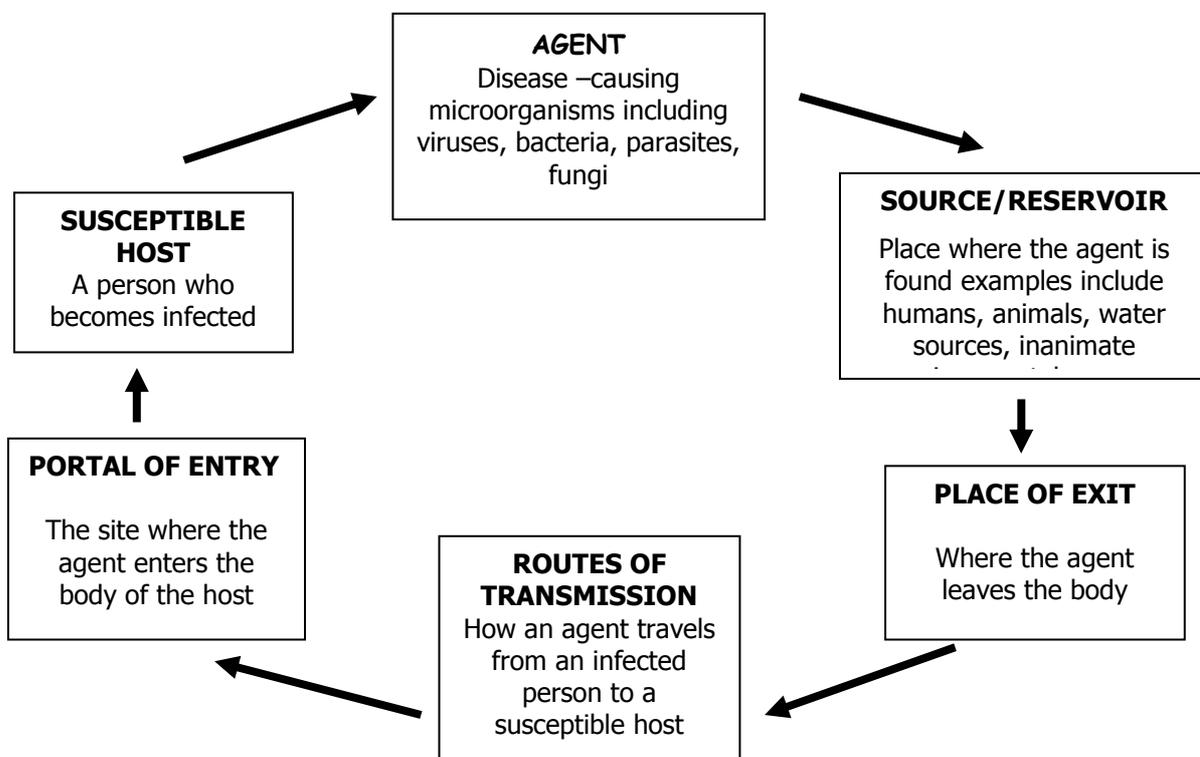
Transmission of infectious agents within a healthcare setting requires three elements: a source (or reservoir) of infectious agents, a susceptible host with a portal of entry receptive to the agent, and mode of transmission for the agent. A diagram of the infectious disease transmission cycle is shown in **Figure 1**.

Source/reservoir: The source or reservoir of the infecting agent may be patients, staff, visitors, vectors, food or water. It may include persons with the active disease, those in the incubation period of the disease and those who are colonized by the infectious agent, but have no apparent disease (carriers).

In healthcare settings, body substances including blood, saliva, sputum, nasal discharge, wound drainage, urine, excrement and contaminated inanimate environmental objects, including equipment and medications may contain transmissible infectious agents.

Susceptible host: Most of the factors that influence infection and the occurrence and severity of disease are related to the host. Persons lacking effective resistance to a particular micro-organism are susceptible to that micro-organisms. Infection rates are higher among patients with increased susceptibility because of extremes of age, severity of the underlying disease, conditions that impair the immune system including human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) or use of invasive devices and procedures.

Figure 1: The Infectious Disease Transmission Cycle



Source: Adapted from APIC 1983; WPRO/WHO 1990

Transmission: For infection transmission to occur there must be **sufficient quantities** of the pathogen AND the pathogen must be **virulent** enough to cause disease. The pathogen moves through a route of transmission and reaches a "portal of entry" to enter the susceptible host. Common portals of entry include respiratory tract, gastrointestinal tract, mucosa (e.g., conjunctiva, nose, mouth), genitourinary tract, breach of skin integrity, mosquito bite.

Infection transmission can be prevented by breaking one or more of the links in the chain of infection transmission between the source or reservoir of infecting organisms which cause the infection and the susceptible host.

- Source control measures include cough etiquette, cleaning and disinfection.
- Transmission modes can be interrupted with implementation of standard and transmission-based infection control precautions (e.g., Contact: hand hygiene; Droplet: distance from source >1 metre; Airborne: ventilation; Vector: bednets)
- Portal of entry into the host can be blocked by adding barriers (e.g., personal protective equipment)
- Host susceptibility can be reduced by strengthening host defences (e.g., vaccination)

Modes of transmission: The modes of transmission of communicable diseases are similar in health-care settings and in the community; however, **the clinical practices employed** during care in healthcare settings (e.g. invasive procedures, manipulation by the health-care worker) may themselves facilitate the spread of pathogens and infections.

Micro-organisms are transmitted by several routes and the same micro-organism may be transmitted by more than one route. There are five main modes of transmission:

1. Contact
2. Droplet
3. Airborne
4. Common vehicle transmission
5. Vector borne

1. Contact transmission involves the spread of infection by direct or indirect contact with patients or the patient-care environment. Contact transmission is the most important and most frequent mode of transmission of healthcare-associated infection and is divided into two sub-groups: direct-contact transmission and indirect contact transmission.

a) Direct contact transmission involves a direct body surface-to-body contact with an infected or colonized person, such as occurs when a health worker turns a patient, gives a patient a bath or performs other patient care activities that require direct personal contact. Other examples of direct contact include person-to-person mechanisms such as kissing, skin-to-skin contact, and sexual intercourse, as well as direct contact with animals, soil or vegetation.

b) Indirect contact transmission occurs when an agent is carried from a reservoir (the source of infection) to a susceptible host without direct contact with the source.

Pathogens can spread by contamination of a patient's hands, the hands of a health worker or an environmental surface. Common respiratory pathogens can survive for hours or even days on environmental surfaces (e.g., door knobs). Hands can transmit infection by touching the contaminated surface, then contacting another body surface such as the conjunctival or nasal mucosa or by contaminating another intermediate area.

Infections spread by direct or indirect contact with patients or patient-care environment include skin infections, diarrhoeal diseases, influenza, viral haemorrhagic fevers.

2. Droplet transmission occurs when large-particle droplets containing microorganisms generated from an infected person are propelled a short distance through the air and deposited on the susceptible host's conjunctivae (the mucous membrane that lines the inner surface of the eyelid and the exposed surface of the eyeball) or the mucous membranes of the nose or mouth. For transmission to occur, the source and the susceptible host need to be within approximately one metre of each other since typically large droplets do not travel beyond one metre.

Droplets are generated from the source person primarily during coughing, sneezing, talking and during the performance of certain procedures such as suctioning and bronchoscopy.

Diseases transmitted by droplet infection include pertussis, mumps, rubella, influenza and meningococcal disease.

3. Airborne transmission occurs by dissemination of either airborne droplet nuclei (small particle residue) of evaporated droplets containing microorganisms that remain infectious while suspended in the air or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may be inhaled by a susceptible host within the same room or over a long distance from the source patient, depending on environmental factors.

Opportunistic airborne transmission: Certain therapeutic procedures (e.g., bronchoscopy, sputum induction, resuscitation, intubation, suctioning and/or extubation) are associated with the generation of infectious aerosols. Opportunistic airborne transmission DOES NOT constitute the classical airborne transmission.

Prevention and control of airborne transmission is difficult as it requires control of airflow and/or installation of special ventilation systems.

Microorganisms transmitted by airborne transmission include *Mycobacterium tuberculosis*, Rubeola (measles), and Varicella (chickenpox) viruses.

4. Common vehicle transmission applies to micro-organisms transmitted by contaminated items including food (e.g. salmonellosis, cholera, Hepatitis A); water (e.g. shigellosis, cholera); parenteral medications/intravenous solutions; blood (e.g. Hepatitis B, C, HIV); patient equipment and medical devices (e. g. *Staphylococcus aureus*, *Klebsiella* spp.).

These serve to transmit infection to multiple hosts. Such transmission may result in an explosive outbreak.

5. Vector borne transmission occurs when vectors such as mosquitoes, flies, rats and other vermin transmit micro-organisms. It can be prevented by appropriate health facility construction and maintenance, screened windows and good housekeeping.

Section III: Infection Control Precautions

Prevention of healthcare-associated infections requires limiting infection transmission through the implementation of appropriate infection prevention and control (IPC) practices. The objective of IPC practice is to decrease the transmission of infectious agents between staff and patients to such a level that infection or colonization does not occur.

In addition to practices carried out by health workers when providing care, all individuals (including patients and visitors) should comply with infection precautions in health-care settings.

Standard Precautions are **routine** infection control precautions that should apply to **ALL** patients, in **ALL** health-care settings. For certain highly transmissible or epidemiologically important pathogens, transmission-based precautions are used **in addition** to standard precautions: Contact, droplet and airborne precautions are based on the different routes of transmission discussed earlier.

Standard precautions and/or transmission based precautions should be applied to signs and symptoms without waiting for laboratory results. Since the infecting agent often is not known at the time of admission to a health care facility, transmission-based precautions are used empirically, according to the clinical syndrome and the likely aetiologic agent and then modified when the pathogen is identified or a transmissible infectious disease aetiology is ruled out. Infectious patients include those with diarrhoea and vomiting, gross bleeding, fever and exanthema, cough and fever, and large discharging wounds.

Standard Precautions

Standard precautions are designed for the care of all patients in health facilities and settings regardless of their diagnosis or presumed infectious status. Patients may also be assigned an additional category of isolation precaution dependent upon the patient's clinical situation.

The precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in health facilities. Implementation of these Standard Precautions is the primary strategy for successful infection control.

Standard Precautions synthesize the major features of Universal Precautions and Body Substance Isolation and are based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin and mucous membranes may contain transmissible infectious agents.

Elements of Standard Precautions

Key elements of healthcare facility recommendations for Standard Precautions include:

- Hand hygiene
- Use of gloves
- Facial protection (eyes, nose and mouth)
- Use of gowns
- Prevention of needle stick injuries
- Respiratory hygiene and cough etiquette
- Environmental cleaning
- Linen management
- Waste disposal
- Appropriate processing of medical instruments and patient care equipment

Hand Hygiene

Hand hygiene has been cited frequently as the single most important practice to reduce the transmission of infectious agents in healthcare settings and is an essential element of Standard Precautions.

The term “hand hygiene” includes both hand washing and hand decontamination. In the absence of visible soiling of hands, approved alcohol based products for hand disinfection are preferred over antimicrobial or plain soap and water because of their superior microbiocidal activity, reduced drying of the skin and convenience. (Hand hygiene SOPs see **Annex 2**).

GLOVES ARE NOT A SUBSTITUTE FOR HANDWASHING

Personal Protective Equipment

Personal Protective Equipment (PPE) refers to a variety of barriers used alone or in combination to protect mucous membranes, airways, skin, and clothing from contact with infectious agents. The selection of PPE is based on the nature of the patient interaction and/or the likely mode(s) of transmission.

Personal protective equipment reduces but does not completely eliminate the risk of acquiring an infection. It is important that it is used effectively, correctly, and at all times where contact with blood and body fluids of patients may occur. Continuous availability of personal protective equipment and adequate training for its proper use are essential.

Health workers should **ROUTINELY ASSESS THE RISK** of exposure to body substances or contaminated areas **BEFORE** any anticipated healthcare activity and select PPE based on the assessment of risk. Staff must be aware that use of personal protective equipment does not replace the need to follow basic infection control measures such as hand hygiene.

All of the PPE listed here **prevent contact with the infectious agent or body fluid that may contain the infectious agent**, by creating a barrier between the worker and the infectious material (e.g., blocking portals of entry).

- Gloves, protect the hands,
- Gowns or aprons protect the skin and/or clothing,
- Masks and respirators protect the mouth and nose. (The respirator has been designed to also protect the respiratory tract from airborne transmission of infectious agents.)
- Goggles – protect eyes
- Face shields – protect face, mouth, nose, and eyes

PPE should be used in the context of other prevention and control strategies and in accordance with infection control recommendations (e.g., Standard, Contact, Droplet or Airborne Precautions).

Gloves

Gloves are used to prevent contamination of healthcare personnel hands when:

- a) anticipating direct contact with blood or body fluids, mucous membranes, non-intact skin and other potentially infectious material
- b) having direct contact with patients who are colonized or infected with pathogens transmitted by the contact route
- c) handling or touching visibly or potentially contaminated patient care equipment and environmental surfaces.

Gloves can protect both patients and healthcare personnel from exposure to infectious material.

Types of gloves: There are five types of gloves

1. Sterile surgical single use gloves are for invasive and sterile procedures (see Box 1).
2. Latex examination disposable gloves for single use (see Box 1)
3. Heavy duty/utility gloves used for decontamination, handling linen, cleaning floors, walls and healthcare facility furniture such as beds, etc. These gloves can be reused.
4. Heat resistant gloves suitable for use at the incinerator
5. Post mortem gloves (elbow length)

Box 1: Guidelines for use of gloves

1. Gloves should be worn as an additional measure, not as substitute for hand washing.
2. Gloves are **not** required for routine care activities in which contact is limited to a patient's intact skin.
3. Clean, non-sterile gloves should be worn:
 - When performing non-invasive procedures.
 - When handling blood, body fluids, secretions and excretions, mucous membranes, draining wounds or non-intact skin (open skin lesions or exudative rashes).
 - When handling items visibly soiled with blood, body fluids, secretions or excretions when the healthcare worker has open skin lesions on the hands.
 - When the healthcare worker has a small cut which must first be covered with a waterproof plaster.
4. Surgical gloves should be worn for surgical procedures, for invasive therapy, (e.g. venipuncture) and other vascular procedures.
5. When indicated, gloves should be put on directly before contact with the patient or just before the task or procedure requiring the surgical gloves.
6. Gloves should be changed between patient care activities and procedures on the same patient after contact with materials that may contain high concentrations of microorganisms (e.g. after handling an indwelling urinary catheter or endotracheal tube to prevent cross-contamination of body sites).
7. Gloves should be worn in the handling of laboratory specimens.
8. Gloves should be removed immediately after completion of care or a specified task, at point of use and before touching clean environmental surfaces.
9. Gloves should be removed before contact with another patient.
10. Hands should be washed and dried immediately after removing gloves.

Single-use disposable latex and sterile gloves should not be washed, decontaminated or reused.

(SOPs for donning and removing gloves are in **Annex 3**)

Gowns and aprons

Gowns are used as specified by Standard and Transmission-Based Precautions to protect the healthcare workers arms and exposed body areas and prevent contamination of clothing with blood, body fluids, and other potentially infectious material (See Box 2)

Box 2: Guidelines for use of gowns and aprons

1. Gowns should be worn to protect skin and prevent soiling of clothing during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.
2. A waterproof apron should be worn under the gown if the gown is not fluid-resistant and splashing or spraying of potentially infectious material is anticipated.
3. Soiled gowns should be removed as soon as possible and hand hygiene performed.
4. The unnecessary use of gown is not recommended.
5. Gowns shall not be worn outside the area for which they are intended

SOPs for donning and removing gowns are in **Annex 4**.

Facial Protection (eyes, nose and mouth)

The mucous membranes of the mouth, nose, and eyes are susceptible portals of entry for infectious agents, as can be other skin surfaces if skin integrity is compromised (e.g., by acne, dermatitis). Therefore, use of PPE to protect these body sites is an important component of Standard Precautions.

Facial protection, including a medical mask and eye protection (e.g. face shield, goggles), should be worn to protect the conjunctivae and the mucous membranes of the nose, eyes and mouth during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions (e.g, endotracheal suctioning, bronchoscopy, invasive vascular procedures).

Surgical masks

Masks are used for three primary purposes in healthcare settings:

- a) To protect healthcare personnel from contact with infectious material from patients e.g., respiratory secretions and sprays of blood or body fluids, consistent with Standard Precautions and Droplet Precautions;
- b) To protect patients from exposure to infectious agents carried in a healthcare worker's mouth or nose during procedures requiring sterile technique;
- c) To limit potential dissemination of infectious respiratory secretions when worn by coughing patient from patient to others (i.e., Respiratory Hygiene/Cough Etiquette).

Box 3: Guidelines on use of surgical masks

- Surgical or procedure masks are indicated when providing care for patients infected by droplet-transmitted pathogens and/or as part of facial protection during patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and excretions.
- If the mask gets wet or dirty with secretions, it must be changed immediately.
- Surgical or procedure masks may not offer adequate respiratory protection against small-particle aerosols (droplet nuclei) and should not be used when caring for patients with diseases caused by pathogens transmitted by the airborne route, unless particulate respirators are not available.

Masks should not be confused with particulate respirators that are used to prevent inhalation of small particles that may contain infectious agents transmitted via the airborne route.

Masks may be used in combination with goggles to protect the mouth, nose and eyes or a face shield may be used instead of a mask and goggles, to provide more complete protection for the face, as discussed below. See **Annex 5** for SOPs for use of masks.

Goggles and face shields

- The eye protection chosen for specific work situations (e.g., goggles or face shield) depends upon the circumstances of exposure, other PPE used, and personal vision needs.
- **Conventional eye glasses are not designed to protect against splashes to eye mucosa, and should not be used as eye protection.**
- While effective as eye protection, goggles do not provide splash or spray protection to other parts of the face.
- Disposable or non-disposable face shields may be used as an alternative to goggles. As compared with goggles, a face shield can provide protection to other facial areas in addition to the eyes. Face shields extending from chin to crown provide better face and eye protection from splashes and sprays; face shields that wrap around the sides may reduce splashes around the edge of the shield.
- Reusable eye protective equipment can be used (e.g. goggles, face shield). However, it may pose a potential risk of cross-infection if not cleaned and decontaminated properly after each use according to manufacturer's instructions.

Respiratory Protection

Particulate respirators are used to prevent inhalation of small particles that may contain infectious agents transmitted via the airborne route. Respirators filter the air before it is inhaled and have been designed to protect the respiratory tract from airborne transmission of infectious agents. Commonly used respirators in health care settings include the N95 particulate respirator and other respirators that provide equal or better protection.

If surgical masks and respirators are not available, other materials such as tissues and cloth may be used to cover the nose and mouth. While the efficacy of these materials has not been scientifically evaluated, they are probably better than no mouth covering at all. SOPS for the use of respirators are in **Annex 5**.

Prevention of needle sticks/sharps injuries:

Box 4: Guidelines on prevention of needle sticks/sharps injuries and the prevention of transmission of infections

1. Take care to prevent injuries when using needles, scalpels, and other sharp instruments or devices; when handling sharp instruments after procedures; when cleaning used instruments, or when disposing of used needles.
2. Never recap used needles.
3. Never direct the point of a needle towards any part of the body except prior to injection.
4. Do not remove used needles from disposable syringes by hand, and do not bend, break, or otherwise manipulate used needles by hand.
5. Dispose of syringes, needles, scalpel blades, and other sharp items in appropriate puncture resistant containers, located as close as practical to the area in which the items were used.
6. The containers should be sealed when $\frac{3}{4}$ full before transporting to the incinerator
7. Avoid the use of reusable syringes.
8. Each facility should have a system for responding when a healthcare worker is injured by a sharp (see Section VIII: Risk Management).

Respiratory hygiene and cough etiquette

Respiratory hygiene and cough etiquette are source control measures that are now considered as part of Standard Precautions. They include:

- Education of health workers, patients and visitors;
- Covering mouth and nose when coughing or sneezing;
- Hand hygiene after contact with respiratory secretions;
- Spatial separation of persons with acute febrile respiratory symptoms.

Box 5: Guidelines on respiratory hygiene and cough etiquette in health facilities

Persons with respiratory symptoms should apply source control measures: They should cover their nose and mouth when coughing/sneezing with tissue or mask, dispose of used tissues and masks, and perform hand hygiene after contact with respiratory secretions.

Health facilities should: post visual alerts at the entrance to healthcare facilities instructing persons with respiratory symptoms to practice respiratory hygiene/cough etiquette; consider making hand hygiene resources, tissues and masks available in common areas and areas used for the evaluation of patients with respiratory illnesses.

Healthcare facility management should: Promote the use of respiratory hygiene/cough etiquette by all health workers, patients and family members with acute febrile respiratory illness; Educate healthcare workers, patients, family members, and visitors on the importance of containing respiratory aerosols and secretions to help prevent the transmission of respiratory diseases; Consider providing resources for hand hygiene (e.g. dispensers of alcohol-based hand rubs, hand-washing supplies) and respiratory hygiene (e.g. tissues); areas of gathering, such as waiting rooms, should be prioritized.

Environmental cleaning and disinfection

Adequate procedures for the routine cleaning and disinfection of environmental and other frequently touched surfaces should be used. (See **Section VI** on Housekeeping.)

Linens

Used linens should be handled, transported, and processed in a manner which prevents skin and mucous membrane exposures and contamination of clothing and avoids transfer of pathogens to other patients and/or the environment. (See **Section VI** on Housekeeping.)

Medical waste disposal

Healthcare waste is a potential reservoir of pathogenic microorganisms, and requires appropriate handling. The only waste which is clearly a risk for transmission of infection, however, is sharps contaminated with blood. See **Section VII** and **Annex 10** for recommendations for classification and handling of different types of waste.

Appropriate processing of medical instruments and patient care equipment

Appropriate cleaning, disinfection and sterilization of patient care equipment are important in limiting and/or preventing the transmission of micro-organisms. (See Box 6 and **Section V** on Reprocessing of Medical Instruments and Patient Care Equipment/Disinfection and Sterilization).

Box 6: Guidelines on disinfection of medical instruments and patient care equipment

1. Handle equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of pathogens to other patients or the environment.
2. Clean, disinfect, and reprocess reusable equipment appropriately before use with another patient.
3. Contaminated commodes, bedpans sputum cups and vomit bowls should be decontaminated, cleaned, disinfected and stored on a rack.

Note: For Safe Practises in Dentistry See Annex 12, the Laboratory see Annex 13 and the Mortuary see Annex 14

Transmission-based precautions

Transmission-Based Precautions are used in addition to Standard Precautions to limit transmission of potential infecting organisms to other patients and healthcare staff.

These additional precautions are based on modes of transmission and are used for patients known or suspected to be infected or colonized with highly transmissible or epidemiological important pathogens (e.g. cholera, measles, meningococcal meningitis, tuberculosis, viral haemorrhagic fever) for which additional precautions beyond Standard Precautions are needed to interrupt transmission in healthcare facilities.

See **Annex 7** on Isolation Precautions.

Contact Precautions: Contact precautions are used in addition to Standard Precautions to provide protection against contact with potentially infectious organisms. These are required for patients with enteric infections and diarrhoea which cannot be controlled or skin lesions which cannot be contained (Box 7).

Box 7: Contact Precautions: Critical protection measures in addition to Standard Precautions

- Patient should be placed in an individual room if available; or cohorted if possible with other like infected patients.
- Staff should use clean, non sterile gloves for all episodes of direct patient contact
- Staff should use a gown (disposable or re-washable) for patient contact or contact with contaminated surfaces or material
- Staff should wash hands before and after contact with patient and on leaving the room.
- Dedicate specific equipment (preferable single-use) for a single patient and cleaning and disinfecting shared equipment between patient uses. Put the patient in a single room or in a room only with other patients with the same diagnosis or with similar risk factors
- Limit patient movement/transport outside of the room
- Appropriate environmental and equipment cleaning, disinfection and sterilisation

Droplet Precautions: Droplet precautions are used in addition to Standard Precautions to provide protection to clinicians and others from infections spread by large droplets generated by coughs and sneezes e.g. adenovirus, rhinovirus, human influenza, *Neisseria meningitidis*, SARS (Box 8).

Box 8: Droplet Precautions: Critical protection measures in addition to Standard Precautions

- Patient should be placed in an individual room if available; or cohorted if possible with other like infected patients. Ensure that the patient maintains at least a distance of 1 metre from all other persons.
- Use a surgical mask when within 1 metre of a patient
- Limit patient movement/transport outside of the room. If a patient has to leave the area, for example, to attend another Department then the patient should wear a medical mask, if tolerated, for the duration of their time away.
- Appropriate environmental and equipment cleaning, disinfection and sterilisation

Airborne Precautions: Airborne transmission occurs by dissemination of either airborne droplet nuclei or small particles in the respirable size range containing infectious agents that remain infectious over time and distance (e.g., *Mycobacterium tuberculosis*, rubeola virus (measles), and varicella-zoster virus (chickenpox)).

Microorganisms carried in this manner may be dispersed over long distances by air currents and may be inhaled by susceptible individuals who have not had face-to-face contact with (or been in the same room with) the infectious individual (Box 9).

Box 9: Airborne Precautions: Critical protection measures in addition to Standard Precautions

- Use a particulate respirator when caring for MDR/XDR TB patients
- Place the patient in an adequately ventilated room (≥ 12 air changes per hour)
- Limit patient movement and if possible ensure that patient wears surgical mask if outside their room.

Airborne precautions should be used for performance of any aerosol-generating procedures associated with pathogen transmission (e.g., bronchoscopy, sputum induction, resuscitation, intubation, suctioning and/or extubation).

A list of infections requiring transmission based precautions and the types of precautions to be effected, the length and time for the precautions are listed in **Annex 7: Table 7**.

Absolute (Strict) Isolation (e.g., haemorrhagic viral fever)

Strict isolation is required where there is a risk of infection by a highly virulent or other unique agent of concern where several routes of transmission are implicated.

Box 10: Absolute (Strict) Isolation: Critical protection measures in addition to Standard Precautions

- Place the patient in an individual room, in an isolation ward, if possible
- All persons entering the room should wear a scrub suit, surgical mask, gloves, gowns, apron, cap, eye protection
- Clean and disinfect spills, waste and reusable equipment safely
- Clean and disinfect soiled linens and laundry safely
- Use safe disposal methods for non-reusable supplies and infectious waste
- Provide information about the risk of transmission to health facility staff. Reinforce Isolation Precautions

Details for viral haemorrhagic fevers can be seen in: *Interim Infection Control Recommendations for Care of Patients with Suspected or Confirmed Filovirus (Ebola, Marburg) Haemorrhagic Fever. WHO March 2008.*

Isolation can have the following effects on patients:

- Patients may not be able to receive visitors
- May become lonely
- Anxious
- Small children may feel their isolation is a punishment
- May not be able to receive certain types of care due to the risk that other patients may become contaminated e.g. use of equipment that is common to all patients at the facility or that involves transporting the patients to an area of the facility common to all patients.

See **Annex 7** on Isolation Guidelines

Additional aspects of infection prevention and control

Patient placement: Some infection prevention and control activities may require that patients with infections *be separated* from other patients:

- Single rooms
- Cohorting is the practice of grouping together patients who are colonized or infected with the same organism to confine their care to one area and prevent contact with other patients. Cohorts are created based on clinical diagnosis, microbiologic confirmation when available, epidemiology, and mode of transmission of the infectious agent.

Health workers: The number of persons entering the assigned unit/area for isolation, cohorting, or special measures should be limited to the minimum number necessary for patient care and support.

Equipment: Avoid sharing of patient equipment, but if unavoidable, ensure that reusable equipment is appropriately disinfected between patients.

Cleaning, disinfection, hand hygiene: Ensure regular cleaning and proper disinfection of common areas and adequate hand hygiene by patients, visitors and caregivers.

Patient transport: Patients should leave the isolation area only for essential purposes. When patient transport is necessary, it is important that appropriate barriers (e.g. masks, barrier-proof dressings) are worn or used by the patient to reduce the transmission of pertinent microorganisms to other patients, staff and visitors, and to reduce contamination of the area

Visitors/Family members: Visitors have been identified as the source of several types of HAIs (e.g., pertussis, *M. tuberculosis*, influenza, and other respiratory viruses and SARS). Visitors, especially those who have been in contact with the patient, should be advised about the possible risk of disease transmission and screened before entering the facility.

Visitor screening is especially important during community outbreaks of infectious diseases and for high risk patient units. Screening may be passive through the use of signs to alert family members and visitors with signs and symptoms of communicable diseases not to enter clinical areas. More active screening may include the completion of a screening tool or questionnaire which elicits information related to recent exposures or current symptoms.

Visitors and accompanying persons should receive instructions for reducing infectious risk including appropriate instruction on use of PPE and other precautions (e.g., hand hygiene, limiting surfaces touched) while in the patient's room. Family members or visitors who are providing care or having very close patient contact (e.g. feeding, holding) may have contact with other patients and could contribute to transmission if isolation precautions are not used correctly.

Information about Standard Precautions, especially hand hygiene, Respiratory Hygiene/Cough Etiquette and other routine infection prevention strategies may be incorporated into patient information materials that are provided upon admission to the healthcare facility.

Fact sheets, pamphlets, and other printed material may include information on the rationale for the additional precautions, risks to household members, room assignment for Transmission-Based Precautions purposes, explanation about the use of personal protective equipment by health workers, and directions for use of such equipment by family members and visitors. Such information may be particularly helpful in the home environment where household members often have primary responsibility for adherence to recommended infection control practices.

Laboratory specimens: The validity of laboratory test results is as much a function of the laboratory analysis as of the proper collection and handling of specimens. Specimens from all patients should be handled as potentially infectious. Health workers should be supported to implement the safe and appropriate collection, transport and collection of specimens.

See **Annex 13** on Laboratory

Care of the deceased: Transmission of infectious diseases associated with mortuary care has been reported. However, the cultural context of the local community also should be respected. It is essential to assess the risk during the mortuary care process, providing adequate explanation to the family. If indicated, PPE should be provided to the family after instruction in its use. Each family should be managed on a case-by-case basis, balancing their rights with the risks of exposure to infection.

Box 11: Infection control precautions and care of the deceased

- **Removal of the body from the isolation room/area:** Anyone handling a corpse should follow Standard Precautions for blood and body fluids: PPE use should be applied to avoid direct contact with body fluids.
- **Mortuary care:** Mortuary staff and the burial team should apply Standard Precautions i.e. perform proper hand hygiene and use appropriate PPE (use of gown, gloves, facial protection if there is a risk of splashes from patient's body fluids/secretions onto staff's body and face). Hygienic preparation of the deceased (e.g. cleaning of body, tidying of hair, trimming of nails, and shaving) also may be conducted with the application of Standard Precautions.
- **Post-mortem examinationⁱ:** Post-mortem examinations and collection of samples for microbiologic analyses are sometimes necessary. However, they are associated with risk of transmitting infections, and should only be performed when necessary, and if safety measures are in place.

For more details see **Annex 14: Safe Practices in the Mortuary.**

Section IV: Tuberculosis

Introduction

Pathogenesis and transmission of TB

- Transmission of TB is through the airborne route. Persons with untreated pulmonary TB are the main source of infection
- *Mycobacterium tuberculosis* is carried in airborne particles or droplet nuclei that can be generated when persons with pulmonary tuberculosis sneeze, cough, sing or speak.
- The infectious droplet nuclei can remain suspended in the air for several hours or days (Health facilities should aim to achieve a minimum of 12 air changes per hour to reduce the concentration of droplet nuclei in the air).
- Infection which is usually asymptomatic occurs when a susceptible person inhales the droplet nuclei containing *Mycobacterium tuberculosis*.
- Once in the lungs the bacilli are taken up by the alveolar macrophages and may spread throughout the body.
- Disease which is usually accompanied by focal and generalized symptoms may develop soon after infection, especially in immune-compromised hosts.
- In persons with an intact immune system an immune response is generated within 2 – 10 weeks after infection that limits further multiplication and spread of TB bacilli.
- Some of the bacilli may remain dormant and viable for many years (i.e. latent infection with TB).
- Persons with latent TB infection have been exposed to TB, but do not have symptoms of active TB disease and are not infectious.
- Environmental contamination e.g. from blankets, linens or environmental surfaces is not a source of infection.

Factors affecting the risk of *Mycobacterium tuberculosis* Infection

The probability that a person who is exposed to *Mycobacterium tuberculosis* will become infected depends primarily on:

- The concentration of infectious droplets
- The number of bacilli generated by the TB patient
- The amount of ventilation in the area
- Duration of exposure
- Level of immunity

Patients with TB may become less infectious within a short period of time (72hrs) and will take approximately 2 weeks to become non-infectious after initiating appropriate treatment. Sputum smears can confirm that this has occurred prior to removing the patient from isolation.

Health workers may contribute to TB transmission by:

- Failing to separate patients who are coughing from those that are not coughing
- Delaying initiation of TB testing
- Failing to initiate treatment with an adequate regimen
- Performing procedures that can induce coughing or cause aerosolization of *Mycobacterium tuberculosis* (i.e. sputum induction)
- By failing to teach cough etiquette to all patients, regardless of cough

Environmental factors that enhance transmission:

- Exposure in small, enclosed spaces.
- Lack of adequate ventilation
- Re- circulation of air containing infectious droplet nuclei

Staff Health (Occupational Health and Safety)

- All staff must be made aware of the significant risk of developing TB if they are HIV positive. Voluntary counselling and testing should be offered to all staff in contact with TB.
- Before entering the health service, all health workers including contracted workers should be screened using a chest X-ray in addition to the TB screening tool in line with the recruitment policy. Sputum specimens should be taken if necessary. All pre-service health records are kept confidential, by the staff clinic and/or the human resources office (HRO)
- Every health worker, regardless of job description should be screened annually for TB and confidential records kept either by the staff clinic, and/ or the HRO of the facility.
- Every health worker should report a cough lasting 2 weeks.
- Sputum specimens must then be examined. A chest X-ray on indication may be part of the medical evaluation. This is the only effective way of detecting TB early. Annual screening alone by X-ray and skin testing is ineffective.
- Ideally, health workers working in high risk areas e.g. mortuary laboratory, isolation wards, medical wards, casualty, and X-ray department to be screened every six months by the Staff clinic using the TB screening tool.

Infection Control Strategies

There are 4 levels of infection control measures as described by WHO:

1. Managerial
2. Administrative
3. Environmental
4. Personal protective equipment

TB Infection control measures should be implemented as much as possible given the resources of the facility starting with managerial measures and administrative first. However, the implementation of one set of measures does not substitute for the other control measures.

Managerial

The national and sub-national managerial activities listed below provide the managerial framework for the implementation of TB infection control in health- care facilities, congregate settings and households:

- A National Infection Control Coordinating Committee should incorporate TB infection control into its comprehensive budgeted plan that includes human resource requirement for implementation of TB infection control at all levels
- Ensure that health facility design, construction, renovation and use are appropriate.
- Conduct surveillance of TB disease among health workers.
- Address TB infection control advocacy communication and social mobilization (ACSM) including the engagement of civil society.
- Monitor and evaluate the set of TB infection control measures.
- Enable and conduct operational research.

Important managerial measures include:

- The creation of an Infection Prevention and Control (IPC) Committee and IPC focal person designated for each health facility (**Annex 1**).
- A written TB infection control plan that details measures that should be taken in the health care facility that should form part of the Health Facility IPC Plan.
- Adequate training of all health workers.
- Facility design and patient flow to assess the risk of transmission and best use of space and ventilation.
- A tracking system for all TB suspects, referrals, and their sputum smear results. This needs to be in place and up to date.
- A register is kept of all TB patients reported to the National TB program.
- All patients with TB disease are managed on DOT as per the national guidelines.
- Patient and visitor information on TBIPC is available for all and offered by the staff.

Administrative

Administrative controls are the most effective and least expensive and therefore should have highest priority in resource constrained setting. Administrative controls are the actionable items health workers can do to reduce the exposure of health workers and patients to *Mycobacterium tuberculosis*. These items include:

- Promptly identify people with TB symptoms and attend to them quickly (**triage**)
- Separate (potentially) infectious patients
- Educate patients on cough etiquette (Control the spread of pathogens)
- Minimize time patients spend in health-care facilities.
- A "cough monitor" gives cough etiquette guidance and assists with triage.
- Signage for cough etiquette is present within the clinic. Signage is also in place to keep doors and windows open when feasible.
- Patients are not allowed to crowd or sit in hallways. Internal waiting areas should be supplemented with larger outdoor sheltered seating close to facility access to prevent crowding.
- Sputum samples are collected in a designated area and away from others.
- Healthcare workers that assist during sputum collection take precautions.
- Processing of sputum samples is done as quickly as possible by the laboratory. There is a tracking mechanism to monitor the turn-around time of laboratory results.
- There is a tracking mechanism to monitor the turn-around time of patients within the healthcare facility.
- A confidential log is kept of all health workers that are diagnosed with TB disease by the staff clinic for surveillance purposes.
- Health workers receive an evaluation for TB at least annually.
- Staff are offered an HIV test annually and offered ART as per national guidelines

Each facility should have an IPC Plan that incorporates a TB infection control plan that outlines a protocol for the prompt recognition, separation, provision of services, investigation for TB and referral of patients with suspected or confirmed TB disease.

Environmental Controls

The greatest threat to healthcare personnel is in the unsuspected, undiagnosed and untreated TB patient. Environmental control measures prevent concentration of droplet nuclei in the environment. Environmental interventions can be effective only if the administrative measures are adequate. Adequate ventilation requires the movement of air contained within a room from inside to outside, replaced by air from outside.

Environmental interventions include implementation of:

- Natural and/or mechanical ventilation;
- Mixed mode ventilation;
- Ultraviolet germicidal irradiation (UVGI).

Natural Ventilation

Natural ventilation is created by the use of external airflows generated by natural forces such as wind or differences in temperature. Opening doors and windows allows cross ventilation and high air change rates can be achieved under ideal conditions. The amount of airflow and natural light should be determined and augmented if needed to improve natural ventilation i.e., extractor fans, ceiling fans, whirlybird venting in the ceiling and the enlargement of windows). Natural light should be increased where necessary. Window curtains, if present, should be gathered to the side to improve airflow.

Mechanical ventilation

Mechanical ventilation is based on systems that control air-exchanges using the single pass or the High Efficiency Particulate Air (HEPA) filtration system; if in place they should be regularly maintained and checked by qualified engineers or experts. Natural and/or mechanical airflow should be monitored daily by the staff to ensure a minimum of 12 air exchanges per hour, especially in waiting rooms, patient wards, sputum collections areas and examination rooms.

Mixed mode

Mixed mode ventilation combines the use of mechanical and natural ventilation. This type of ventilation is done through the installation of an exhaust fan to increase the rate of air changes in the room. It can be useful in places where natural ventilation is not suitable (e.g. in very cold weather) and fully mechanical ventilated rooms are not available.

Upper room UVGI

Upper-room UVGI may be capable of disinfecting equivalent to 10-20 air changes per hour if properly designed, installed and maintained. Eye and skin risks can be avoided by shielding the lamps and measuring to avoid over exposure. Upper room UVGI is suitable for rooms with high ceiling (so that people cannot look into the lamp). Bulbs emitting UV should be replaced every 1-2 years. If UVGI lighting is used, there should be a funded routine maintenance schedule.

Personal Protective Equipment (PPE)

Particulate respirators used in conjunction with administrative and environmental controls provide health workers with additional protection from TB. Quality assured N-95 or FFP2 respirators should be worn, fitting tightly on the face by the health workers. Health workers should be fit tested: prior to initial use and whenever a different respirator is used and periodically at least annually thereafter (See **Annex 5**).

These respirators are expensive and should only be worn in high-risk situations such as caring for DR-TB, MDR-TB or XDR-TB patients or suspects or when assisting with high risk procedures such as:

- Bronchoscopies
- Endotracheal intubation
- Suctioning
- Open abscess irrigation
- Autopsy/Postmortem

Surgical Mask

- Face or surgical masks (cloth or paper) do prevent spread of microorganisms from the wearer (e.g. TB patient or suspect) to others by capturing droplets near the nose and mouth hence preventing the spread of the infectious droplet nuclei.
- Face masks do not provide protection to the wearer (e.g. health workers, family members) from inhaling infectious droplet nuclei in the air.
- The surgical mask (cloths, paper) is of use if placed on patients to prevent the generation of such nuclei.
- Respiratory protective device with an N95 or FFP2 is recommended solely for use by the health worker.
- TB or DR-TB cases, being transported to other hospital departments for leaving the isolation room for medical investigations, have to wear surgical masks.

The health condition of the health worker should be continuously evaluated. Pregnant and HIV-positive health workers should be placed in less risky departments. All the infection control measures previously described (including the availability of respirators) should be implemented and monitored.

Cases admitted to TB medical wards should be allocated beds taking into account the level of infectivity, the type of resistance and smear conversion status.

Laboratory

Most laboratories only prepare sputum smears for ZN staining to reduce the formation of aerosols and reduction of exposure to aerosols:

1. If Class I/Class 2 safety cabinets are used they should be correctly positioned in the laboratory to prevent outflow of air into the laboratory. The cabinets should be serviced yearly.
2. In the absence of a centrifuge (for processing sputum with hypochlorite) or a safety cabinet, the smears should be prepared in a well-ventilated area.
3. Containers should be carefully opened. Avoid vigorous shaking of the sputum.
4. Broken orange sticks should be used instead of loops or swabs for preparing smears.
5. Culture and susceptibility testing for TB require a Biosafety level 3 laboratory. For this reason currently only the reference laboratories, National TB reference laboratory Bulawayo and the National Microbiology Reference Laboratory have the facility to process specimens for culture and susceptibility.
6. Autoclave specimen containers before disposal or incineration.

Multi- drug resistant (MDR) and Extensive Drug Resistant (XDR) Tuberculosis

Definitions

Primary resistance: The bacterial resistance is called primary resistance in patients who have not had prior treatment with anti – tuberculosis drugs.

Acquired resistance: In patients with some record of previous treatment, the bacterial resistance is called acquired resistance. Acquired resistance can also occur in those patients who were exposed to a patient with a resistant form of TB.

Multi – drug resistant tuberculosis

MDR-TB is defined as TB caused by *Mycobacterium tuberculosis* resistant in vitro to the effects of isoniazid and rifampicin, with or without resistance to any other drugs.

XDR-TB is defined as TB resistant to isoniazid and rifampicin as well as to any one of the fluoroquinolones and to at least one of three injectable second-line drugs (amikacin, capreomycin or kanamycin). All forms of resistant TB require a longer treatment course (2 or more years) and more expensive second-line drugs for the duration of the treatment. It is critically important that both health workers and the public actively encourage all TB patients to have their cough assessed by a provider as quickly as possible and if TB medication is prescribed, that they take their drugs each day until treatment is completed.

How does multi-drug resistance TB develop?

Drug resistant bacilli develop as a result of either an inadequate TB treatment regimen or it can develop in those individuals who do not take their medications as prescribed (skipping doses or dropping out of treatment, or stopping their medication once they start to feel better). Inadequate treatment is commonly caused by:

- Prescription of an anti-TB treatment regimen which is not the recommended standard regimen. This is especially dangerous if the patient has sputum smear – positive TB.
- It is the responsibility of every health professional that starts patients on TB treatment to ensure that the nationally recommended anti-TB treatment regimens are strictly followed at all times.
- Poor treatment compliance by the patient due to either lack of directly observed therapy (DOT) or patient's insufficient understanding of the importance of good treatment adherence. Treatment adherence is especially important during the intensive (initial) phase of anti-TB treatment.
- Unavailability of anti- tuberculosis drugs. It is the responsibility of the National TB Control Program to ensure that regular and sufficient stocks of anti – TB drugs are available in the country at all times. The PMDs, central hospitals and local authority health departments have the duty to notify all TB patients in order to facilitate annual anti – TB drug requirements in the country.

How can we prevent the spread of Multi – drug resistant TB?

Effective anti-TB treatment is the key to prevention of MDR–TB. Good infection control practice is important in the prevention of spread both in a health facility and in the community.

Infection control in the MDR and XDR – TB admission units

Ideally, all TB patients (including MDR and XDR – TB) should be managed in purpose built, negative pressure ventilation units. However these units are very costly to build and maintain with the help of specifically trained environmental engineers and maintenance

personnel. Natural ventilation when properly used is an acceptable and cost effective alternative.

As a minimum these basic infection control measures should be instituted:

- Well lit and ventilated rooms for DR TB, MDR TB and XDR TB patients
- Training of health workers in safe sputum collection practices and proper use of PPE.
- Annual TB screening and provision of HIV testing and anti- retroviral therapy for all health workers
- Appropriate use of surgical masks by patients to reduce droplet dissemination.
- Staff and visitors to wear N95 respirators (or FFP2) to reduce exposure to TB droplet nuclei inhalation when caring for DR/MDR/XDR infected patients.

The IPCO should ensure all infection prevention and control procedures are in place.

Disinfectants used

Disinfectants used in these areas are the same used throughout the facility (See Section VI).

Notification of TB

Every diagnosed TB patient should be notified. It is a public health requirement under national Public Health Act 15: 09 of 1996, that every form of TB diagnosed case should be notified to the Ministry of Health using the relevant TB notification form(s).

Actions to be taken after Notification

1. Monitor treatment and ensure full compliance with the treatment regimen and prevent defaulting.
2. Contact tracing for screening, using appropriate forms according to the National TB control guidelines as soon as it is detected.

Source:

National Guidelines for TB/HIV co-management. Zimbabwe National Tuberculosis control program, Fourth edition 2010

WHO policy on TB infection control in Health-Care Facilities, Congregate settings and Households 2009

Implementing the WHO Policy on TB Infection Control, 2010, available from <http://www.tbcta.org/Library>

Implementing TBIC in Out-patient Settings-CDC, 2012, available from <http://www.cdc.gov/globalaids/Resources/pmtct-care/tuberculosis-infection-control.html>

Resource: Tuberculosis Laboratory Manual WHO 2012

Section V: Reprocessing of medical instruments and patient care equipment/disinfection and sterilisation

Introduction

Contaminated medical equipment and instruments can transmit infection to both patients and staff, so they must be effectively decontaminated after each use. All instruments that are used during a specific procedure in a patient need to be sterilised or disinfected. It is advisable to identify different types of instruments according to their use and to determine the steps for managing the different types.

Decontamination is the use of physical or chemical means to remove, inactivate, or destroy pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles. Decontamination comprises, cleaning, disinfection or sterilization as appropriate.

When to choose Disinfection or Sterilisation?

Disinfection is a process that reduces the number of pathogenic microorganisms (except bacterial spores) to a level that is not harmful to health.

Sterilisation is a process that eliminates all forms of microbial life, including spores and viruses, using either physical or chemical methods

E.H. Spaulding developed an approach to disinfection and sterilisation of patient care items and equipment in which he classified instruments and other items used in the care of patients as critical, semi critical and non-critical according to the degree of risk for infection involved in use of the items. This is now well known as Spaulding's classification and the definitions are as follows:

Critical items are instruments that come into contact with cavities or sterile tissues, including the vascular system. These articles pose a high risk of infection if they are contaminated with any microorganism, which means that they should always be sterile. This includes, for example, surgical instruments, cardiac probes, catheters and prostheses.

Semi – critical items Semi-critical articles are instruments that come into contact with the mucous membrane of the respiratory, genital and urinary tracts and with skin that is not intact. Although mucous membranes are usually resistant to infections by bacterial spores, they can present infection when they are contaminated with other microbial forms. For this reason, they should be sterile, or at the least, they should be submitted to high-level disinfection (HLD). This includes, for example, respiratory assistance devices, anaesthesia and endoscopic devices

Non-critical items refer to all instruments that only come into contact with intact skin. In this case, healthy skin acts as an effective barrier to keep out the majority of microorganisms. As a result, the level of disinfection needed is lower. In general, only adequate cleaning and drying are required, with the need for intermediate- or low-level disinfection on some occasions. Some examples of this type of instruments are sphygmomanometers, linen, bedpans, incubators, mattresses and furniture.

Examples of how different items are classified are shown in Table 1.

Processing of patient equipment and medical instruments

Appropriate cleaning, disinfection and sterilisation of patient care equipment are important in limiting and/or preventing the transmission of micro-organisms. The reprocessing method required for a specific item will depend on the item's intended use, risk of infection to the patient, and the amount of soiling.

Table 1: Classification of different items used in healthcare using Spaulding’s classification

Level of risk	Category	Indications	Criteria	Examples
High	Critical	Sterilisation	Items that come into contact with sterile tissues or enter the blood stream	Surgical instruments
	Semi-critical	High level disinfection	Items that touch mucous membranes	Endoscopes Respiratory equipment ET tubes Oropharyngeal& nasal airways
Low	Non-critical	Low level disinfection	Items that touch the intact skin	Stethoscopes, blood pressure apparatus, bedpans, urinals etc.

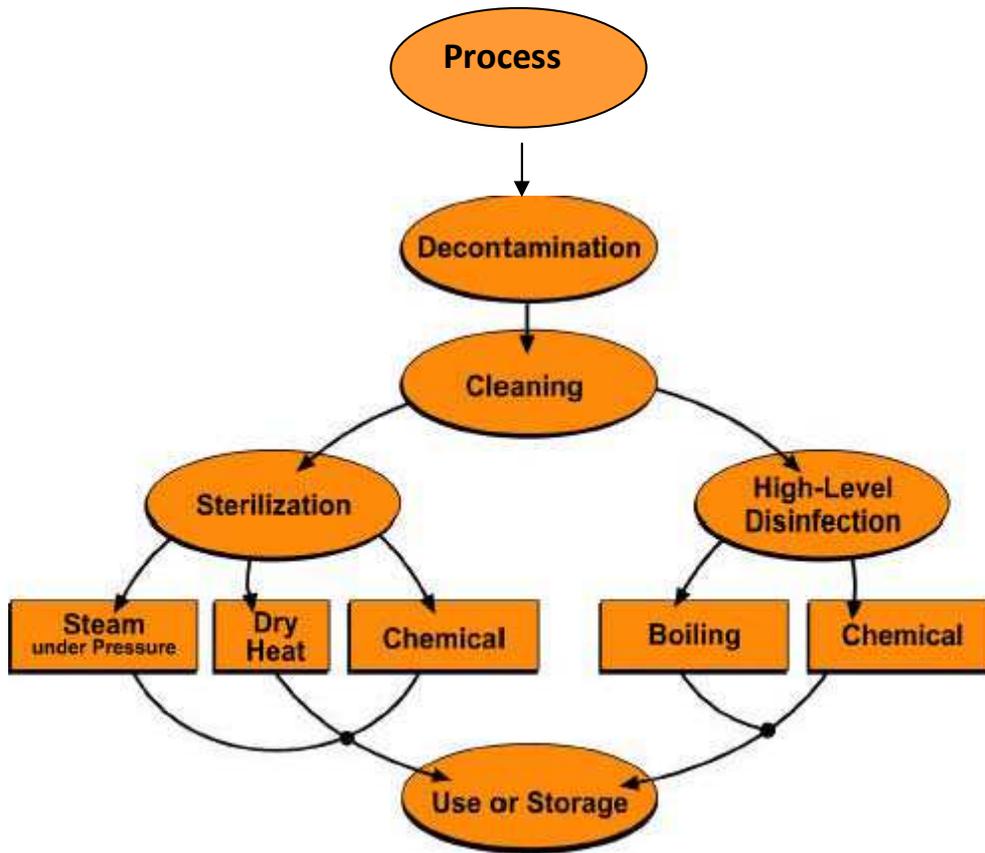
Cleaning is always essential prior to disinfection or sterilisation. The decontamination process used for surgical instruments and equipment depends on many factors including the level of potential risk of infection to the patient.

Proper processing involves several steps that reduce the risk of transmitting infections from used instruments and other items to healthcare workers and patients. For proper processing, it is essential to perform the steps in the correct order. Figure 1 outlines the steps in processing.

Box 12: Key points about processing of medical instruments and equipment

- Cleaning is essential before disinfection or sterilisation. ALWAYS clean re-usable equipment with soap or detergent and water until all visible soil is gone
- Disinfect or sterilise equipment before using it on another patient
- Choose high-level disinfection or sterilisation method depending on the item’s nature and intended use
- Single use items must be disposed properly in waste receptacle
- Failure to disinfect or sterilise medical equipment properly may result in infection
- Level of decontamination required depends upon intended use of item

Figure 2: Steps in processing of patient equipment and medical instruments



(Source: AVSC International. Infection Prevention Curriculum. Teacher's Manual. New York, 1999, p. 263 (modified)).

Cleaning

- Cleaning to remove organic material must always precede high level disinfection and sterilisation of critical and semi-critical instruments and devices.
- Cleaning processes may include:
 - Chemical energy (detergents or enzymes)
 - Mechanical energy (friction)
 - Thermal energy

Disinfection

- Disinfection removes microorganisms without complete sterilisation to prevent transmission of organisms between patients.
- Disinfection methods: thermal and chemical
- Different levels of disinfection:
 - *High-level disinfection*: Destroys all micro-organisms except some bacterial spores
 - *Intermediate disinfection*: Inactivates *Mycobacterium tuberculosis* vegetative bacteria, most viruses and most fungi, but does not always kill bacterial spores

- *Low-level disinfection*: Can kill most bacteria, some viruses and some fungi, but cannot be relied on to kill more resistant bacteria such as *M. tuberculosis* or bacterial spores.

Sterilisation

- Sterilisation is the destruction of all microorganisms and can be achieved by either physical or chemical methods.
- Sterilisation is necessary for medical devices penetrating sterile body sites.
- Sterilising processes include:
 - Steam under pressure (autoclaving)
 - Dry heat (hot air oven)
 - Low temperature sterilisation (e.g., ethylene oxide)
 - Chemical sterilisation (e.g., glutaraldehyde)
 - Irradiation

See **Annex 8** on the Steps of Decontamination

Section VI: Housekeeping (environmental cleaning and laundry)

To minimize the transmission of microorganisms from equipment and the environment, adequate methods for cleaning, disinfecting and sterilizing must be in place. Written policies and procedures which are updated on a regular basis must be developed for each facility.

Cleaning and disinfecting non-critical surfaces in patient-care areas are part of Standard Precautions. In general, these procedures do not need to be changed for patients on Transmission-Based Precautions. Administrative and office areas with no patient contact require normal domestic cleaning.

90% of microorganisms are present within visible dirt, which should be eliminated by routine cleaning. Cleaning removes nearly all pathogens from contaminated surfaces and items. Cleaning can be done with water and neutral detergents. Dry sweeping is not recommended.

Most patient care areas (waiting areas, consulting rooms, non-infectious disease wards) should be cleaned daily by wet mopping with hot water¹ and detergent if available. The cleaning and disinfection of all patient-care areas is important for frequently touched surfaces, especially those closest to the patient, that are most likely to be contaminated (e.g., bedrails, bedside tables, commodes, doorknobs, sinks, surfaces and equipment in close proximity to the patient). Isolation rooms and other areas that have patients with known transmissible infectious diseases should be cleaned with a detergent/disinfectant solution at least daily.

Any areas visibly contaminated with blood or body fluids should be cleaned immediately with detergent and water. Chlorine solution (1%) is adequate for cleaning and disinfecting blood or body fluid spills. Large spills should first be removed with absorbent material (which should then be properly disposed of) before disinfecting and cleaning.

Any process of disinfection must be preceded by cleaning because organic materials (e.g., blood and other body fluids) protect microbes from the disinfection process. Type of disinfectant used depends on local availability (Sodium hypochlorite; Alcohol; Phenolic compounds; Quaternary ammonium compounds; Peroxygen compounds). Specific disinfection requirements depend on the type of work and the nature of the infectious agents being handled. Contact times and concentrations for disinfectants are specific for each material and manufacturer.

Box 13: Key points about cleaning and disinfection

- The environment used by the patient MUST be regularly cleaned
- Cleaning should use proper techniques to avoid aerosolisation
- Items and surfaces in contact with a patient's skin or mucosa and/or frequently touched by health workers should be cleaned and disinfected daily
- Any areas visibly contaminated with blood or body fluids should be cleaned and disinfected immediately.
- Health workers should use Standard Precautions for cleaning and disinfection.

Areas of the healthcare setting can be classified into areas each with specific cleaning routines:

- Sweeping: offices and other non-patient areas; normal domestic cleaning
- Wet mopping daily: waiting areas, consulting rooms, non-infectious disease wards, pharmacy.
- Cleaning with a detergent or disinfectant solution, with separate cleaning equipment for each room daily, whenever soiled and after each intervention (in the case of operating theatres and delivery rooms): infectious disease or isolation wards, casualty departments, laboratory, laundry, kitchen, sterilization services.

Laundry

Soiled textiles, including bedding, towels, and patient or resident clothing may be contaminated with pathogenic microorganisms. However, the risk of disease transmission is negligible if they are handled, transported, and laundered in a safe manner.

Box 14: Key principles for handling soiled laundry

- Do not shake items or handle them in any way that may aerosolize infectious agents;
- Contain soiled items in a laundry bag or designated bin.

Cleaning soiled linen: Soiled linen should not be sorted in patient-care areas, and should be handled with minimum agitation to avoid releasing pathogens.

All personnel handling soiled linen should use Standard Precautions.

Transporting soiled linen: Securely closed impermeable bags should be used for transporting linen heavily soiled with body substances or other fluids. See **Annex 9** on Housekeeping (Environmental Cleaning and Laundry)

Section VII: Healthcare facility waste management

Introduction

The guidelines outline procedures for the classification, segregation, safe packaging (containment), labelling, storage, transport and disposal of clinical and related waste. They are intended to assist authorities and practitioners as well as other people involved (whether directly or indirectly) in determining an appropriate waste management strategy. The unique and specific factors applicable to each situation, the local conditions, requirements and regulations, the type and the volume of waste generated should all be taken into account when formulating facility based standard operating procedures.

The Aim

The guidelines for waste management in health facilities aim to enhance and protect public health and safety, to minimize waste generation and the environment impact on waste treatment and disposal to facilitate compliance with regulatory requirement.

Definition

WHO (1999) defines health care waste as the total waste stream from a health care or research facility that includes both potential risk waste and non-risk waste materials. The basic risk categories defined in Table 2 are:

- Infectious
- Pathological
- Sharps
- Chemical
- Pharmaceuticals
- Genotoxic waste
- Wastes with a high content of heavy metals
- Radioactive
- Pressurized Containers

The ability of infectious waste to cause disease depends upon:

- Infectivity, pathogenicity and virulence of the micro-organism
- Susceptibility of the host
- Portal of entry.

Importance of proper waste disposal

Proper disposal:

- Minimizes the spread of infections and reduces the risk of accidental injury to staff, patients, visitors and the community.
- Helps provide an aesthetically pleasing atmosphere.
- Reduces odors.
- Attracts fewer insects and rodents and does not attract animals.
- Reduces the likelihood of contamination of the soil or ground water with chemicals or micro-organisms.

The definitions for the different categories of waste care are given on Page 31.

Table 2: Categories of Hazardous Waste

<p>Hazardous waste</p>	<p>Infectious wastes: Waste suspected to contain pathogens e.g. Cultures and stocks of infectious agents from diagnostic and research laboratories and items contaminated with such agents; wastes from infectious patients (excreta, dressings from infected or surgical wounds, clothes and bedding heavily soiled with human blood or other body fluids, and other contaminated waste infected with human pathogens e.g. food residues); discarded live and attenuated vaccines; contaminated waste that has been in contact with infected patients undergoing hemodialysis (e.g. dialysis equipment such as tubing and filters, disposable towels, gowns, aprons, gloves, and laboratory coats); infected animals from laboratories.</p> <p>Pathological waste: Human tissues, organs or fluids e.g. body parts; blood and other body fluids; fetuses, animal carcasses infected with human pathogens. Recognizable body parts are also referred to as anatomical waste.</p> <p>Sharps wastes (used or unused): Needles, syringes, scalpel blades, suture needles, razors, infusion sets, contaminated broken glass, specimen tubes and other similar material.</p> <p>Chemical Wastes: Solid, liquid, or gaseous chemicals such as solvents, reagents, film developer, ethylene oxide and other chemicals that may be toxic, corrosive, flammable, explosive or carcinogenic.</p> <p>The types of hazardous chemicals used most commonly in the maintenance of health care facilities and are most likely to be found in waste include:</p> <ul style="list-style-type: none"> • Formaldehyde • Photographic chemicals • Solvents • Organic chemicals • Inorganic chemicals <p>Pharmaceutical Wastes: Outdated medications of all kinds, as well as residuals of drugs used in chemotherapy that may be cytotoxic, genotoxic, mutagenic, teratogenic or carcinogenic. Items contaminated by or containing pharmaceutical bottles, boxes.</p> <p>Radioactive Wastes: Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind. e.g unused liquids from radiotherapy or laboratory research, contaminated glassware, packages, or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources</p> <p>Genotoxic Wastes: Genotoxic waste is highly hazardous and may have mutagenic or carcinogenic properties. It may include certain cytostatic drugs, vomit, urine, or feces from patients treated with cytostatic drugs, chemical and radioactive material.</p> <p>Pressurized Containers: Cylinders containing gases or aerosols which when accidentally punctured or incinerated could explode.</p> <p>Waste with High content of Heavy metals: Batteries, broken thermometers, blood pressure gauges etc.</p>
<p>Non-hazardous Waste</p>	<p>Communal Wastes: All solid waste that does not contain hazardous waste types). Communal waste from medical treatment or research centres include uncontaminated wastes such as bottles, office paper, boxes and packaging materials</p>

Source: Safe management of wastes from health-care activities. Edited Pruss A, Giroult E, Rushbrook P. World Health Organization 1999

Definitions of Categories of Health Facility Waste Care:

Treatment	Any method, technique, or process (usually thermal or chemical) designed to change the biological character or composition of a health care risk waste to reduce or eliminate its potential for causing disease. The treatment may/not physically destroy the waste and render it unrecognizable.
Destruction	The process whereby wastes are rendered unrecognizable, such as grinding or shredding. Destruction may be part of the treatment process or follow treatment.
Disposal	Final placement of health care facility waste, or its residue, following treatment to eliminate its original risk.

Source: WHO. Health Care Waste Management within Hospitals. Geneva: World Health Organization, 1998, p.3 (modified).

Box 15: Some key principles of healthcare facility waste management

- Recommendations for classification and handling of different types of waste should be followed. Proper segregation will reduce the risk of disease transmission and minimize the amount of potentially infectious health-care waste generated.
- All personnel handling used equipment and soiled linen and waste should use Standard Precautions and perform hand hygiene after removing PPE. Healthcare workers should use PPE whenever there is a risk of splash/spray during handling of waste.
- Health-care waste should be segregated at the point of generation according to its type, using four major categories: sharps, non-sharps infectious waste, non-sharps non-infectious waste and hazardous waste.
- Disposable sharps should be placed in puncture-resistant disposable containers and handled as clinical waste, placed in the appropriate boxes and labelled with a biohazard symbol designed specifically for this purpose
- Biohazard liquid waste (blood, body substances, or other potentially infectious material) should be carefully disposed of to avoid accidental spills and be autoclaved/incinerated/burned.
- All biohazard liquids and trash should be handled with gloves and transported carefully
- Treat waste contaminated with blood, body fluids, secretions and excretions as clinical waste, in accordance with local regulations.
- Human tissues and laboratory waste that is directly associated with specimen processing should also be treated as clinical waste.
- Discard single use items properly.

See **Annex 10** on Healthcare Facility Waste Management

Section VIII: Risk management

One of the major goals of risk management is to regulate facilities where work is carried out and to promote safe work practices in an effort to minimise the incidence of occupational exposures.

Compliance with Standard Precautions is necessary to reduce occupational exposure to HBV, HCV, HIV and other blood borne pathogens that employees may be exposed to in their workplace. Occupational exposure to potentially infectious material may occur through an injury with a sharp object that has been used on a patient or through the contamination of mucous membranes with patients' blood or secretions.

Healthcare workers are also at risk for occupational exposure to airborne diseases (e.g., tuberculosis and measles); droplet-borne diseases (e.g., Hib, etc.) and diseases transmitted through contact (e.g. impetigo, scabies). Occupational exposure risks can be reduced through implementation of IPC.

Prevention of occupational exposure in health facilities

Healthcare facility managements are encouraged to adopt a policy for the prevention of occupational accidental exposure to infectious pathogens. Health facilities should implement standard precautions for the prevention of exposure to potentially infectious material.

The greatest risk for accidental exposure to an infectious agent is with the handling of sharp objects that have been used on infectious patients. All personnel should be taught how to safely handle sharp objects and how to safely dispose of them. Messages should promote avoidance of re-capping of needles, using proper "sharps bins" for disposing of sharps, and taking care in performing procedures.

Health personnel should be reminded that blood and secretions from patients are potentially infectious. The health facility should ensure the continuous supply of educational materials, disposable syringes and needles and proper sharps bins.

Post-exposure response

Each facility should have a system for responding when a healthcare worker is injured by a sharp and/or exposed to an infectious disease. Specific post-exposure policies are needed for a number of infectious diseases including human immunodeficiency virus (HIV), viral hepatitis, pandemic influenza, Severe Acute Respiratory Syndrome (SARS), tuberculosis.

The following types of exposures should be considered for post exposure HIV prophylaxis:

- Needle-stick/sharps injury with sharp used on an HIV-infected patient.
- Mucosal exposure of the mouth or eyes by splashing fluids from an HIV-infected patient
- Broken skin exposed to blood or secretions from an HIV-infected patient
- Human bite from an HIV-infected patient.

Methods of minimizing exposure

The following are methods aimed at both employer and employee to eliminate or minimize exposure to blood borne pathogens:

1. Complying with Standard Precautions including the use of PPE.
2. Training in infection prevention and control policies and guidelines including Standard Precautions.
3. Establishing appropriate engineering controls in the health care facilities.
4. Implementing work practices control.
5. Implementing appropriate housekeeping procedures.

Training

- It is essential that all health care workers receive initial and ongoing training in infection prevention and control to enable them to perform their duties safely.
- A goal of training is to enable health care workers to anticipate and manage situations in which they may be exposed to infectious blood borne pathogens such as HIV or HBV.
- It is also important that all health care workers have access to appropriate professional counseling, and follow-up services after any possible and definite exposures to blood, and body fluids.

Engineering Controls

Engineering controls are used to eliminate or minimize employee exposure to blood, and body fluids, and for disposal of biohazard wastes, etc.

Engineering controls used throughout a health care facility include:

- Hand washing facilities, readily accessible to staff wherever occupational exposure may occur (soap, running water, paper towels, bin for disposal of used towels)
- Puncture-resistant, leak-proof sharps containers, labeled or colour-coded, and located as close as possible to their places of use
- Leak-proof containers for specimens and other regulated wastes properly labeled or colour-coded.
- Mechanical pipettes. Pipetting by mouth is prohibited.
- Laboratory equipment specific to the type of work involved.
- It is mandatory that all departments shall have a first aid kit, which is easily accessible, and contain a disinfectant.
- Where possible safety devices e.g vacutainers, safety needles shall be used
- Ample supplies of PPE for staff

Work Practice Controls

Safe work procedures shall be developed within the framework of:

- Risk identification
- Risk assessment
- Risk control.

The implementation of effective controls impact on many areas in the workplace, such as:

- Selection and purchasing of supplies, equipment and PPE
- Staffing
- Policies and procedures in the workplace
- Provision of information and training
- Recording the immunization of HCW's with Hepatitis B vaccine
- Recording and monitoring of exposures to blood and body fluids.

The following work practice controls are part of the Standard Precautions for blood borne pathogens compliance guidelines:

- Eating, drinking, smoking, applying cosmetics, and handling contact lenses are prohibited in the work areas and/or work surfaces that carry an inherent potential for contamination. Food and drink shall not be stored in refrigerators, freezers, or cabinets where blood or other potentially infectious material is stored. Such storage equipment must be clearly labelled to prevent this possibility.
- Hands and other skin surfaces contaminated with blood or other potentially infectious materials shall be washed immediately and thoroughly with soap and running water.
- Mucous membranes, if contaminated, shall be washed thoroughly with water.
- All persons who have open wounds or weeping skin rashes shall refrain from all direct patient care, potentially hazardous laboratory procedures and from handling patient-care equipment until the condition resolves. Cuts or abrasions shall be protected with a waterproof dressing and gloves prior to performing any procedure involving contact with blood and other potentially infectious material.
- Pregnant staff shall be especially familiar with and strictly adhere to Standard Precautions and Transmission Based precautions. Infection in the mother places the fetus at risk of acquiring the infection.

Personal Protective Equipment (See Section III)

Infectious Waste Disposal (See Section VII)

Section IX: Healthcare Associated Infections (HAI) Surveillance

Surveillance of both process measures and infection rates to which they are linked are important for evaluating the effectiveness of infection prevention and control efforts and for identifying areas for change. Carrying out surveillance is part of the infection prevention and control team/committee's function.

The key objective is to detect and contain pathogens or clinical conditions related to healthcare associated infections (HAI) which may result in clusters or common source outbreaks. The information gathered from surveillance is used to formulate new policies or revise current policies. Surveillance has shown to effectively reduce HAI over a period of time

HAI surveillance data are useful for improving the awareness of clinical staff and others (including administrators) about healthcare-associated infections and antimicrobial resistance so they can appreciate the need for preventive action; for identifying possible areas for improvement in healthcare practices; and for evaluating the impact of infection prevention and control practices.

Outcome surveillance is expensive and time consuming and requires trained infection control personnel, a good microbiology laboratory and other support. These resources are not yet available in many healthcare facilities in Zimbabwe and thus the initial objective in the majority of healthcare facilities should be to carry out basic surveillance with the aim of identifying key issues and areas of concern. Once basic surveillance has been achieved, periodic point prevalence surveillance can be used to monitor the effectiveness of infection control measures.

In addition to basic surveillance, the Infection Control Team could implement regular audits (process surveillance). Audits are usually simple to perform and are less resource intensive than outcome surveillance. They will help the infection control team to identify inappropriate and unsafe infection control practices immediately. In addition, they will also help them to identify wasteful practices and help divert resources to implement evidence-based and cost-effective practices.

Targeted surveillance based on the highest risk areas or patients has been preferred over facility-wide surveillance for the most effective use of resources. However, surveillance for certain epidemiologically important organisms may need to be facility-wide.

Data gathered through surveillance of high-risk populations, device use, procedures, and/or facility locations (e.g. ICUs) are useful for detecting transmission trends. Identification of clusters of infections should be followed by a systematic epidemiologic investigation to determine commonalities in persons, places, and time; and guide implementation of interventions and evaluation of the effectiveness of those interventions.

Surveillance priorities and methods

Surveillance priorities should correspond to information needs

- Patients and units to be monitored
- Types of infections
 - Infections that may become epidemic in the Health Facility
 - Infections in vulnerable populations (e.g. neonates, burn patients, immunocompromised hosts, ICU patients)
 - Infections that may cause severe outcomes
 - Infections associated with selected invasive devices or specific procedures (e.g. use of intravascular devices, indwelling urinary catheters, surgery)

Surveillance methods should be appropriate for situation

- Frequency and duration of monitoring
- Data collection methods
- Reporting channels

Passive surveillance for HAI has low sensitivity. Active surveillance for HAI is recommended

Prevalence (cross-sectional) surveys: Outcome measure is a prevalence rate.

- Investigation team visits every patient in hospital on a single day, reviews medical charts, interviews clinical staff to identify infected patients, and collects risk factor data. Outcome measure is a prevalence rate
- Simple, fast and relatively inexpensive
- Useful when initiating a surveillance programme to assess IPC issues in all units, for all kinds of infections, and in all patients
- Repeated prevalence surveys can be useful to monitor trends

Incidence (continuous) surveys: Outcome measures include attack rates, infection ratio, and incidence rates.

- Incidence surveys are usually targeted
- All patients within a defined population are monitored for a specific period of time.
- Outcome measures include attack rates, infection ratio, and incidence rates.
- More labour-intensive, time consuming and costly than prevalence surveys

Site-specific surveillance is useful for frequent infections with significant impact on morbidity, mortality, costs (e.g. surgical site infections). Note: This surveillance is primarily laboratory-based (microorganisms, antibiotic susceptibility).

- Unit-oriented surveillance focuses on high-risk units (e.g., ICUs, surgical units, oncology/ haematology, burn units, neonatology).
- Priority-oriented surveillance for specific issue of concern to facility.

See **Annex 15** on HAI surveillance

Annexes

Annex 1: Organisation of infection prevention and control in Health Care Facilities

Infection Prevention and Control Committee (IPCC) Composition

Members of this committee represent key personnel who are in decision-making positions from the various health care facility departments e.g. Administration, Central Supply and Sterilization, Microbiology Laboratory, Dental, Hospital Food Services Department, Epidemiology, Equipment Technicians, Housekeeping, Laundry, Medicine, Mortuary, Nursing, Operating Theatre, Surgical Obstetrics/Gynecology, Pediatric department, Public Health (Public Health Nurses and Environmental Health Officers), Pharmacy, Quality Assurance, Rehabilitation, Transport services, Training School, X-ray, Public Works Department and other departments. Where applicable community based health workers should be included.

Function

The Committee is an integral component of the continuous quality improvement (CQI) programme of the health care facility, and is responsible for establishing and maintaining infection prevention and control, its monitoring, surveillance, reporting, research and education. The Infection Prevention and Control Committee has the authority to recommend areas for review or revision of the Guidelines for Infection Prevention and Control Policies in Healthcare Facilities in Zimbabwe, which should be subjected to periodic reviews by the National Infection Prevention and Control Committee.

The IPCC is responsible to the Health Care Facility Manager or Medical Superintendent or Clinical Director, which may or may not be the chairman of the Infection Control Committee.

Responsibilities of the Infection Prevention and Control Committee

1. Ensure each department and ward/unit has appropriate IPC policy documents.
2. Ensuring needed equipment and supplies are identified and made available.
3. Advising staff on all aspects of IPC procedures, and maintaining a safe environment for patients, visitors and staff.
4. Support IPCO's ongoing training programs in order to ensure that all members of staff are sensitized on measures to prevent the transmission of infections.
5. Encouraging participation of all health care facility staff in infection prevention and control by orientation, regular meetings and in-service education.
6. Establishing a system for identifying infections or suspected sources of infections by means of departmental rounds, review of clinical reports and identifying at-risk patients.
7. Reviewing the levels of nosocomial and other infections (including identifying common sources and routes of entry of infections) on a monthly basis and implementing recommendations where necessary.
8. Verifying the effectiveness of the recommendations implemented for infection prevention and control.
9. Verifying whether recommended practices are being adhered to, i.e., hand washing, decontamination, disinfection and sterilization.
10. Investigating the spread of infection outbreaks in collaboration with the IPCO and other staff.
11. Liaising with all disciplines and sectors to foster team work in infection prevention and control.

12. Providing mentoring on infection prevention and control management to others.
13. Introducing new techniques and providing general reminders of the importance of the maintenance of an infection-free environment for the safe delivery of health care.
14. Support the creation of training programs on infection prevention and control for integration in the pre-service curricula of all health care workers.
15. Assist the IPCO in performing any other duties as and when required, (e.g. kitchen inspections, pest control, waste disposal).
16. Facilitate monitoring and surveillance processes to ensure compliance by employees with the infection prevention and control policies and guidelines throughout the health care facility. This is accomplished through a series of audits and quality control activities.
17. Analyze, report and facilitate use of information for decision making.

Chairperson of the IPCC

The Chairperson is responsible to the health care facility manager for infection prevention and control. The incumbent should be a senior member of the institution staff: medical microbiologist, epidemiologist, physician, surgeon or other. He/she should have prior interest in and experience in infection prevention and control.

Responsibilities of the position include:

1. Chairing the Infection Prevention and Control Committee.
2. Acting as a link between the IPCO and the Infection Prevention and Control Committee.
3. Promoting effective infection prevention and control practices.
4. Ensuring that infection prevention and control policies and guidelines are developed, and/or adapted/adopted, implemented, reviewed and updated as needed.
5. Supports infection prevention and control activities, including:
 - surveillance activities for the collection, processing, analysis and reporting of nosocomial and other infections, and taking appropriate control measures
 - supporting staff development (orientation, in-service education) on infection prevention and control for health care facility staff
 - communication and consultation processes between the ICO, the ICC and internal and external sources.
6. Reviewing and consolidating individual departmental infection prevention and control reports into facility-wide report for dissemination.

Infection Prevention and Control Officer (IPCO)

The IPCO should be a health professional preferably with a post-basic education in infection prevention and control, is an active member of the Infection Prevention and Control Committee and is responsible for the day-to-day activities of infection prevention and control to include:

1. Monitoring of clinical practices care, housekeeping, laboratory, other units, and environmental practices.
2. Conducting surveillance activities such as investigating outbreaks of hospital infections.
3. Monitoring infection prevention and control practices.
4. Collecting, recording, storing and reporting relevant infection control data.

5. Advising on the management of 'at risk' patients relating to isolation categories and prevention and control measures.
6. Advocates for supplies such as gloves, gowns, surgical masks and N-95 respirators.
7. Conducting learning needs assessment on infection prevention and control for all categories and levels of health workers.
8. Planning, conducting and/or participating in orientation and education programs on infection prevention and control. The ICO also keeps a record of all staff that have completed such trainings and programs.
9. Confidentially monitoring staff health and report according to national guidelines.
10. Conducting applied research on infection prevention and control practices with the assistance of the IPCC.
11. Keeping health care workers abreast of new information on infection prevention and control.
12. Serving as the Recording Secretary of the IPCC minutes so that a log is kept of ICC and ICO data, reports, requests and recommendations.

The IPCO reports to the CEO/Medical Superintendent or Health Care Facility Manager through their immediate supervisor of that facility. She/he serves as a resource person to staff of all disciplines and levels in matters related to infection prevention and control.

Annex 2: Hand Hygiene Procedures

Types of Hand Hygiene (see Table 3)

There are four types of hand hygiene:

a) Routine Hand washing, i.e. washing hands with plain soap and running water:

- Removes transient micro-organisms and soil, blood or other organic material from hands.
- Is appropriate in most situations when hands should be washed, including after arriving at work.

b) Hand washing with antiseptic and running water:

- Removes transient micro-organisms and soil and kills or inhibits the growth of resident micro-organisms.
- Reduces the risk of infections in high-risk situations, such as:
 - when there is heavy microbial contamination
 - before performing invasive procedures, (e.g. the placement and care of intravascular devices, in dwelling urinary catheters)
 - before contact with patients who have immune defects, damage to the integumentary system/skin (e.g. burns, wounds) and percutaneous implanted devices
 - before and after direct contact with patients who have antimicrobial resistant organisms.

c) Antiseptic hand rub

- Alcohol is one kind of antiseptic hand rub
- Kills or inhibits the growth of most transient and resident micro-organisms, but does not remove micro-organisms or soil
- Can be used when hand washing with soap and running water is not possible, as long as hands are not visibly soiled with dirt, blood, or other organic material.

d) Surgical hand scrub

- Scrubbing with antiseptic before beginning surgical procedures will help prevent the growth of micro-organisms for a period of time
- Reduces the risk of infections to the patient if the gloves are damaged during the procedure

Hand washing Guidelines

- There should be a tap readily available within proximity of the working area
- Hands should be washed under running water.
- A health facility approved liquid soap dispenser should be used for routine hand washing
- Hands should be dried using paper hand towels or drip dried by shaking.
- Patients and family members should be instructed on proper hand washing.
- The patient's hands should be washed before eating, after toileting and when soiled.

All Health workers hands should be washed:

- Before and after coming into contact with each patient.

- Whenever there is a chance of contamination.
- Before putting on gloves for performing clinical procedures (e.g. insertion of IUD).
- Before putting on gloves for performing invasive procedures.
- Between certain procedures on the same patient where soiling of hands is likely, to avoid cross-contamination of body sites.
- After touching blood, body fluids, secretions, excretions, exudates from wounds.
- After contact with items known or considered likely to be contaminated with blood, body fluids, secretions, or excretions (e.g. bedpans, urinals, wound dressings) whether or not gloves are worn.
- Before and after gloves are removed.
- Before medication preparation.
- Before preparing, handling, serving or eating food, and before feeding a patient.
- After diapering or toileting children.
- When hands are visibly soiled.
- After personal body functions – such as using the toilet, wiping or blowing nose, or touching hair or face.
- Before leaving work.

Hand washing Instructions

- Routine hand washing is accomplished by vigorously rubbing together all surfaces of lathered hands followed by thorough rinsing under a stream of running water. This should take 10–15 seconds to complete. Hands should be dried with a paper towel or shaken dry.
- Immediate re-contamination of the hands by touching sink fixtures may be avoided by using a paper towel to turn off taps.
- When running tap water is not available, use a bucket with a tap which can be turned on to wet hands, off to lather hands and turned on again for rinsing.
- If a bucket with a tap is not available, a bucket/basin and pitcher can be used to create a running stream of water. A helper can pour water from the pitcher over the hands being washed.
- Similarly, a bucket/basin and a tea kettle may be used.

Skin Care

- Frequent hand washing and gloving can irritate skin. Lotions can ease the dryness resulting from frequent hand washing; it can also help prevent dermatitis from frequent glove use.
- Hand washing cannot reduce the bacterial counts of personnel with dermatitis. Those with dermatitis should not be assigned procedures needing frequent hand washing.
- Staff responsible for processing instruments that have open sores or cuts on their hands or forearms should not clean instruments until the lesions are healed.
- Health providers with dermatitis carry high numbers of micro-organisms and may be at increased risk of exposure to blood borne pathogens. Intact skin is a major defence from infection.
- Antiseptic hand cleansers are designed to rapidly wash off the majority of the transient flora by their mechanical detergent effect and to exert an additional sustained microbiological activity on the resident hand flora.

Hand washing techniques are indicated in **Table 3**.

Figures 3 and 4 illustrate the dynamism of hand washing for infection prevention and control.

Figure 5 shows the procedure using a handrub.

Figure 6 shows the procedure for a surgical scrub.

Figure 7 shows the parts of the hands that are often missed during hand washing.

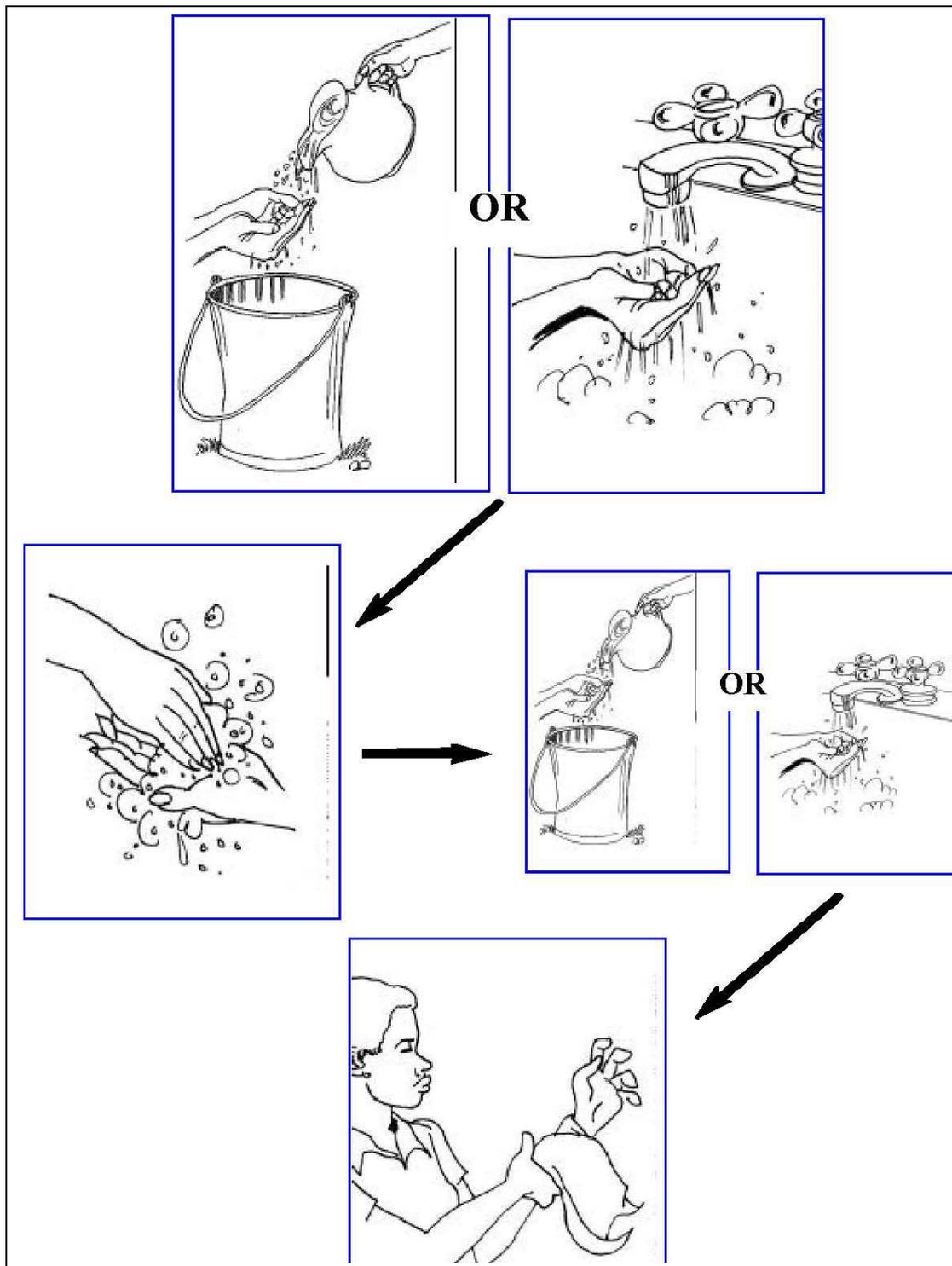
Table 3: Hand Hygiene Techniques

Types of hand washing	Agents	Procedure	Remarks
1. Routine hand washing.	Liquid soap with or without antimicrobial agent.	Routine handwashing (Fig 4) <ul style="list-style-type: none"> • Remove hand-worn jewellery, e.g. rings, watches and bracelets. • Turn on tap. • Wet hands thoroughly under running water to at least 4 inches above the wrist. • Soap hands adequately. • Rub hands vigorously back and front, in between fingers up to and including the wrist. • Rinse under clean running water until all traces of soap are removed. • Dry hands from tip of fingers to wrist with paper towel. If towels are not available, shake off excess water and allow hands to air-dry. • Use same paper towel to turn off tap if tap not elbow controlled. 	<ul style="list-style-type: none"> • Frequently missed areas are thumbs, under nails, backs of fingers and hands (Fig 7). • This technique should last 10-15 seconds, longer if hands are visibly soiled.
2. Antiseptic hand washing.	i. Liquid soap. ii. Antiseptics: <ul style="list-style-type: none"> • 0.5% chlorhexidine with or without glycerol. • Povidone-iodine scrub. 	<ul style="list-style-type: none"> • Wash hands as above using antiseptic agent. 	<ul style="list-style-type: none"> • Used in ICU. Labour and Delivery Units, Nursery, Isolation Units, etc. • Drying of hands achieves a further reduction in number of micro-organisms. • Reusable towels are to be avoided because of the potential for microbial contamination.
3. Alcohol hand rub.	<ul style="list-style-type: none"> • 70% ethyl alcohol • or Methylated spirit with glycerol. 	<ul style="list-style-type: none"> • Apply 3-5ml of alcohol handrub solution. • Rub hands together until dry. 	<ul style="list-style-type: none"> • Only to be applied on hands not visibly soiled. • Artificial nails or chipped nail polish may increase bacterial load and impede visualization of solids under nail.

Types of Hand Hygiene	Agent(s)	Procedure	Remarks
Surgical hand scrub	<ul style="list-style-type: none"> • Providone-iodine 7.5% surgical scrub Or Chlorhexidine 5% surgical scrub (undiluted) 	<ul style="list-style-type: none"> • See Figure 5. • Remove hand-worn jewellery, e.g. rings, watches, bracelets. • Turn on tap. • Wet hands and arms up to the elbow under clean running water, always holding hands with fingers-up in a vertical position. • Apply antiseptic soap generously. • Using a circular motion to avoid abrasions, begin at the fingertips of one hand and lather and wash between the fingers, continuing from fingertips to elbow. • Wash surfaces between fingers, sides of hands, tips of fingers, palms and dorsum of hands up to the elbow of one arm. • Repeat procedure for the second hand and arm. • Continue washing for 3–5 minutes. • Rinse each arm separately, fingertips first, holding hands above the level of the elbow. • Dry hands in fingers-up vertical position with a sterile towel. Wipe from the fingertips to the elbow. 	<ul style="list-style-type: none"> • Use of scrubbing brushes, is no longer recommended because of damage to the skin . • Surgical hand scrub should be for 3–5 minutes. • Always keep hands upright during washing so that fluid does not trickle back to hands. Do not touch anything until you start the procedure.

Source: Disinfection Module: A Guide to Disinfection In Health Facilities, Zimbabwe, Harare. The Zimbabwe Essential Drug Action Program, Ministry of Health & Child Welfare. Republic of Zimbabwe, 2001,

Figure 3: Routine Hand washing Techniques



NOTE: ELBOW TAPS ARE PREFERRED WHENEVER POSSIBLE. DRY HANDS WITH A NEW PAPER TOWEL OR NEW CLEAN CLOTH. DON'T REUSE CLOTH TOWELS

Figure 4: Details of hand washing procedure



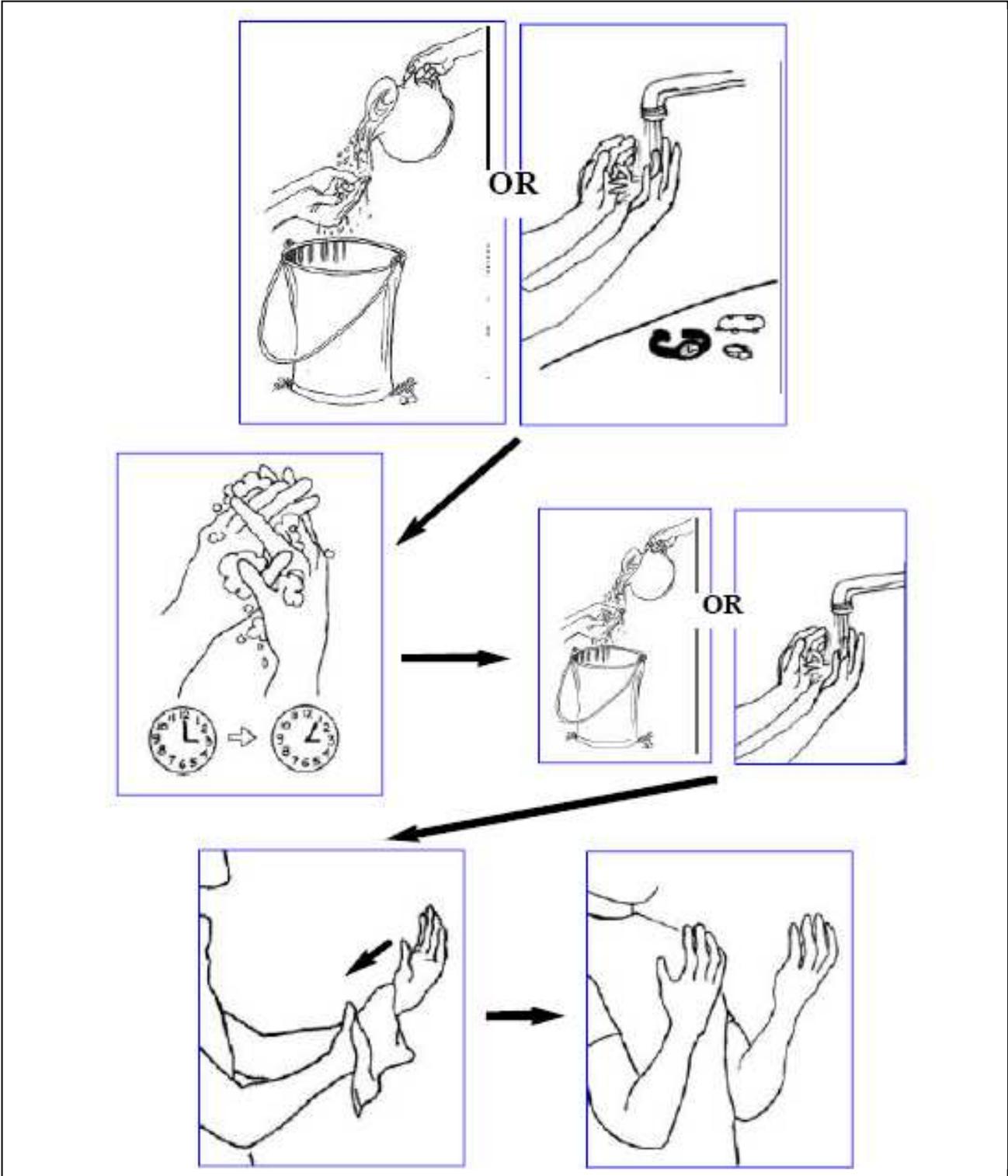
Source: http://www.who.int/gpsc/clean_hands_protection/en/index.html

Figure 5: Details of hand rub procedure



Source: http://www.who.int/gpsc/clean_hands_protection/en/index.html

Figure 6: Surgical Hand scrub Techniques



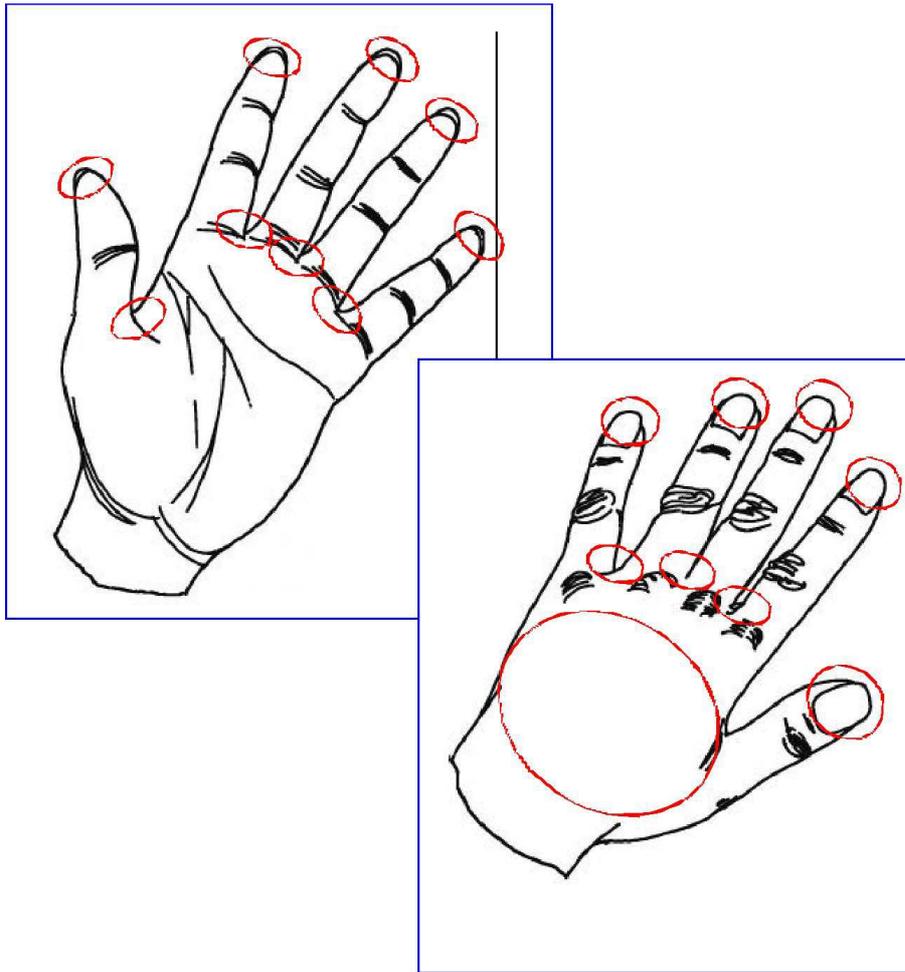


Figure 7:  Areas to be given special attention when hand washing

Care of Handwashing products

Since microorganisms grow and multiply in standing water:

1. Liquid soap is preferred but if bar soap is used, provide soap rack; soft soap foams when bars of soap are not drained properly. Racks promote drainage and soap will stay drier.
2. Liquid hand wash products should be stored in closed containers and dispensed from either disposable containers or containers that are washed and dried thoroughly before refilling. Do not top up the system.

The types of soaps and antiseptic agents for hand washing are shown in **Table 4** and the characteristics of antiseptic agents in **Table 5**.

Table 4: Hand hygiene products and indications for use

Products	Indications	Special Considerations
<p>Liquid soap Plain soap, bar soap,</p>	<ul style="list-style-type: none"> • For routine care of patients. • For washing hands soiled with dirt, blood or other organic material. 	<ul style="list-style-type: none"> • May contain very low concentrations of anti-microbial agents to prevent microbial contamination growth in the product. • Use of bar soap is discouraged .If liquid soap is not available bar soap should be on racks that allow water to drain; small bars that can be changed frequently are safest.
<p>Waterless antiseptic agents: Glycerol-alcohol hand rub Alcohol rinses Alcohol foams Alcohol wipes Alcohol towelettes Germicidal hand rinse (Hibistat)</p>	<p>Demonstrated alternative to conventional agents.</p> <p>For use where hand washing facilities are inadequate, impractical or inaccessible (e.g. ambulances, home care, mass immunization).</p> <p>For situations in which the water supply is interrupted</p>	<p>Not effective if hands are visibly soiled with dirt or heavily contaminated with blood or other organic material. Follow manufacturer’s recommendations for use. Efficacy affected by concentration of alcohol in product.</p> <p>Lotions should be readily available to protect skin integrity. glycerol-alcohol hand rub can be prepared by pharmacy</p>
<p>Antiseptic/Anti-microbial agents: Chlorhexidinegluconate scrub strengths: 2% aqueous foam or 4% liquid preparation, 0.5% tincture Povidone-iodine</p>	<p>May be chosen for hand scrubs prior to performance of invasive procedures (e.g. placing intravascular lines or devices).</p> <p>When caring for severely immunocompromised patients.</p> <p>Based on risk of transmission (e.g. specific micro-organisms).</p> <p>Critical care areas.</p> <p>Intensive care nurseries.</p> <p>Operating theatre hand scrub.</p> <p>When caring for individuals with antimicrobial resistant organisms.</p>	<p>Antiseptic agents may be chosen if it is felt important to reduce the number of resident flora or when the level of microbial contamination is high.</p> <p>For use in high risk areas such as ICU, neonatal units, operating theatre, labour and delivery rooms, isolation areas, laboratory and dialysis units, for invasive procedures.</p> <p>Antiseptic agents should be chosen when persistent antimicrobial activity on the hand is desired. They are usually available in liquid formulations. Antiseptic agents differ in activity and characteristics.</p>

Table 5: Characteristics of antiseptic agents

Group and subgroup	Gram-positive bacteria	Gram-negative bacteria	<i>Mycobacterium tuberculosis</i>	Fungi	Virus	Speed of killing sensitive bacteria	Inactivated by mucus or protein	Comments
Alcohols	Good	Good	Good	Good	Good	Fast	Moderate	Optimum strength 70% with added emollients (glycerine or cetyl alcohol is less drying), not recommended for physical cleaning of skin, good for hand antisepsis and for surgical site preparation.
Chlorhexidineglucanate 2% aqueous/foam 4% liquid	Good	Good	Fair	Fair	Good	Intermediate	Minimal	Has persistent effect good for both hand washing and surgical site or preoperative patient skin preparation; do not use near mucous membranes; toxic effects on ears and eyes reported; activity neutralised by non-ionic surfactants.
Hexachlorophene 3% aqueous	Good	Poor	Poor	Poor	Poor	Slow	Minimal	Provides persistent, cumulative activity after repeated use (washing with alcohol reduces persistent action), can be toxic when absorbed from skin especially in premature infants, good for hand washing but not surgical site preparation; limited spectrum of antimicrobial activity.
Iodine compounds iodine in alcohol	Good	Good	Good	Good	Good	Fast	Marked	Causes skin “burns”, but this is unusual with 1% tincture; especially if it is removed after several minutes, too irritating for hand washing but excellent for surgical site preparation.
IodophorsPovidone-iodine 0.05%, 2%, 7.5%, 10% solution	Good	Good	Fair	Good	Good	Intermediate	Moderate	Less irritating to the skin than iodine; good for both hand washing and surgical site preparations; rapidly neutralized in presence of organic materials such as blood or sputum.
Para-chloro-meta-xyleneol (PMX) 0.5% -3.75%	Good	Fair*	Fair	Fair	Fair	Intermediate	Minimal	Activity neutralised by non-ionic surfactants.
Triclosan 0.3%-2%	Good	Good	Fair	Poor	Good	Intermediate	Minimal	Effect over Gram-negative bacteria: low, absorbed through intact skin.

*Activity improved by addition of chelating agent such as EDTA

Some of these agents, such as iodine or chlorhexidine, are combined with alcohol to form tinctures and are available in the combined formulation.

Source: Canada Communicable Disease Report. Vol.24S8. Infection Control Guidelines: Handwashing, Cleaning, Disinfection and Sterilization in Health Care. Health Canada, Ottawa, 1998,p4 (modified).

Improving Compliance with Hand Hygiene

Compliance with hand washing protocols by health personnel is a major problem in health facilities. The reasons for non-compliance are many and include elements of lack of knowledge about the importance of hand washing, as well as perceived obstacles such as understaffing, lack of supplies, equipment and water.

The literature identifies a number of suggested strategies to improve compliance. These appear in Table 6.

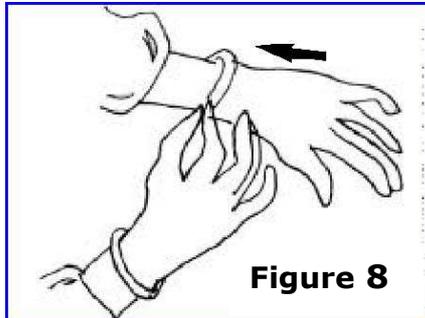
Table 6: Proposed Strategies to Improve Hand Hygiene Techniques and Compliance

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

Source: Canada Communicable Disease Report, Vol. 24S8. Infection Control Guidelines: Hand washing, Cleaning, Disinfection and Sterilization in Health Care. Health Canada, Ottawa, 1998, p. 3.

Annex 3: Putting on and removing gloves

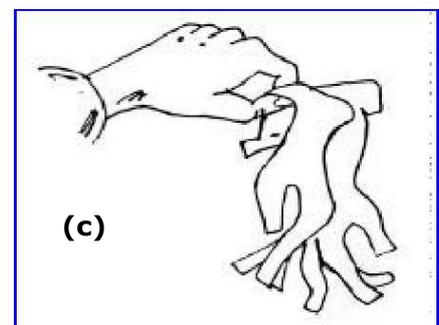
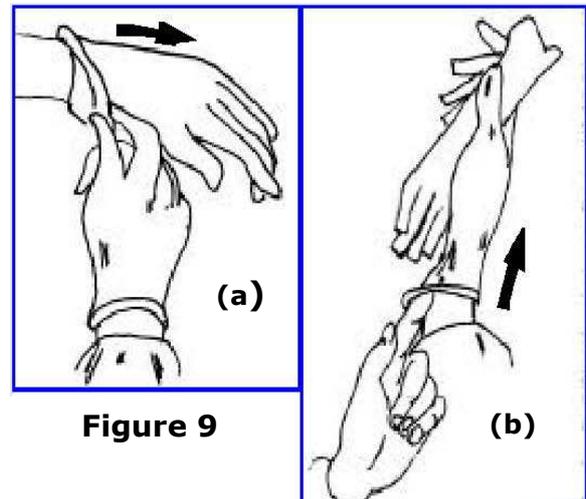
1. Putting on gloves (Figure 8)



1. Always check gloves for damage before using them.
2. Use the correct size, i.e., gloves that fit the hands.
3. Use gloves that are appropriate for the particular procedure (refer to types of gloves).

2. Removing gloves: Figure 9 (a), (b) and (c)

- Remove gloves and discard after single use or after handling specimens.
- To remove gloves, grasp the cuffed end of one glove with the other gloved hand and carefully pull off the held glove in a motion directed away from the body. See Fig.9(a).
- Either dispose of this glove or hold it in the remaining gloved hand.
- Remove the second glove by placing a finger from the in gloved hand between the cuff of the remaining glove and the skin of the wrist to form a hook. Remove the second glove with a peeling motion, pulling it inside out and enclosing the other glove, if it is being held by that hand during the process. See Fig.9 (b). Take care not to splash other people or surfaces.
- Discard used gloves into the appropriate waste receptacle (Figure 9 (c)).
- Wash hands after removal of gloves and other personal protective barrier equipment.

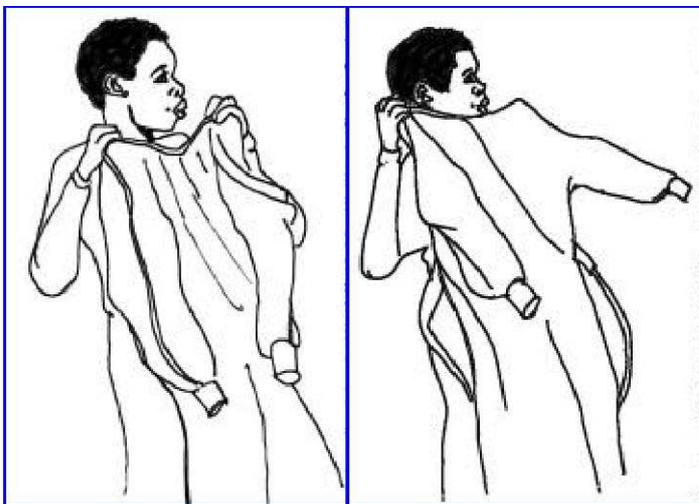


Annex 4: Putting on and removing gowns

1. Putting on a gown (Figure 10)

- a) Hold the gown so that the back is facing the front of the body.
- b) Slip arms one at a time into the sleeves.
- c) Fasten the neck tab located at the back of the gown to close the top of the gown.
- d) 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.
- e) Generally, if both a gown and gloves are worn, the gown should be put on first.

Figure 9: Putting on a gown



3. Removing the gown

- a) Untie the waist ties and then ask assistant to unfasten the neck tab.
- b) 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.
- c) Finally, hold the removed gown away from body and roll into a ball in a motion directed away from the body.
- d) Discard the gown into an appropriate receptacle.
- e) Remove gloves
- f) Wash hands after removal of gown and other personal protective barrier equipment.

Annex 5: Procedures for the use of masks and respirators

Putting on a surgical mask (Figure 10):

- a) Position the mask to cover both nose and mouth.
- b) Tie the two (2) top ties first firmly at the back of the head. Tie the two (2) bottom ties at the back of the neck.
- c) Bend the flexible metal tab above the bridge of the nose to help secure the mask.
- d) The mask should conform to the shape of the face to minimize venting at the sides.
- e) When using the mask with elastic bands, position the mask to cover both the nose and mouth with the bands looped behind each ear.
- f) Adjust the flexible metal tab as described above.
- g) Once in position, handling of the mask and talking should be minimized.

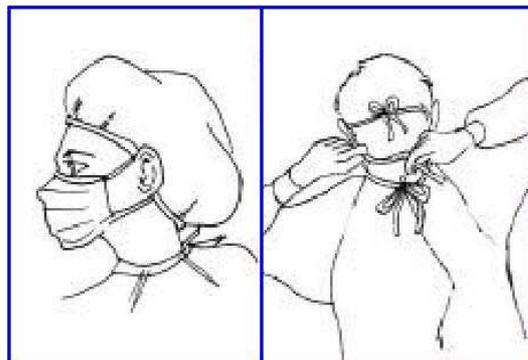


Figure 11

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

Removing a Mask

NB. Mask to be removed after gown and gloves

1. Untie the bottom ties.
2. Untie the top ties, being careful not to let go of the mask with both hands.
3. Masks with elastic bands should be removed by unlooping the bands from behind each ear, being careful not to drop the mask.
4. Used mask must not be crushed or squeezed before discarding into a waste receptacle. (Hold mask by the string or rubber band)
5. Discard used masks into a waste receptacle.

Respirators

Respirators are a special type of device that provide a high level of filtration and are closely fitted to the face to prevent leakage around the edges. They are manufactured with at least 94-95% filter efficiency for particles of 0.3-0.4 micrometers in diameter and are recommended for use by health workers to **reduce the concentration of *M.tuberculosis* bacilli inhaled**. They are manufactured as CDC/NIOSH-certified N95 (or greater) and CEN-certified FFP2 (or greater) pieces. If the respirator is not fitted correctly, infectious droplet nuclei can easily enter a person's airways potentially resulting in infection.

Respirators of different sizes and shapes are available. **Fit-tests** should be done using a 'fit-testing kit' when selecting the type of respirator, as variability in facial structure can mean some masks fit better than others. Poorly fitting masks will not be effective and any facial hair, such as beards may also prevent the respirator from fitting properly.

An informal way to test the fit of a respirator is as follows:

- Fit the mask according to manufacturer's instructions.
- Once the mask is in place, inhale sharply. The mask should be drawn in towards the face, indicating that a negative pressure has been generated.
- If the mask does not draw in or leakage of air at the edges of the respirator, the straps should be adjusted by pulling back along the sides and/or reposition respirator.
- Repeat until mask is sealed properly.

Respirators will NOT work if:

- They are not properly fitted
- If the wearer has a lot of facial hair which prevents a close fit
- They are damaged or crushed
- They are saturated (reused until the filter capacity has been exceeded)
- They get wet (even if they dry again).

Care of respirators:

N95 respirators are expensive and can be re-used for up to 2 weeks. Healthworkers must not share respirators.

- Keep the mask dry and clean (not in a plastic bag).
- Replace masks if they are damaged, or get wet (even if they dry again)
- Never use the mask 'inside out' or reversed
- Do not hang round neck when not in use

Source: Implementing the WHO policy on TB infection control . Developed by the Tuberculosis Coalition for Technical Assistance (TBCTA) under the auspices of the TB-infection control sub-group of the Stop-TB partnership

Annex 6: Protective Eye Wear

a) Types of Eye wear

- Plastic glasses with solid side shields
- Goggles
- Masks with clear visors
- Chin-length face shields.

b) Instructions

Putting on Plastic Glasses

1. Place the eye wear in front of the eyes and loop the handles behind each ear.

Removing Plastic Glasses

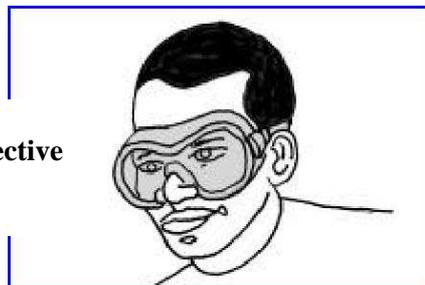
1. Lift the eye wear behind the ears and pull forward and away from the body.
2. If gloved hands are used for this procedure, the gloves should **not** be contaminated with blood or other potentially infectious material.
3. Remove gloves, then remove glasses and wash hands.

Putting on protective goggles

Protective goggles provide a more secure barrier than plastic glasses.

1. Position goggles to cover both eyes and nose
2. Hold the goggles in one hand, allowing head straps to fall below ears, to around neck.
3. Place goggles above the nose and over the eyes.
4. Raise top strap to back of head. Pull bottom strap over head, below ears, to around neck.
5. Adjust for comfort.

Figure 11:
Putting on Protective Goggles



Removing Protective Goggles

1. Carefully lift the top strap from the back of the head to the front.
2. Holding goggles with one hand lift the bottom strap from the back of the head to the front.
3. If gloved hands are used for these procedures, the gloves should be removed prior to removing the goggles.

Putting on Face Shield

Face shield protects the face from splashes:

1. Read the manufacturer's instructions if the face shield needs assembling.
2. Once assembled, the face shield is donned similarly to a pair of glasses, but the face shield may fit a little higher on the forehead than glasses.
3. Be sure the face shield covers the face.

Removing Face Shield

Removing the face shield is similar to removing glasses

1. Lift the face shield carefully from behind the ears and pull forward and away from the body. If the face shield has an elastic band, lift the face shield carefully from behind the ears and pull upwards, forward and away from the body.
2. If gloved hands are used for this procedure, the gloves should be removed prior to the removal of the face shield.

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

- Gloves
- Gown
- Protective eye wear
- Mask.

NOTE: Always wash hands with soap and water or use hand rub after removal of PPE

Annex 7: Guidelines on Isolation Precautions

Standard Precautions

All persons accessing the isolation area shall observe Standard Precautions guidelines and transmission-based precautions.

Patient Care Equipment and Articles

- Contaminated, reusable critical medical devices or patient care equipment (i.e. equipment that enters normally sterile tissues or through which blood flows) should be sterilized.
- Semi-critical medical devices or patient care equipment (i.e., equipment that touches mucous membranes) should be sterilized or disinfected (reprocessed) after use to reduce the risk of transmission of micro-organisms to other patients. The article and its intended use and the manufacturer's recommendations determine the type of reprocessing.
- Non-critical equipment (i.e., equipment that touches the skin) contaminated with blood, body fluids, secretions or excretions should be decontaminated, cleaned and disinfected after use, according to the manufacturer's directions and the facility policy.
- Contaminated disposable (single-use) patient care equipment should be handled and transported in a manner that reduces the risk of transmission of micro-organisms. The equipment should be disposed of according to the institution/health care facility policy.
- No special precautions are needed for dishes, glasses, cups, and eating utensils. Reusable dishes and utensils can be used for patients on isolation precautions and can be washed in hot soapy water or disinfected with 0.01% (100 ppm) sodium hypochlorite solution.

Routine and Terminal Cleaning

Standard routine cleaning procedures should be strictly adhered to.

1. Terminal decontamination, cleaning and disinfection should be done when the patient no longer occupies the room and the room shall be left vacant for at least one hour to allow aeration depending on the type of infection.
2. The room, or area and bedside equipment of patients on Transmission-Based Precautions should be cleaned using the same procedures used for patients on Standard Precautions unless the infecting micro-organism(s) and the amount of environmental contamination indicates special cleaning.
3. In addition to thorough cleaning, adequate disinfection of bedside equipment and "high touch" environmental surfaces (e.g. bedrails, bedside tables, carts, doorknobs, faucet handles, etc.) is indicated for certain pathogens, especially enterococci, which can survive in the inanimate environment for prolonged periods of time. 0.1% sodium hypochlorite (1000ppm available chlorine)
4. All waste should be disposed according to the facilities policy.

Requirements for isolation

1. Accommodation for the suspected or confirmed patient in a room or area designated for infectious diseases.
2. Adequate personnel assigned to the area.
3. Appropriate protective equipment and supplies.

4. A schedule for the daily routine cleaning and maintenance of the isolation area should be drawn.
5. A system for the education of health care personnel, patients, and family members regarding the illness and the precautionary measures to be observed.

Establishing priorities for single rooms

Where single rooms are limited in number, the institution should set priorities for their use, based on risk factors for transmission.

Consider the severity of the outcome should transmission occur, for example, in the following descending order of priority:

- Airborne infections
- Droplet transmission
- Influenza if in a high-risk unit
- Patients with infections spread by contact and who are non-compliant and cannot be confined to bed:
 - Diarrhoea in incontinent patient, not contained by diapers
 - Respiratory tract infection in a child unable to appropriately handle respiratory secretions
 - Infected wound or skin drainage not contained by dressing
 - Extensive burns
 - Dysentery (salmonella infections, cholera, multi-drug resistant infections).

Isolation Categories

1. Contact Route

- Gastro-intestinal
- Respiratory
- Skin
- Wound infections
- Colonization with multi-drug resistant bacteria
- Enteric infections, e.g. *Clostridium difficile*, *Shigella* spp., Hepatitis A
- Enteroviral infections in infants and young children
- Respiratory syncytial virus, parainfluenza.

2. Airborne Route

- Measles
- Varicella (including disseminated zoster)
- Tuberculosis.

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Abscess			
Draining, major	C	DI	No dressing or containment of drainage; until drainage stops or can be contained by dressing
Draining minor or limited	S		Dressing covers and contains drainage
Acquired human immunodeficiency syndrome (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures
Actinomycosis	S		Not transmitted from person to person
Amoebiasis	S		Person to person transmission is rare. Transmission in settings for the mentally challenged and in a family group has been reported . Use care when handling diapered infants and mentally challenged persons
Anthrax	S		Infected patients do not generally pose a transmission risk.
Cutaneous	S		Transmission through non-intact skin contact with draining lesions possible, therefore use Contact Precautions if large amount of uncontained drainage. Handwashing with soap and water preferable to use of waterless alcohol based antiseptics since alcohol does not have sporicidal activity
Pulmonary	S		Not transmitted from person to person
Antibiotic associated colitis (see <i>Clostridium difficile</i>)			
Ascariasis			Not transmitted from person to person
Aspergillosis	S		Contact Precautions and Airborne Precautions if massive soft tissue infection with copious drainage and repeated irrigations required
Blastomycosis, cutaneous or pulmonary	S		Not transmitted from person to person
Botulism			Not transmitted from person to person
Bronchiolitis (see respiratory infections in infants and young children)	C	DI	Use mask according to Standard Precautions.
Brucellosis (undulant, Malta, Mediterranean fever)	S		Not transmitted from person to person except rarely via banked spermatozoa and sexual contact . Provide antimicrobial prophylaxis following laboratory exposure
<i>Campylobacter</i> gastroenteritis (see gastroenteritis)			
Candidiasis, all forms including mucocutaneous	S		
Cellulitis	S		
Chancroid (soft chancre) (<i>H.ducreyi</i>)	S		Transmitted sexually from person to person
Chickenpox (see varicella)			

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
<i>Chlamydia trachomatis</i> : Conjunctivitis Genital (lymphogranulomavenereum)	S		
Pneumonia (infants ≤3 mth)	S		
<i>Chlamydia pneumoniae</i>	S		Outbreaks in institutionalized populations reported, rarely
Cholera (see gastroenteritis)			
Closed-cavity infection			
Open drain in place; limited or minor drainage			Contact Precautions if there is copious uncontained drainage
No drain or closed drainage system in place			
<i>Clostridium</i>			
<i>C. botulinum</i>			Not transmitted from person to person
<i>C. difficile</i> (see Gastroenteritis, <i>C. difficile</i>)	C	DI	
<i>C. perfringens</i> Food poisoning			Not transmitted from person to person
Gas gangrene			Transmission from person to person rare; one outbreak in a surgical setting reported . Use Contact Precautions if wound drainage is extensive.
Congenital rubella	C	Until 1 yr of age	Standard Precautions if nasopharyngeal and urine cultures repeatedly neg. after 3 mos. of age
Conjunctivitis			
Acute bacterial	S		
<i>Chlamydia</i>	S		
Gonococcal	S		
Acute viral (acute hemorrhagic)	C	DI	Adenovirus most common; enterovirus70 , Coxsackie virus A24 also associated with community outbreaks. Highly contagious; outbreaks in eye clinics, pediatric and neonatal settings, institutional settings reported. Eye clinics should follow Standard Precautions when handling patients with conjunctivitis. Routine use of infection control measures in the handling of instruments and equipment will prevent the occurrence of outbreaks in this and other settings.
Croup (see respiratory infections in infants and young children)			
Cryptococcosis	S		Not transmitted from person to person, except rarely via tissue and corneal transplant
Cryptosporidiosis (see gastroenteritis)			
Cysticercosis	S		Not transmitted from person to person
Cytomegalovirus infection, including in neonates and immunosuppressed patients	S		No additional precautions for pregnant HCWs
Decubitus ulcer (see Pressure ulcer)			Not transmitted from person to person

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Diarrhoea, acute-infective etiology suspected (see gastroenteritis)			
Diphtheria			
Cutaneous	C	CN	Until 2 cultures taken 24 hrs. apart negative
Pharyngeal	D	CN	Until 2 cultures taken 24 hrs. apart negative
Ebola virus (see viral hemorrhagic fevers)			
Echinococcosis (hydatidosis)	S		Not transmitted from person to person
Encephalitis or encephalomyelitis (see specific etiologic agents)			
Endometritis (endomyometritis)	S		
Enterobiasis (pinworm disease, oxyuriasis)	S		
Enteroviral infections (i.e., Group A and B Coxsackie viruses and Echo viruses) (excludes polio virus)	S		Use Contact Precautions for diapered or incontinent children for duration of illness and to control institutional outbreaks
Epiglottitis, due to <i>Haemophilus influenzae</i> type b	D	U 24 hrs	See specific disease agents for epiglottitis due to other etiologies)
Epstein-Barr virus infection, including infectious mononucleosis	S		
Food poisoning			
Botulism	S		Not transmitted from person to person
<i>C. perfringens</i> or <i>welchii</i>	S		Not transmitted from person to person
Staphylococcal	S		Not transmitted from person to person
Furunculosis, staphylococcal	S		Contact if drainage not controlled. Follow institutional policies if MRSA
Infants and young children	C	DI	
Gangrene (gas gangrene)	S		Not transmitted from person to person
Gastroenteritis			
Adenovirus	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks for gastroenteritis caused by all of the agents below
<i>Campylobacter</i> species	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
Cholera (<i>Vibrio cholerae</i>)	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks <i>NOTE: See Zimbabwe National Cholera Guidelines</i>
<i>C.difficile</i>	C		Discontinue antibiotics if appropriate. Do not share electronic thermometers; ensure consistent environmental cleaning and disinfection. Hypochlorite solutions may be required for cleaning if transmission continues. Handwashing with soap and water preferred because of the absence of sporicidal activity of alcohol in waterless antiseptic hand rubs.

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
<i>Cryptosporidium species</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>E.coli</i>			
Enteropathogenic O157:H7 and other shiga toxin-producing Strains	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Other species</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Giardia lamblia</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Noroviruses</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks. Persons who clean areas heavily contaminated with feces or vomitus may benefit from wearing masks since virus can be aerosolized from these body substances 1; ensure consistent environmental cleaning and disinfection with focus on restrooms even when apparently unsoiled . Hypochlorite solutions may be required when there is continued transmission . Alcohol is less active, but there is no evidence that alcohol antiseptic handrubs are not effective for hand decontamination. Cohorting of affected patients to separate airspaces and toilet facilities may help interrupt transmission during outbreaks.
Rotavirus	C	DI	Ensure consistent environmental cleaning and disinfection and frequent removal of soiled diapers. Prolonged shedding may occur in both immunocompetent and immunocompromised children and the elderly
<i>Salmonella species</i> (including <i>S. typhi</i>)	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Shigella species</i> (Bacillary dysentery)	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Vibrio parahaemolyticus</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
Viral (if not covered elsewhere)	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<i>Yersinia enterocolitica</i>	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
German measles (see rubella; see congenital rubella)	S		
Giardiasis (see gastroenteritis)	S		
Gonococcalophthalmia neonatorum (gonorrheal ophthalmia, acute conjunctivitis of newborn)	S		

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Gonorrhea	S		
Granuloma inguinale (Donovanosis, granuloma venereum)	S		
<i>Haemophilus influenzae</i> (see disease-specific recommendations)			
Hepatitis, viral			
Type A	S		Provide hepatitis A vaccine post-exposure as recommended
Diapered or incontinent patients	C		Maintain Contact Precautions in infants and children <3 years of age for duration of hospitalization; for children 3-14 yrs. of age for 2 weeks after onset of symptoms; >14 yrs. of age for 1 week after onset of symptoms
Type B-HBsAg positive; acute or chronic	S		See specific recommendations for care of patients in hemodialysis centers
Type C and other unspecified non-A, non-B	S		See specific recommendations for care of patients in hemodialysis centers
Herpangina (see enteroviral infection)			
Hookworm	S		
Herpes simplex (<i>Herpesvirushominis</i>)			
Encephalitis	S		
Mucocutaneous, disseminated or primary, severe	C	Until lesions dry and crusted	
Mucocutaneous, recurrent (skin, oral, genital)	S		
Neonatal	C	Until lesions dry and crusted	Also, for asymptomatic, exposed infants delivered vaginally or by C-section and if mother has active infection and membranes have been ruptured for more than 4 to 6 hrs until infant surface cultures obtained at 24-36 hrs. of age negative after 48 hrs incubation
Herpes zoster (varicella-zoster) (shingles)			
Disseminated disease in any patient .Localized disease in immune-compromised patient until disseminated infection ruled out	A,C	DI	Susceptible HWs should not enter room if immune caregivers are available; no recommendation for protection of immune HWs; no recommendation for type of protection, i.e. surgical mask or respirator; for susceptible HWs.
Localized in patient with intact immune system with lesions that can be contained/covered	S	DI	Susceptible HWs should not provide direct patient care when other immune caregivers are available.
Histoplasmosis	S		Not transmitted from person to person

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Human immunodeficiency virus (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures
Impetigo	C	U24hrs	
Influenza			Single patient room when available or cohort; avoid placement with high-risk patients; mask patient when transported out of room; chemoprophylaxis/vaccine to control/prevent outbreaks. Use gown and gloves according to Standard Precautions may be especially important in pediatric settings. Duration of precautions for immunocompromised patients cannot be defined; prolonged duration of viral shedding (i.e. for several weeks) has been observed; implications for transmission are unknown
Human (seasonal influenza)	D	5 days except DI in immune-compromised persons	Single patient room when available or cohort; avoid placement with high-risk patients; mask patient when transported out of room; chemoprophylaxis/vaccine to control/prevent outbreaks. Use gown and gloves according to Standard Precautions may be especially important in pediatric settings. Duration of precautions for immunocompromised patients cannot be defined; prolonged duration of viral shedding (i.e. for several weeks) has been observed; implications for transmission are unknown
Avian (e.g., H5N1, H7, H9 strains)			See www.cdc.gov/flu/avian/professional/infect-control.htm for current avian influenza guidance.
Pandemic influenza (also a human influenza virus)	D	5 days from onset of symptoms	See http://www.pandemicflu.gov for current pandemic influenza guidance.
Legionnaires' disease	S		Not transmitted from person to person
Leprosy	S		
Leptospirosis	S		Not transmitted from person to person
Lice			http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm
Head (pediculosis)	C	U 24hrs	
Body			Transmitted person to person through infested clothing. Wear gown and gloves when removing clothing; bag and wash clothes according to CDC guidance above
Pubic			Transmitted person to person through sexual contact
Listeriosis (<i>Listeria monocytogenes</i>)	S		Person-to-person transmission rare; cross-transmission in neonatal settings reported
Lymphocytic choriomeningitis	S		Not transmitted from person to person
Lymphogranuloma venereum	S		
Malaria	S		Not transmitted from person to person except through transfusion rarely and through a failure to follow Standard Precautions during patient care. Install screens in windows and doors in endemic areas. Use DEET-containing mosquito repellants and clothing to cover extremities

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Measles (rubeola)	A	4 days after onset of rash; DI in immune compromised	Susceptible HWs should not enter room if immune care providers are available; no recommendation for face protection for immune HW; no recommendation for type of face protection for susceptible HWs, i.e., mask or respirator . For exposed susceptibles, post-exposure vaccine within 72 hrs. or immune globulin within 6 days when available . Place exposed susceptible patients on Airborne Precautions and exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine
Meningitis			
Aseptic (nonbacterial or viral; also see enteroviral infections)	S		
Bacterial, gram-negative enteric, in neonates	S		
Fungal	S		
<i>Haemophilus influenzae</i> , type b known or suspected	D	U 24hrs	
<i>Listeria monocytogenes</i> (See Listeriosis)	S		
<i>Neisseria meningitidis</i> (meningococcal) known or suspected	D	U 24hrs	See meningococcal disease below
<i>Streptococcus pneumoniae</i>	S		
<i>M. tuberculosis</i>	S		Concurrent, active pulmonary disease or draining cutaneous lesions may necessitate addition of Contact and/or Airborne Precautions; For children, airborne precautions until active tuberculosis ruled out in visiting family members (see tuberculosis below)
Other diagnosed bacterial	S		
Meningococcal disease: sepsis, pneumonia, meningitis	D	U 24hrs	
<i>Molluscum contagiosum</i>	S		
Mucormycosis	S		
Multidrug-resistant organisms (MDROs), infection or colonization (e.g., MRSA, VRE, VISA/VRSA, ESBLs, resistant <i>S. pneumoniae</i>)	S/C		MDROs judged by the infection control program, based on local, state, regional, or national recommendations, to be of clinical and epidemiologic significance. Contact Precautions recommended in settings with evidence of ongoing transmission, acute care settings with increased risk for transmission or wounds that cannot be contained by dressings. See recommendations for management options in Management of Multidrug-Resistant Organisms In Healthcare Settings, 2006 .
Mumps (infectious parotitis)		U 9 Days	After onset of swelling; susceptible HWs should not provide care if immune caregivers are available. Note: (Recent assessment of outbreaks in healthy 18-24 year olds indicated salivary viral shedding occurred early in the course of illness and 5 days of isolation after onset of parotitis may be appropriate in community settings; however the implications for healthcare personnel and high-risk patient populations remain to be clarified

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Mycobacteria, non-tuberculosis (atypical)			Not transmitted person-to-person
Pulmonary	S		
Wound	S		
Mycoplasma pneumonia	D	DI	
Necrotising enterocolitis	S		Contact Precautions when cases clustered temporally
Nocardiosis, draining lesions, or other presentations	S		Not transmitted person-to-person
Parainfluenza virus infection, respiratory in infants and young children	C		Viral shedding may be prolonged in immunosuppressed patients . Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.
Pediculosis (lice)	C	U 24 hrs after treatment	
Pertussis (whooping cough)	D	U 5 days	Single patient room preferred. Cohorting an option. Post-exposure chemoprophylaxis for household contacts and HWs with prolonged exposure to respiratory secretions
Pinworm infection (Enterobiasis)	S		
Pinworm infection (Enterobiasis)	S		
Plague (<i>Yersinia pestis</i>)			
Bubonic	S		
Pneumonic	D	U 48 hrs	Antimicrobial prophylaxis for exposed HW
Pneumonia			
Adenovirus	D,C	DI	Outbreaks in pediatric and institutional settings reported . In immunocompromised hosts, extend duration of Droplet and Contact Precautions due to prolonged shedding of virus.
Bacterial not listed elsewhere (including gram-negative bacterial)	S		
<i>B. cepacia</i> in patients with CF, including respiratory tract colonization	C	Unknown	Avoid exposure to other persons with CF; private room preferred. Criteria for D/C precautions not established. See CF Foundation guideline
<i>B. cepacia</i> in patients without CF (see Multidrug-resistant organisms)			
<i>Chlamydia</i>	S		
Fungal	S		
<i>Haemophilus influenzae</i> , type b			
Adults	S		
Infants and children	D	U 24 hrs	
<i>Legionella spp.</i>	S		
Meningococcal	S	U 24 hrs	See meningococcal disease above
<i>Mycoplasma</i> (primary atypical pneumonia)	D	DI	

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Pneumococcal pneumonia	S		Use Droplet Precautions if evidence of transmission within a patient care unit or facility
<i>Pneumocystis jirovecii</i> (<i>Pneumocystis carinii</i>)	S		Avoid placement in the same room with an immunocompromised patient.
<i>Staphylococcus aureus</i>	S		For MRSA, see MDROs
<i>Streptococcus</i> , group A			
Adults	D	U 24 hrs	See streptococcal disease (group A streptococcus) below. Contact precautions if skin lesions present
Infants and young children	D	U 24 hrs	Contact Precautions if skin lesions present
Viral			
Adults	S		
Infants and young children (see respiratory infectious disease, acute, or specific viral agent)			
Poliomyelitis	C	DI	
Pressure ulcer (decubitus ulcer, pressure sore) infected			
Major	C	DI	If no dressing or containment of drainage; until drainage stops or can be contained by dressing
Minor or limited	S		If dressing covers and contains drainage
Rabies	S		Person to person transmission rare; transmission via corneal, tissue and organ transplants has been reported. If patient has bitten another individual or saliva has contaminated an open wound or mucous membrane, wash exposed area thoroughly and administer postexposure prophylaxis.
Respiratory infectious disease, acute (if not covered elsewhere)			
Adults	S		
Infants and young children	C	DI	
Respiratory syncytial virus infection, in infants, young children and immunocompromised adults	C	DI	Wear mask according to Standard Precautions CB. In immunocompromised patients, extend the duration of Contact Precautions due to prolonged shedding). Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.
Rhinovirus	D	DI	Droplet most important route of transmission . Outbreaks have occurred in NICUs and LTCF. Add Contact Precautions if copious moist secretions and close contact likely to occur (e.g., young infants)
Rickettsial fevers, tickborne (Rocky Mountain spotted fever, tickborne typhus fever)	S		Not transmitted from person to person except through transfusion, rarely
Ringworm (dermatophytosis, dermatomycosis, tinea)	C		Rarely, outbreaks have occurred in healthcare settings, (e.g., NICU, rehabilitation hospital Use Contact Precautions for outbreak.

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Ritter's disease (staphylococcal scalded skin syndrome)	C	DI	See staphylococcal disease, scalded skin syndrome below
Roseola infantum (exanthema subitum; caused by HHV-6)	S		
Rubella (German measles) (also see congenital rubella)	D	U 7 days after onset of rash	Susceptible HCWs should not enter room if immune caregivers are available. No recommendation for wearing face protection (e.g., a surgical mask) if immune. Pregnant women who are not immune should not care for these patients. Administer vaccine within three days of exposure to non-pregnant susceptible individuals. Place exposed susceptible patients on Droplet Precautions; exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine.
Scabies	C	U24hrs	
Schistosomiasis (bilharziasis)	S		
Severe acute respiratory syndrome (SARS)	A, D,C	DI plus 10 days after resolution of fever, provided respiratory symptoms are absent or improving	Airborne Precautions preferred; D if AIIR unavailable. N95 or higher respiratory protection; surgical mask if N95 unavailable; eye protection (goggles, face shield); aerosol-generating procedures and “supershedders” highest risk for transmission via small droplet nuclei and large droplets. Vigilant environmental disinfection (see www.cdc.gov/ncidod/sars)
Sporotrichosis			
Skin, wound, or burn			
Major	C	DI	No dressing or dressing does not contain drainage adequately
Minor or limited	S		Dressing covers and contains drainage adequately
Enterocolitis	S		Use Contact Precautions for diapered or incontinent children for duration of illness
Multidrug-resistant (see multidrug-resistant organisms)			
Pneumonia	S		
Scalded skin syndrome	C	DI	Consider healthcare personnel as potential source of nursery, NICU outbreak
Toxic shock syndrome	S		
Streptococcal disease (group A streptococcus)			
Skin, wound, or burn			
Major	C,D		No dressing or dressing does not contain drainage adequately
Minor or limited	S		Dressing covers and contains drainage adequately

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Endometritis (puerperal sepsis)	S		Pharyngitis in infants and young children
Pharyngitis in infants and young children	D	U 24hrs	
Pneumonia	D	U 24hrs	
Scarlet fever in infants and young children	D	U 24hrs	
Serious invasive disease	D	U 24hrs	Outbreaks of serious invasive disease have occurred secondary to transmission among patients and healthcare personnel Contact Precautions for draining wound as above; follow rec. for antimicrobial prophylaxis in selected conditions
Streptococcal disease (group B streptococcus), neonatal	S		
Strongyloidiasis	S		
Syphilis			
Latent (tertiary) and seropositivity without lesions	S		
Skin and mucous membrane, including congenital, primary, Secondary	S		
Tapeworm disease			
<i>Hymenolepis nana</i>	S		Not transmitted from person to person
<i>Taeniasolium</i> (pork)	S		
Other	S		
Tetanus	S		Not transmitted from person to person
Tinea (e.g., dermatophytosis, dermatomycosis, ringworm)	S		Rare episodes of person-to-person transmission
Toxoplasmosis	S		Transmission from person to person is rare; vertical transmission from mother to child, transmission through organs and blood transfusion
Toxic shock syndrome (staphylococcal disease, streptococcal disease)	S		Droplet Precautions for the fir 24 hours after implementation of antibiotic therapy if Group A streptococcus is a likely etiology
Trachoma, acute	S		
Trench mouth (Vincent's angina)	S		
Trichinosis	S		
Trichomoniasis	S		
Trichuriasis (whipworm disease)	S		
Tuberculosis(<i>M. tuberculosis</i>)			
Extrapulmonary, draining lesion)	A,C		Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are three consecutive negative cultures of continued drainage. Examine for evidence of active pulmonary tuberculosis
Extrapulmonary, no draining lesion, meningitis	S		Examine for evidence of pulmonary tuberculosis. For infants and children, use Airborne Precautions until active pulmonary tuberculosis in visiting family members ruled out

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Pulmonary or laryngeal disease, confirmed	A		Discontinue precautions only when patient on effective therapy is improving clinically and has three consecutive sputum smears negative for acid-fast bacilli collected on separate days (MMWR 2005; 54: RR-17 http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e)
Pulmonary or laryngeal disease, suspected	A		Discontinue precautions only when the likelihood of infectious TB disease is deemed negligible, and either 1) there is another diagnosis that explains the clinical syndrome or 2) the results of three sputum smears for AFB are negative. Each of the three sputum specimens should be collected 8-24 hours apart, and at least one should be an early morning specimen
Skin-test positive with no evidence of current active disease	S		
Tularemia			
Draining lesion	S		Not transmitted from person to person
Pulmonary	S		Not transmitted from person to person
Typhoid (<i>Salmonella typhi</i>) fever (see gastroenteritis)			
Typhus			
<i>Rickettsia prowazekii</i> (Epidemic or Louse-borne typhus)	S		Transmitted from person to person through close personal or clothing contact
<i>Rickettsia typhi</i>	S		Not transmitted from person to person
Urinary tract infection (including pyelonephritis), with or without urinary catheter	S		
Secondary bacterial infection (e.g., <i>S. aureus</i> , group A beta hemolytic streptococcus)	S/C		Follow organism-specific (strep, staph most frequent) recommendations and consider magnitude of drainage
Varicella Zoster (See Herpes Zoster)			
<i>Vibrio parahaemolyticus</i> (see gastroenteritis)			
Vincent's angina (trench mouth)	S		
Viral hemorrhagic fevers due to Lassa, Ebola, Marburg, Crimean-Congo fever viruses	S, D, C	DI	Single-patient room preferred. Emphasize: 1) use of sharps safety devices and safe work practices, 2) hand hygiene; 3) barrier protection against blood and body fluids upon entry into room (single gloves and fluid-resistant or impermeable gown, face/eye protection with masks, goggles or face shields); and 4) appropriate waste handling. Use N95 or higher respirators when performing aerosol-generating procedures. Largest viral load in final stages of illness when hemorrhage may occur; additional PPE, including double gloves, leg and shoe coverings may be used, especially in resource-limited settings where options for cleaning and laundry are limited. Notify public health officials immediately if Ebola is suspected

Table 7: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS¹

Infection/Condition	Precautions		
	Type ²	Duration ³	Comments
Viral respiratory diseases (not covered elsewhere)			
Adults	S		
Infants and young children (see respiratory infectious disease, acute)			
Whooping cough (see pertussis)			
Wound infections			
Major	C	DI	No dressing or dressing does not contain drainage adequately
Minor or limited	S		Dressing covers and contains drainage adequately
<i>Yersinia enterocolitica</i> gastroenteritis (see gastroenteritis)			
Zoster (varicella-zoster) (see herpes zoster)			
Zygomycosis (phycomycosis, mucormycosis)	S		Not transmitted person-to-person

¹ Source: Extracts from Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings <http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf>

Type of Precautions: A, Airborne Precautions; C, Contact; D, Droplet; S, Standard; when A, C, and D are specified, also use S. ³Duration of precautions: CN, until off antimicrobial treatment and culture-negative; DI, duration of illness (with wound lesions, DI means until wounds stop draining); DE, until environment completely decontaminated; U, until time specified in hours (hrs) after initiation of effective therapy; Unknown: criteria for establishing eradication of pathogen has not been determined

Annex 8: Methods of Disinfection and Sterilisation

Process	Level of Microbial/ Inactivation	Method	Examples (with processing times)	Healthcare Application (examples)
Sterilisation	Destroys all microorganisms, including bacterial spores	High temperature	Steam (~40 min), dry heat (1—6 hr depending on temperature)	Heat-tolerant critical (surgical instruments) and semicritical patient-care items
		Low temperature	Ethylene oxide gas (~15 hr), hydrogen peroxide gas plasma (~50 min)	Heat-sensitive critical and semicritical patient-care items
		Liquid immersion	Chemical sterilants ^b : >2% glut (~10 hr); 1.12% glut and 1.93% phenol (12 hr); 7.35% HP and 0.23% PA (3 hr); 7.5% HP (6 hr); 1.0% HP and 0.08% PA (8 hr); ≥0.2% PA (~50 min)	Heat-sensitive critical and semicritical patient-care items that can be immersed
High-level disinfection (HLD)	Destroys all microorganisms except high numbers of bacterial spores	Heat-automated	Pasteurization (~50 min)	Heat-sensitive semicritical items respiratory therapy equipment)
		Liquid immersion	Chemical Sterilants/HLDs ^b : >2% glut (20–45 min); 0.55% OPA (12 min); 1.12% glut and 1.93% phenol (20 min); 7.35% HP and 0.23% PA (15 min); 7.5% HP (30 min); 1.0% HP and 0.08% PA (25 min); 650–675 ppm chlorine (10 min)	Heat-sensitive semicritical items (GI endoscopes, bronchoscopes)
Intermediate-level disinfection	Destroys vegetative bacteria, mycobacteria, most viruses, most fungi, not bacterial spores	Liquid contact	Hospital disinfectant with label claim regarding tuberculocidal activity (e.g., chlorine-based products, phenolics-exposure times at least 60 sec)	Noncritical patient care item (blood pressure cuff) or surface with visible blood
Low-level disinfection	Destroys vegetative bacteria, some fungi and viruses, but not mycobacteria or spores	Liquid contact	Hospital disinfectant with no tuberculocidal claim (e.g., chlorine based products, phenolics, quaternary ammonium compounds-exposure times at least 60 sec) or 70–90% alcohol.	Noncritical patient care item (blood pressure cuff) or surface (bedside table) with no visible blood

Table 8: Methods for Disinfection and Sterilisation of Patient-Care items and Environmental Surfaces

Abbreviations: glut-glutaraldehyde; HP-hydrogen peroxide; PA- peracetic acid; OPA orthophthalaldehyde; ppm-parts per million; GI-gastrointestina

^b Consult the package insert for information about the cleared contact time and temperature, and see text for discussion why one product is used at a reduced exposure time (2% glutaraldehyde at 20 min, 20°C). Increasing the temperature using an automated endoscope reprocess (AER) will reduce the contact time (e.g., OPA 12 min at 20°C but 5 min at 25°C in AER). Tubing must be completely filled for high-level disinfection and liquid chemical sterilization. Material compatibility should be investigated when appropriate (e.g., HP and HP with PA will cause functional damage to endoscopes).

Table 9: Summary of Advantages and Disadvantages of Chemical Agents Used as Sterilants or as High-level disinfectants

Sterilisation Method	Advantages	Disadvantages
Glutaraldehyde	<ul style="list-style-type: none"> • Numerous use studies published • Relatively inexpensive • Excellent material compatibility 	<ul style="list-style-type: none"> • Respiratory irritation from glutaraldehyde vapor • Pungent and irritating odor • Relatively slow mycobactericidal activity • Coagulates blood and fixes tissue to surfaces • Allergic contact dermatitis • Glutaraldehyde vapour monitoring recommended
Hydrogen Peroxide	<ul style="list-style-type: none"> • No activation required • May enhance removal of organic matter and organisms • No disposal issues • No odor or irritation issues • Does not coagulate blood or fix tissues to surfaces • Inactivates <i>Cryptosporidium</i> • Use studies published 	<ul style="list-style-type: none"> • Material compatibility concerns (brass, zinc, copper, and nickel/ silver plating) both cosmetic and functional • Serious eye damage with contact
Orthophthalaldehyde	<ul style="list-style-type: none"> • Fast-acting high-level disinfectant • No activation required • Odor not significant • Excellent materials compatibility claimed • Does not coagulate blood or fix tissues to surfaces claimed 	<ul style="list-style-type: none"> • Stains skin, mucous membranes, clothing, and environmental surfaces • Repeated exposure may result in hypersensitivity in some patients with bladder cancer • More expensive than glutaraldehyde • Eye irritation with contact • Slow sporicidal activity
Peracetic Acid	<ul style="list-style-type: none"> • Rapid sterilization cycle time (30–45 minutes) • Low-temperature (50°–55°C) liquid immersion sterilization • Environmental friendly by-products (acetic acid, O₂, H₂O) • Fully automated • Single-use system eliminates need for concentration testing • Standardized cycle • May enhance removal of organic material and endotoxin • No adverse health effects to operators under normal operating conditions • Compatible with many materials and instruments • Does not coagulate blood or fix tissues to surfaces • Sterilant flows through scope facilitating salt, protein, and microbe removal • Rapidly sporicidal • Provides procedure standardization (constant dilution, perfusion of channel, temperatures, exposure) 	<ul style="list-style-type: none"> • Potential material incompatibility (e.g., aluminum anodized coating becomes dull) • Used for immersible instruments only • Biological indicator may not be suitable for routine monitoring • One scope or a small number of instruments can be processed in a cycle • More expensive (endoscope repairs, operating costs, purchase costs) than high-level disinfection • Serious eye and skin damage (concentrated solution) with contact • Point-of-use system, no sterile storage

Table 9: Summary of Advantages and Disadvantages of Chemical Agents Used as Sterilants or as High-Level disinfectants

Sterilisation Method	Advantages	Disadvantages
Peracetic Acid/Hydrogen Peroxide	<ul style="list-style-type: none"> • No activation required • Odor or irritation not significant 	<ul style="list-style-type: none"> • Material compatibility concerns (lead, brass, copper, zinc) both cosmetic and functional • Limited clinical experience • Potential for eye and skin damage

Adapted from Rutala WA, Weber DJ. Guideline for Disinfection and Sterilization in Healthcare Facilities; CDC 2008

^a All products effective in presence of organic soil, are relatively easy to use, and have a broad spectrum of antimicrobial activity (bacteria, fungi, viruses, bacterial spores, and mycobacteria). The above characteristics are documented in the literature; contact the manufacturer of the instrument and sterilant for additional information. All products listed in the table are chemical sterilants except OPA, which is a high-level disinfectant.

Several methods are used to sterilise patient-care items in healthcare, including steam sterilisation, ethylene oxide, hydrogen peroxide gas plasma, and a peracetic acid immersion system. The advantages and disadvantages of these systems are listed in Table 10.

Table 10: Summary of Advantages and Disadvantages of Commonly Used Sterilisation Technologies

Sterilisation Method	Advantages	Disadvantages
Steam	<ul style="list-style-type: none"> • Nontoxic to patient, staff, environment • Cycle easy to control and monitor • Rapidly microbicidal • Least affected by organic/inorganic soils among sterilization processes listed • Rapid cycle time • Penetrates medical packaging, device lumens 	<ul style="list-style-type: none"> • Deleterious for heat-sensitive instruments • Microsurgical instruments damaged by repeated exposure • May leave instruments wet, causing them to rust • Potential for burns
Hydrogen Peroxide Gas Plasma	<ul style="list-style-type: none"> • Safe for the environment • Leaves no toxic residuals • Cycle time is 28–73 minutes and no aeration necessary • Used for heat- and moisture-sensitive items because process temperature <50°C • Simple to operate, install (208 V outlet), and monitor • Compatible with most medical devices • Only requires electrical outlet 	<ul style="list-style-type: none"> • Cellulose (paper), linens, and liquids cannot be processed • Sterilization chamber size from 1.8–9.4 ft³ total volume (varies with model type) • Some endoscopes or medical devices with long or narrow lumens cannot be processed at this time in the US. (See manufacturer’s recommendations for internal diameter and length restrictions.) • Requires synthetic packaging (polypropylene wraps, polyolefin pouches) and special container tray • Hydrogen peroxide may be toxic at levels greater than 1 ppm TWA
100% Ethylene Oxide (ETO)	<ul style="list-style-type: none"> • Penetrates packaging materials, device lumens • Single-dose cartridge and negative-pressure chamber minimizes the potential for gas leak and ETO exposure • Simple to operate and monitor • Compatible with most medical materials 	<ul style="list-style-type: none"> • Requires aeration time to remove ETO residue • Sterilization chamber from 4.0–7.9 ft³ total volume (varies with model type) • ETO is toxic, a carcinogen, and flammable • ETO emission regulated by states but catalytic cell removes 99.9% of ETO and converts it to CO₂ and H₂O • ETO cartridges should be stored in flammable liquid storage cabinet • Lengthy cycle/aeration time
Peracetic Acid	<ul style="list-style-type: none"> • Rapid cycle time (30–45 minutes) • Low temperature (50°–55°C) liquid immersion sterilization • Environmental friendly by-products • Sterilant flows through endoscope which facilitates salt, protein, and microbe removal 	<ul style="list-style-type: none"> • Point-of-use system, no sterile storage • Biological indicator may not be suitable for routine monitoring • Used for immersible instruments only • Some material incompatibility (e.g., aluminum anodized coating becomes dull) • One scope or a small number of instruments processed in a cycle • Potential for serious eye and skin damage (concentrated solution) with contact

Methods of sterilisation

The following selection criteria should also be used when considering the most appropriate method of sterilisation and disinfection:

- Effect of the method on the equipment
- Effectiveness in reducing microbial activity to the level required
- Safety for the health worker during use
- Cost – effectiveness
- Ease of use
- Should leave no toxic residue on the equipment
- In the case of disinfectants the method of disposal should be safe for the community and the environment

Methods

- Steam Sterilisation (autoclaving)
- Dry heat (oven)
- ETO(Ethylene oxide) gas sterilization
- Hydrogen Peroxide Gas Plasma
- Chemicals (cold sterilization)

Steam under pressure (autoclaving/steam) is the most effective method of sterilisation and reliable, dependable, non-toxic It is also cheaper than chemical methods. It should be considered first for all medical equipment that can withstand heat. Careful monitoring is essential including:

- Regular (monthly) biological checks using spore strips to ensure the autoclaves are still working well.
- Chemical indicators i.e. Bowie Dick test and other external chemical indicators are critical to check the performance of the autoclaves
- Regular maintenance is essential to check the pressure and temperature gauges are accurate
- Checks on the physical conditions e.g. time, pressure and temperature during the sterilization process. To be done daily.

Recommended conditions for sterilisation of health care supplies in Steam under pressure

Example:

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

The temperatures used vary with the equipment so follow the Manufacturer's Operational Manual

The units of pressure marked on an autoclave's pressure gauge may vary from one autoclave to another.

Dry Heat

Only for instruments/items that may be damaged by steam but not affected by high temperatures. Non-toxic, does not harm the environment, easy to install, non-corrosive but time consuming. It is normally used in the sterilisation of powders and laboratory glassware.

Time/Temperature :

1 hour at 180 degrees C

2 hours at 160 degrees C

2½ hours at 150 degrees C

3 hours at 140 degrees C

Factors affecting the efficacy of disinfection

1. The number and location of micro-organisms

- The number of micro-organisms present will lengthen the time for effective disinfection to take place. In general the higher bio-burden requires more time for disinfection.
- Instruments with joints, multiple pieces, crevices are more difficult to clean and disinfect than flat surface equipment

2. Innate resistance of micro-organisms

- Some micro-organisms are more resistant to disinfection than others. The generally accepted order from the most resistant to the least resistant is: bacterial spores, mycobacteria, hydrophilic viruses, fungi, vegetative bacteria, lipid viruses.
- Certain organisms, which flourish in a health care facility environment (such as *Pseudomonas aeruginosa* and other antibiotic-resistant micro-organisms), have an inherent resistance to certain disinfectants, while other organisms may develop resistance as a result of environmental selection.

3. Concentration and potency of disinfectant used

- The more concentrated the disinfectant the greater its efficacy and the shorter the time necessary to achieve microbial kill. The danger is in increasing the risk of toxicity
- The disinfection time depends on the potency of the disinfectant
- Many disinfectants are broad spectrum; that is, effective against all or most forms of microbial life.
- Some broad spectrum disinfectants include orthophthalaldehyde, sodium hypochlorite (bleach), and hydrogen peroxide.
- Limited spectrum disinfectants include phenolics and quaternary ammonium compounds.

4. Physical and chemical factors

- Temperature , pH, relative humidity, and water hardness affect disinfection procedures
- The activity of most disinfectants increases as the temperature increases.
- Too high a temperature may reduce the germicidal activity.
- An increase in pH increases the antimicrobial activity of some disinfectants but decreases the activity of phenols and hypochlorites and iodine.

- Relative humidity is the single most important factor influencing the activity of Ethylene oxide
- Water hardness reduces the rate of kill of certain disinfectants.

5. **Presence of organic and inorganic matter**

- Organic matter in the form of serum, blood, pus, or faecal or lubricant material can interfere with the antimicrobial activity of disinfectants in at least two ways. i.e. chemical reaction or occlusion from salts.
- The presence of organic soil affects or compromises disinfection.
- This further emphasizes the importance of meticulous cleaning of medical devices before sterilization / disinfection procedure.

6. **Duration of exposure**

- Follow the manufacturer's instructions on the label
- Duration of exposure influences the disinfection process.
- All lumens and channels of endoscopic instruments must be in contact with the disinfectant.
- In general longer contact times are more effective than shorter contact times
- There is a correlation between exposure time and temperature for some disinfectants

7. **Presence of biofilms**

- These are microbial communities that are tightly attached to surfaces and cannot be easily removed or disinfected.

Table 11: Processing of Instruments and Equipment

Equipment /Items	Agent(s) and Preferred Methods	Recommendations
Airways and endotracheal tubes	<ul style="list-style-type: none"> • Single use, disposal or heat sterilized in CSSD 	<p>Single use preferred If reusable reprocess according to manufacturer's instructions</p>
Anesthetic equipment Ventilator tubing Oxygen Masks Endotracheal tubes	<p>Where possible:</p> <p>Steam sterilize or use ethylene oxide Check manufacturer's instructions for each instrument</p> <p>Chemical disinfection between patients:</p> <p>Sodium hypochlorite (0.5%)</p> <p>After use with TB patients and at end of the day use orthophthalaldehyde (OPA)</p>	<p>General Procedure:</p> <p>After each patient wash thoroughly with liquid detergent Rinse with water Disinfect Rinse thoroughly with sterile water Dry</p> <p>Disinfection Procedure:</p> <p>Glutaraldehyde soak 4-5 minutes Soak in hypochlorite solution for 10 minutes</p> <p>After TB patients:</p> <p>Soak in OPA for 5 minutes</p>
Nebulisers	<p>Container and mask: Clean and dry after each use (wipe with paper. Store dry and cover to protect from dust</p>	<p>Disinfect as described for oxygen mask</p>
Babies Feeding: Cup and Spoon	<p>Wash thoroughly with brush, detergent and water Rinse and immerse in fresh 0.5% hypochlorite for 30 minutes Rinse</p>	<p>Steam sterilization is preferred</p>
Oxygen Masks	<p>Sodium hypochlorite 0.5%</p> <p>Do not heat sterilize but</p> <p>Ethylene oxide can be used if available</p>	<p>Wash in warm soapy water Soak in sodium hypochlorite for 20 minutes</p> <p>Rinse in sterile water and dry</p>
Infant incubators	<p>Read manufacturer's instruction for cleaning/disinfection procedures.</p> <p>Routine cleaning with soap and water and dry</p> <p>Wipe with 70% alcohol or 0.5% hypochlorite</p>	<p>Do not use alcohol on Perspex parts as it will discolour</p> <p>For infected patients:</p> <p>Follow routine cleaning wipe with alcohol or hypochlorite. Rinse with clean water and dry</p>
Humidifiers	<p>Heat disinfect in CSSD OR Wash with hot water and detergent, rinse and store dry.</p>	<p>When re-using fill with sterile water and connect in-line. Water must be changed every 24 hours or sooner if necessary.</p>
Laryngoscope blades	<p>OPA</p>	<ul style="list-style-type: none"> • Wash in warm soapy water. • Rinse and dry. • Soak in OPA for 5 minutes. • Rinse in sterile water

Table 11: Processing of Instruments and Equipment (Contd.)

Equipment /Items	Agent(s) and Preferred Methods	Recommendations
Oroscope pieces	OPA	<ul style="list-style-type: none"> • Wash in warm soapy water. • Rinse and dry. • Soak in OPA for 5 minutes. • Rinse in sterile water
Instruments: <ul style="list-style-type: none"> • General • Surgical • Dental Ophthalmic	<ul style="list-style-type: none"> • Steam sterilization. OR • Chemical disinfection with OPA or 2% glutaraldehyde solution only for those instruments that cannot be heat sterilized. • Return to CSSD in a closed container. • OPA or 2% glutaraldehyde. Check manufacturer’s instructions <ul style="list-style-type: none"> • In some cases, use ethylene oxide if available. • Alcohol can be used as an alternative 	<ul style="list-style-type: none"> • Decontaminate, brush with detergent solution, rinse. • Then soak in OPA for 5 minutes or 2% glutaraldehyde for 20 minutes. • Rinse in sterile water and dry. • Contaminated instruments to be cleaned by trained staff in CSSD.
Oxygen tent	<ul style="list-style-type: none"> • Wash with hot water and detergent, rinse well, and dry thoroughly. 	<ul style="list-style-type: none"> • Store covered with clean plastic sheeting in a clean area.
Razors <ul style="list-style-type: none"> • Safety • Open • Electric 	<ul style="list-style-type: none"> • Ideally individual shaving equipment is disposable. 	<ul style="list-style-type: none"> • Discard disposables after each use in a sharps container.
Renal dialysis machines	Detergent Disinfectants as recommended by the manufacturer Machine disinfection: Follow manufacturer’s instructions	Machine exterior: spray exterior with disinfectant/detergent, leave for 5 minutes for optimum disinfection before drying Blood spillage – apply to surface by wet or damp wiping ensuring good coverage leave for 5 minutes for optimum disinfection before drying
Suction bottles	<ul style="list-style-type: none"> • Detergent and water. Pre-disinfect to render safe: <ul style="list-style-type: none"> • NaDCC powder OR • Sodium hypochlorite 0.25% (2500 ppm) 	Regardless of patient’s status of infection: <ul style="list-style-type: none"> • Empty suction bottle, wash With soapy water. Rinse with water • Add disinfectant powder (NaDCC) OR 0.25% sodium hypochlorite solution into bottle, leave for 20 minutes, • Rinse with clean water and dry.
Thermometers: Armpit	<ul style="list-style-type: none"> • Methylated spirit • According to manufacturer’s Instructions 	<ul style="list-style-type: none"> • Each ward should have enough thermometers available to serve individual patient. Before and after use: <ul style="list-style-type: none"> • Wipe with cotton wool soaked in methylated spirit. • Store thermometers dry.

Preparation of disinfectants

Hypochlorite/Bleach

RECOMMENDATIONS FROM CENTERS FOR DISEASE CONTROL (CDC)*

Sodium hypochlorite solution (household bleach) should be prepared daily.

Source: * Use of Bleach in Prevention of Transmission of HIV in Health Care Settings.

<http://www.cdc.gov/od/ohs/biosfty/bleachiv.htm>

Concentrations that can be used range from approximately:

500 ppm (0.05%) available chlorine to 5,000 ppm (0.5%) of household bleach are effective depending on the amount of organic material, (e.g. blood, mucus) present on the surface to be cleaned.

Preparing the correct concentration:

Calculations for dilution of Sodium Hypochlorite are not easily understood and are explained as follows:

Use Formula: $C_1V_1 = C_2V_2$

C1 and C2 are the concentrations of hypochlorite expressed in percentage

C1 is the concentration of the solution to be made

C2 is the concentration of the concentrated solution available

V1 and V2 are volumes

V1 is the required volume

V2 is the volume of concentrated solution

Example 1:

How much of 5% sodium hypochlorite is required to make 5 litres of 1% sodium hypochlorite

- $0.01 \times 5\,000\text{ml} = 0.05 \times V_2$
- $V_2 = \frac{0.01 \times 5\,000\text{ml}}{0.05}$
- $V_2 = 1\,000\text{ ml}$

Source: Remington's Pharmaceutical Science. 16th Edition

Example 2:

Product	How to make 5L of 0.5%	How to make 5l of 1%	How to make 5l of 2%
5% Sodium hypochlorite	0.5l (500ml) add water up to 5 l	1 l (1 000ml) add water up to 5 l	2 l (2 000ml) add water up to 5 l

Example 3:

Product	Chlorine available	How to make 0.1%	How to make 0.5%	How to make 1%	How to make 2%
Sodium hypochlorite liquid (bleach)	3.5%	1 part bleach to 25 parts water	1 part bleach to 6 parts water	1 part bleach to 2.5 parts water	4 parts bleach to 3 parts water
Sodium hypochlorite liquid (bleach)	5%	1 part bleach to 49 parts water	1 part bleach to 9 parts water	1 part bleach to 4 parts water	1 part bleach to 1.5 parts water

Useful concentrations used for specific risk areas:-

200 ppm available chlorine (0.02%) for general disinfection.
 1,000 ppm available chlorine (0.1%)for hospital use.
 5,000 ppm available chlorine (0.5%) for HIV and HBV.
 10,000 ppm available chlorine (1%) for body fluid spillages
 20,000ppm available chlorine (2%) for cholera

Note:

Use recommended strengths and ensure supplied concentrated sodium hypochloride is at the stated concentration as it can deteriorate during long term storage.

Handle concentrated solutions with care because of toxicity

Antiseptics

Antiseptics are designed to be used for reducing or destroying micro-organisms on the skin or mucous membranes without damaging these tissues.

Uses of Antiseptics

Antiseptics are used for:

- Skin, cervical, or vaginal preparation before a clinical procedure
- Surgical scrub
- Hand washing in high-risk situations, such as before an invasive procedure or contact with a patient at high-risk of infection, (e.g. a newborn or immune-suppressed patient) (see Table 9).
- Also used in waterless hand rinses / rubs

Antiseptics are not meant to be used on inanimate objects, such as instruments and surfaces. They usually do not have the same killing power as chemicals used for disinfection of inanimate objects.

Table 12: Common Antiseptics and Their Use in Patient Preparation

Antiseptic	Usage	Advantages	Disadvantages	Comments
<p>Iodophors (e.g. betadine)</p> <p>Povidine-iodine solution</p> <p>Strengths: 10%, 7.5%, 2%, 0.5%</p>	<ul style="list-style-type: none"> • Surgical scrub • Patient preparation • Use in genital area, vagina, cervix 	<ul style="list-style-type: none"> • Less irritating to the skin than iodine • Can be used on mucous membranes 	<ul style="list-style-type: none"> • Effectiveness is moderately reduced by blood or other organic material • Effective 1-2 minutes after application 	<ul style="list-style-type: none"> • Effective against a broad range of microorganisms
<p>Chlorhexidine gluconate 2% or 4% scrub (e.g. Hibitane, Hibiscrub, Hibiclens) or 0.5% tincture</p>	<ul style="list-style-type: none"> • Surgical scrub and skin preparation 	<ul style="list-style-type: none"> • Good persistent effect. Remains effective for at least 6 hours after application • Effectiveness not reduced by blood or other organic material 	<p>May cause irritation</p>	<ul style="list-style-type: none"> • Effective against a broad range of microorganisms but has a minimal effect against mycobacteria and fungi • May irritate the genital area, vagina and cervix
<p>Iodine 1% Tincture of Iodine 2%</p> <p>Alcohol 70%- 90% (isopropyl)</p>	<ul style="list-style-type: none"> • Used for skin preparation, but must be allowed to dry and then removed from the skin with alcohol • Cannot be used on dirty skin • Wash area before applying 	<ul style="list-style-type: none"> • Fast acting • Rapid kill • Effectiveness moderately reduced by blood or other organic material 	<ul style="list-style-type: none"> • Can cause skin irritation • Drying effect on Skin • Cannot be used on mucous membranes 	<ul style="list-style-type: none"> • Effective against a broad range of microorganisms • Effective against a broad range of microorganisms • Alcohols should be stored in areas approved for flammable materials
<p>Triclosan</p> <p>Strengths: 0.3% - 2%</p>	<p>Skin preparation</p>	<p>Excellent Persistent activity on skin. Activity minimally affected by organic matter</p>	<p>Poor fungicide</p>	<ul style="list-style-type: none"> • Good activity against Gram-positive and Gram-negative organisms • Its speed is intermediate

Annex 9: Environmental Cleaning and Laundry

Routine cleaning

- Health care facilities should determine a schedule for cleaning and maintaining ducts, fans, and air conditioning systems.
- Routine cleaning of environmental surfaces and non-critical patient care items should be performed according to a predetermined schedule and should be sufficient to keep surfaces clean and dust free. Surfaces that are frequently touched by the hands of health workers and patients, such as call bells, surfaces of medical equipment and knobs for adjustment or opening, require daily cleaning.
- The frequency of cleaning and disinfection of the health facility environment varies according to the:
 - Type of surface to be cleaned
 - The number of people in the area
 - Amount of activity in the area
 - The risk to patients
 - Amount of soiling.
- Damp rather than dry dusting or sweeping should be performed.
- Vacuum cleaners should be used on carpeted areas. Expelled air from vacuum cleaners should be diffused so that it does not aerosolize dust from unclean surfaces.
- A routine should be established to prevent re-distribution of micro-organisms during wet cleaning. This should be accomplished by cleaning less heavily contaminated areas first and changing cleaning solutions and cloths/mops.
- Wet mopping is most commonly done with a double bucket technique, which extends the life of the solution because fewer changes are required. When a single bucket is used, the solution should be changed more frequently throughout the day because of increased bioburden.
- Tools used for cleaning and disinfecting should be cleaned, disinfected and dried between uses.
- Cleaning agents: a detergent is acceptable for surface cleaning of most areas. 0.5 or 1 percent of a chlorine-based disinfectant, is preferable for cleaning in nurseries, pediatric settings, critical care unit, burns unit, emergency rooms, operating theatres, bone marrow transplantation facilities, and surfaces of dialysis machines.
- Disinfecting agents should be mixed and used according to manufacturers' recommendations.
- Household utility gloves should be worn during cleaning and disinfecting procedures.
- Disinfectant fogging is not recommended
- Pest control should be carried out in accordance with the health department/health facility policies and guidelines.
- An Infection prevention and control educational programme for housekeeping staff to assist them in understanding the effective methods of cleaning and the importance of their work should be implemented.

Special cleaning

Special organisms of epidemiological significance

Except during outbreaks, no special environmental cleaning techniques are advocated for organisms such as *Clostridium difficile*, methicillin-resistant *Staphylococcus aureus* or diarrheal diseases. During an outbreak, thorough environmental cleaning and disinfection with a disinfectant that has demonstrated effectiveness against the specific organism is required.

Blood spills and body fluids

- Appropriate personal protective equipment should be worn for cleaning up a blood spill. Heavy duty gloves should be worn during the cleaning and disinfecting procedures.
- The health worker should wear a face shield and plastic apron, if the possibility of splashing exists.
- Overalls or aprons, as well as boots or protective shoe covers should be worn for large blood spills.
- Personal protective equipment should be changed if torn or soiled, and always removed before leaving the location of the spill, and then hands are washed.
- The blood spill area should be decontaminated and cleaned of obvious organic material before applying a disinfectant. Blood and other material substantially inactivate sodium hypochlorite and other disinfectants. However newer disinfectants that can be poured directly onto a blood spill should be used if available.
- 0.5% (5000 ppm) sodium hypochlorite is recommended for disinfecting small spills.
- For Large spills remove the waste with disposal paper towel/disposable cleaning cloth. Discard in a plastic lined waste bin.
- Disinfect using 1.0% (10,000 ppm) sodium hypochlorite.
- After cleaning, the area should be disinfected for 10 minutes with an intermediate-level chemical disinfectant such as sodium hypochlorite
- Concentrations ranging from approximately 0.5% household bleach (500 ppm available chlorine) are effective, depending on the amount of organic material, (e.g. blood or mucus) present on the surface to be cleaned and disinfected, as well as the nature of the surface.
- For carpet or upholstered surfaces a low level disinfectant may be used.
- Disposable items should be discarded immediately after use in a plastic lined waste receptacle.
- Care should be taken to avoid splashing or generating aerosols during the clean up.
- Hands should be thoroughly washed and dried after gloves are removed.
- For blood spills in clinical, public health or research laboratories, refer to the Section on Safe Practices in the Laboratory.

Surgical settings, ambulatory surgical units

- Surgical settings include operating theatres, doctors' procedure rooms contaminated by organic debris should be cleaned as spills or splashes occur.
- Surgical lights and horizontal surfaces, equipment, furniture and patient transport vehicles should be cleaned between patients with a clean cloth and an intermediate disinfectant.
- Floors should be cleaned with an intermediate disinfectant/detergent, preferably using a wet vacuum system between patients 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 toweling or cloths, using an appropriate cleaning agent and water as necessary, (e.g. after each procedure, end of the day, etc.), the surfaces are then disinfected with a disinfectant such as sodium hypochlorite. 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) 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.

Terminal cleaning

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

- Terminal cleaning should primarily 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.
- Housekeeping personnel should use the same precautions to protect themselves during terminal cleaning that they would use for routine cleaning. Masks are not needed unless the room was occupied by a patient for whom there were airborne precautions and insufficient time has elapsed to allow clearing of the air of potential airborne organisms.
- All disposable items should be discarded immediately in the appropriate receptacle.
- Reusable items that have been in direct contact with the patient or with the patient's excretions, secretions, blood, or body fluids should be reprocessed as appropriate to the item.
- Bedside tables, bed rails, commodes, mattress covers, and all horizontal surfaces in the room should be cleaned (see Table 11).
- Routine washing of walls, blinds, and curtains is not indicated. These should be cleaned if visibly soiled (see Table 11).
- Cubicle curtains should be changed frequently (Quarterly and/or when need arises).

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

- Special terminal cleaning procedures may be indicated for certain organisms, e.g. *Clostridium difficile* or diarrheal 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 door knobs, call bell pulls, taps, and wall surfaces, which have been frequently touched by the patient.
- Local public health authorities should be consulted about cleaning the room of a patient who has Lassa fever, Ebola, Marburg or other Viral Hemorrhagic Fevers and other emerging infectious diseases.

Terminal disinfection

- **Walls:** clean with 0.5% sodium hypochlorite solution.
- **Beds, lockers and tables:** clean with 0.5% sodium hypochlorite solution.
- **Utensils:** clean with 0.5% sodium hypochlorite solution. Soak for 30 minutes. Wash in warm soapy water, rinse and dry.
- **Linen:** Place in appropriate bag. If soiled, sluice and place in appropriate bag for laundry.
- **Equipment:** Decontaminate, clean and soak in 0.5% sodium hypochlorite for 10-30 minutes. Wash in warm soapy water, rinse and dry.

Environmental cleaning guidelines

Housekeeping areas are divided into:

- Low-risk – administration and waiting rooms.
- High-risk – areas where contamination is expected, e.g. laboratory, operating theatres, delivery rooms, wards, toilets, ICU, burns units, renal units, casualty, mortuary, incinerators and in all areas where blood, body fluids, secretions, excretions, spills may be found.

IMPORTANT POINTS TO REMEMBER!

Always use frictional cleaning/scrubbing. This is the most important way to remove dirt and microbes, for all environmental cleaning procedures. In order to avoid soiling clean areas in the process of cleaning dirty ones, always:

- Change cleaning disinfectant solution after 24 hours OR as per manufacturer's direction whichever is the sooner OR when obviously dirty.
- Concentrate efforts on "high touch" items such as hand rails, bedrail, commode handles, over-bed tray tables, door handles, etc.
- Use separate equipment for cleaning contaminated areas, e.g. toilets, isolation rooms.
- Wash walls from top to bottom.
- 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 for all personnel

Routine cleaning in:

Low-Risk Areas

Walls and ceilings

Clean with water and detergent using a damp cloth

- Ensure routine damp dusting
- Always keep surfaces dry
- Wipe chairs, lamps, tabletops and counters with a damp cloth, water and detergent.

Floors

- Clean regularly according to schedule (three times a day or when needed) to keep areas clean using detergent and water
- When dusting use a clean damp cloth-Do not use dry brooms to dust.

High-Risk Areas

Use appropriate protective clothing

Sinks

- Use a detergent cleaning solution
- Rinse with clean water.

Toilets

- Wear heavy duty gloves
- Use a disinfectant cleaning solution, scrub daily or as required with a separate cloth or toilet brush.

Waste containers

- Wear heavy duty gloves
- Use a detergent solution, scrub to remove soil and organic material.

Cleaning solutions

Three types of cleaning solutions are used during housekeeping at a health facility. It is essential that housekeeping staff understand the different types of cleaning agents and how each should be used (see Table 11).

a) Plain detergent and water

This is used for **low-risk** areas and general cleaning tasks. Detergents remove dirt and organic material and dissolve or suspend grease, oil and other matter so it can easily be removed by scrubbing.

b) Disinfectant solution (0.5% sodium hypochlorite solution – see Annex 9: Disinfection and Sterilization)

Disinfectants rapidly kill or inactivate infectious micro-organisms during the cleaning process. Disinfectants are also used to decontaminate an area so that it is safer for staff to clean.

In most settings, a 0.5% sodium hypochlorite solution made from locally available bleach is the cheapest disinfectant, but alternatives can include commercial disinfectants or quaternary ammonium compounds but these are narrow spectrum.

c) Disinfectant/Detergent cleaning solution

This is a balanced solution of disinfectant and a detergent and water (only available commercially) and is used for cleaning areas that may be contaminated with infectious materials (such as operating theatres, procedure rooms, toilets and sluice rooms). **The solution must contain both a disinfectant and a detergent.** Disinfectants rapidly kill or inactivate infectious micro-organisms during the cleaning process, while detergents remove dirt and organic material, which cannot be done by water or disinfectants alone.

Linen Management Guidelines

Collection and Handling

- All soiled linen should be sluiced.
- Soiled linen with blood, body fluids, secretions, or excretions should be handled in a manner that prevents skin or mucous membrane exposure, contamination of clothing, and transfer of micro-organisms to other patients and the environment.
- All used linen is considered contaminated and should be bagged at the point of origin and placed in the soiled linen container.
- Wet linen should be placed in a fluid impervious bag for soiled linen or a regular plastic trash bag before deposited in a soiled linen container.
- Never place soiled linen on the floor or any clean surfaces.
- Linen should be handled with a minimum of agitation and shaking.
- Sorting and rinsing of linen should not occur in patient care areas. Some facilities use colour coded soiled linen bag into which different types of linen are sorted, e.g. personal clothing, towels, reusable incontinence products, bedding.
- Heavily soiled linen should be rolled or folded to contain the heaviest soil in the centre of the bundle. Large amounts of solid soil, faeces or blood clots shall be removed from linen with a gloved hand and toilet tissue and placed into a bedpan or toilet for flushing. Excreta shall not be removed by spraying with water, (e.g. from clothing, reusable incontinence pads).

Bagging and Containment

- Soiled wet linen should be placed in strong impervious plastic bags to prevent leakage.
- Laundry carts or hampers used to collect or transport soiled linen should be covered.
- Linen bags should be tied securely when three-quarters full and the laundry area.
- When linen is commercially laundered should decontaminate their carts prior to bringing clean linen to the facility.
- Linen transport vehicles should have specific cleaning kits and mops for decontamination.

- Separate carts should be used for dirty and clean linen. Carts used to transport soiled linens shall be cleaned with the recommended cleaning product used in the health facility after each use.
- Linen transported by cart should be moved in such a way that the risk of cross-contamination is minimized.
- Clean linen should be transported and stored in a manner that prevents its contamination and ensures its cleanliness.

Washing and drying

- Soiled linen should be laundered with cold water to avoid protein fixation on linen.
- If low temperature water is used for laundry cycles, chemicals suitable for low temperature washing at the appropriate concentration shall be used
- Use of a commercial laundry detergent with household bleach (according to product instructions and where suitable for fabrics) and a normal machine wash and machine dry are sufficient to clean soiled linen in a community living or home care setting.
- Machine drying or hanging clothing and linens on a clothes-line at the home care site is also a suitable method for drying.

Sterile Linen

Surgical gowns and linens used in sterile procedures shall be sterilized by steam after the normal washing and drying cycle to destroy any residual spores. Disposable items for use in sterile procedures may be more cost-effective in some situations.

Linen Colour Coding System

Linen should be sluiced first before placing in bags. Linen should be placed in a strong impervious plastic bag to avoid leakage on the linen bag:

- Red bags for soiled linen. Sluice first before placing in plastic bag then in the linen bag.
- White bags for used regular used linen
- Green bags for linen from special departments such as operating theatre, labor and delivery ward, to be transported to the laundry.
- Yellow bags for linen from patients with infectious conditions that require special handling.
- Kitchen linen to be laundered separately

Note: Clean linen from the laundry should be transported in laundered clean white bags

Guidelines on Protection of laundry workers

- The Laundry department should be well ventilated with a minimum of 12 air exchanged per hour.
- Workers should protect themselves from potential cross-infection from soiled linen by wearing appropriate personal protective equipment, such as heavy duty gloves and impervious gowns or heavy duty plastic aprons, masks and gumboots when handling soiled linens. Household gloves should be washed after use, allowed to dry, and discarded if punctured or torn.
- Hand washing facilities should be readily available.
- Personnel are to wash their hands whenever gloves are changed or removed.
- Staff in care areas need to be aware that sharps are not to be placed in soiled linens. Workers are at risk from contaminated sharps, instruments or broken glass that may be contained with linen in the laundry bags.
- Laundry workers, as other health workers, should be offered vaccination against Hepatitis B.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
Cleaning cloths (preferably use disposable cloths)	If reusable must be washed in hot water and dried daily.	Liquid detergent and water. • Sodium hypochlorite 0.5%. • POASB 1%. • Clean water. • Bucket.	Rinse in soapy water. • In high-risk areas Disinfect after each use . • Store dry. • Incinerate if heavily contaminated.
Floor, mops, brooms, Brushes	Clean and disinfect after use.	Liquid detergent and water. Sodium hypochlorite 0.5%	<ul style="list-style-type: none"> • Wash thoroughly with detergent after each use. • Rinse in water. • Immerse in disinfectant for 30 minutes then dry. • Always colour code and confine use of each mop to its designated room, e.g .kitchen, toilet, ward, • DO NOT MIX MOPS • Mops should be stored Dry and upright with head up.
Plastic buckets for use during cleaning	Daily after use or as required.	<ul style="list-style-type: none"> • Abrasive materials to clean. • Liquid detergent and water. Isolation areas: <ul style="list-style-type: none"> • Sodium hypochlorite 0.5%. TB areas: Sodium hypochlorite 1%. Phenolic disinfectant 2%.	<ul style="list-style-type: none"> • Each area to have own bucket. • General wards clean daily or as required with detergent and water. Isolation areas: <ul style="list-style-type: none"> • Soak in sodium hypochlorite for 10 minutes. TB areas: <ul style="list-style-type: none"> • Soak for 20 minutes in sodium hypochlorite or phenolic disinfectant 2%. Rinse with tap water. Store dry
ABLUTION FACILITIES			
Ablution blocks: • Toilets • Toilet seats • Toilet cistern and urinal	<ul style="list-style-type: none"> • Thorough daily cleaning. • Clean when soiled. • Clean between patients and after discharge. • Disinfect seats. 	<ul style="list-style-type: none"> • Liquid detergent and water. • Sodium hypochlorite 0.5%. . 	<ul style="list-style-type: none"> • Use a low-level disinfectant. • Use deodorizer if necessary as per manufacturer’s instructions. • Use sodium hypochlorite.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
ABLUTION FACILITIES			
Bedpans/ urinals/ washing bowl	<ul style="list-style-type: none"> • Scrub with vim, soap and water daily. 	<ul style="list-style-type: none"> • Detergent and water. <p>In case of diarrheal disease:</p> <ul style="list-style-type: none"> • Sodium hypochlorite 0.25% (2,500 ppm) or NaDCC powder • 	<p>Regardless of patients status of infection:</p> <p>Empty bedpan/urinal/washing bowl down sewer. Clean with soapy water and use scouring powder if stained.</p> <p>In case of diarrheal disease:</p> <ul style="list-style-type: none"> • Sprinkle disinfectant (NaDCC powder, if available) into receptacle then empty. • Otherwise fill with prepared disinfectant solution; leave for 30 minutes empty, wash again in freshly prepared solution. • Rinse with clean water and dry. • Extra bedpans/urinals not in use should be stored in cupboards. • Used toilet brushes: <p>Soak in disinfectant for one hour, wash in warm soapy water, rinse and hang to dry.</p>
Jugs (for measuring urine, emptying catheter bags)	<ul style="list-style-type: none"> • Between use and daily. 	<ul style="list-style-type: none"> • Bedpan sterilization after use. • Store dry and inverted. 	<ul style="list-style-type: none"> • If bed pan sterilizer not available, soak in disinfectant for at least 1 hour after pouring contents in sluice. • Wash and leave to dry.
Sluice rooms	<ul style="list-style-type: none"> • Once a day and as required • Disinfect after contamination. 	<ul style="list-style-type: none"> • Liquid detergent and warm water. <p>Spills:</p> <ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> • Avoid splashing spills on walls and surrounding area. • Pour contents of urinals and bedpans GENTLY down the sluice. • Disinfect surfaces after use and as necessary.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
ABLUTION FACILITIES			
Bathrooms: <ul style="list-style-type: none"> • Floors • Walls • Enamel baths and basins (bathtubs and sinks) • Washing bowls: autoclavable 	<ul style="list-style-type: none"> • Clean once a day as required. • Clean spills as per policy. • Clean once per week and as necessary. • Clean and disinfect between patients. 	<ul style="list-style-type: none"> • Liquid detergent and warm water. Spills: <ul style="list-style-type: none"> • Sodium hypochlorite 1%. • Liquid detergent to clean bath and sink. Disinfect with: <ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> • Scrub floors and walls to remove any residues. • Clean and dry drainage hole. • Clean walls from top to bottom. • Do not use ammonia detergent and chlorine-based compound together because of release of toxic compounds. • Rinse thoroughly to remove disinfectant. • Do not use abrasive material to clean bath and sink, as it will damage the surface.
Shower: <ul style="list-style-type: none"> • Floor and walls Pedal bin and container: <ul style="list-style-type: none"> • Without liner • With liner 	<ul style="list-style-type: none"> • Disinfect in between and after each patient use. <ul style="list-style-type: none"> • Empty daily and as needed. • Wash daily and as Needed with soapy water. • Disinfect when spills occur. 	<ul style="list-style-type: none"> • Liquid detergent and warm water. Spills: <ul style="list-style-type: none"> • Sodium hypochlorite 1% <ul style="list-style-type: none"> • Liquid detergent and water. Disinfect with: <ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> • Scrub floors and walls to remove any residues • Clean and dry drainage hole. • Clean walls from top to bottom. Without liner: – <ul style="list-style-type: none"> • Damp dust daily and clean thoroughly once per week with detergent. • Rinse and disinfect. With liner: <ul style="list-style-type: none"> • Dispose liner when ¾ full • Clean daily and when necessary
Drains	<ul style="list-style-type: none"> • Once per week and as necessary. 	<ul style="list-style-type: none"> • Liquid detergent and water. • Drain cleaner for unblocking. 	Pour hot soapy water down the drain. If blocked use plunger. Use drain cleaner only if necessary.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/ Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
FURNITURE, FITTINGS AND EQUIPMENT			
Beds (including frames)	<ul style="list-style-type: none"> • Daily damp cleaning • Disinfect on discharge or for spills. 	<ul style="list-style-type: none"> • Liquid detergent and water. • Spills and terminal disinfection 	<ul style="list-style-type: none"> • Scrub the bed with detergent and water. <p>When possible in between patients, take the mattress and the pillow(s) from the bed and place in the sun for at least 1 hour.</p>
Bedside lockers (General Ward)	<ul style="list-style-type: none"> • Daily damp cleaning • Thorough cleaning once per week and on discharge of patient 	<ul style="list-style-type: none"> • Liquid detergent and water. • If splashed with blood and body fluids, wipe with 0.5% sodium hypochlorite. • Spills and terminal Disinfection 	<ul style="list-style-type: none"> • Check lockers for pest control requirements.
Bowls (dressing, surgical, vomit, kidney)	<ul style="list-style-type: none"> • After each use. 	<ul style="list-style-type: none"> • Individual bowl for each patient preferred. • Clean with detergent. • Store dry and inverted. • Autoclave at CSSD if autoclavable. • For communal use, after thorough cleaning, wipe with sodium hypochlorite 0.5%. • Empty, wash with detergent, hot water, rinse and store dry. 	<ul style="list-style-type: none"> • For infected patients use individual bowls. • Clean with a disinfectant. • On discharge, autoclave or disinfect with hypochlorite 1% (10,000 ppm). For infected patients, treat as for washing bowls: • Decontaminate, wash with detergent and water. • Rinse and dry. • If autoclavable send to CSSD for sterilisation
<p>Couches:</p> <p>Occupational Physiotherapy, Radiography Departments</p> <p>Dental equipment surfaces</p>	<ul style="list-style-type: none"> • Wipe daily or as needed. <ul style="list-style-type: none"> • Wipe at end of each day and as needed. 	<ul style="list-style-type: none"> • Liquid detergent and warm water. <ul style="list-style-type: none"> • Methylated spirit. <p>OR</p> <ul style="list-style-type: none"> • Sodium hypochlorite 0.5% 	<ul style="list-style-type: none"> • Disinfect the couch after use or before next patient if soiled <ul style="list-style-type: none"> • Disinfect with methylated spirit after every patient

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
FURNITURE, FITTINGS AND EQUIPMENT			
Carpets	<ul style="list-style-type: none"> • Vacuum daily. • Wash quarterly. 	<ul style="list-style-type: none"> • Carpet shampoo or warm soapy water. 	<ul style="list-style-type: none"> • Vacuum clean routinely and wash thoroughly as needed. • Carpeting is NOT recommended for Patient areas.
Bed curtains Window curtains	<ul style="list-style-type: none"> • Every 3 months or after infectious cases. 	<ul style="list-style-type: none"> • Laundry detergent and water. 	<ul style="list-style-type: none"> • For infectious cases avoid use of curtains
Electronic equipment	<ul style="list-style-type: none"> • Wipe surfaces between patients. 	<ul style="list-style-type: none"> • Methylated spirit. 	<ul style="list-style-type: none"> • Wipe in between patients
Fans	<ul style="list-style-type: none"> • Routinely and on discharge of patient. 	<ul style="list-style-type: none"> • Liquid detergent and warm soapy water. 	<ul style="list-style-type: none"> • Damp wipe with clean cloth. • Dismantle the fan for terminal cleaning and when visibly dirty.
Furniture and fittings	<ul style="list-style-type: none"> • Routine damp dusting. • If contaminated wipe with disinfectant and leave to dry. 	<ul style="list-style-type: none"> • Liquid detergent and warm water. • Spills: methylated spirit or 70% alcohol 	<ul style="list-style-type: none"> • Damp dust with detergent soap solution • If contaminated wipe with methylated spirit or 70% alcohol
Hydrotherapy pool	<ul style="list-style-type: none"> • Clean after each use. 	<p>Water:</p> <ul style="list-style-type: none"> • Chlorine-based compound. • Chlorine level in pool 1.4 to 2.0 ppm. <p>Tiled areas and floor area surrounding pool:</p> <ul style="list-style-type: none"> • Sodium hypochlorite 0.5%. 	<ul style="list-style-type: none"> • Check chlorine levels and pH of pool daily. • Bacteriological investigations of pool water to ensure level of disinfection is sufficient to cope with level of use.
Flowers vases/containers	<ul style="list-style-type: none"> • Change water daily and wash vases/containers. 	<ul style="list-style-type: none"> • Liquid detergent and water. 	<ul style="list-style-type: none"> • Pour dirty water down sluice (not sink). • Wash in hot water and detergent. • Store dry and inverted.
Linen	<ul style="list-style-type: none"> • Collect as per facility policy. 	<ul style="list-style-type: none"> • Laundry detergent and water. • Colour coded bag for contaminated linen <p>White – Dirty linen Red – Soiled linen Yellow – Infectious linen</p>	<ul style="list-style-type: none"> • If not soiled put into laundry bin and send to laundry. • If soiled, remove solid soil and discard into sluice for flushing. • If contaminated put in colour-coded container and send to laundry.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
FURNITURE, FITTINGS AND EQUIPMENT			
Mattress, pillows: • With plastic covering • With mackintosh	<ul style="list-style-type: none"> Wipe and disinfect when necessary and after each patient. Wash mackintosh with liquid detergent and disinfect after each patient. 	<ul style="list-style-type: none"> Liquid detergent and water. Sodium hypochlorite 0.5% if contaminated. 	<ul style="list-style-type: none"> All mattresses and pillows should be covered with soft impervious plastic.
Stands for: • IV sets • Gas tanks • Bedscreen	<ul style="list-style-type: none"> Damp clean daily and as necessary. 	<ul style="list-style-type: none"> Liquid detergent and water. Disinfect spills. Wipe with methylated Spirit or 70% alcohol. 	<ul style="list-style-type: none"> Methylated spirit or 70% alcohol should be used to disinfect spills in preference to chlorine-based disinfectants as these are corrosive.
Kitchen • Sinks • Other	<ul style="list-style-type: none"> Daily or as necessary. 	<ul style="list-style-type: none"> Liquid detergent and warm water. 	
Safety cabinet (Pharmacy)	<ul style="list-style-type: none"> Wipe at end of each procedure. 	<ul style="list-style-type: none"> Sodium hypochlorite 0.5%. Treat spills as per policy. 	<ul style="list-style-type: none"> Clean airflow and change filters as per manufacturer's instructions.
Trolleys and Trays for: • Procedures • Food	<ul style="list-style-type: none"> Daily damp cleaning and as required. Disinfect before and after every use. 	<ul style="list-style-type: none"> Liquid detergent and water . Disinfectants: <ul style="list-style-type: none"> 70% alcohol 0.5% chlorhexidine in alcohol. Sodium hypochlorite 0.5% 	Procedure trolleys and trays: <ul style="list-style-type: none"> Wipe with methylated spirit, 70% alcohol or chlorhexidine before and after every use. Food trolley: <ul style="list-style-type: none"> Wipe daily with sodium hypochlorite
Glassware and other equipment : • Pharmacy	<ul style="list-style-type: none"> As per requirements of Pharmacy. 	<ul style="list-style-type: none"> Liquid detergent and warm water. 	Clean as required
Image Intensifier	<ul style="list-style-type: none"> Daily and after each use. 	<ul style="list-style-type: none"> Liquid detergent and warm water. OR <ul style="list-style-type: none"> Methylated spirit or 70% alcohol. 	<ul style="list-style-type: none"> Routinely damp dust . Wipe with methylated spirit or 70%alcohol.
X-ray equipment	<ul style="list-style-type: none"> Daily and after each use. 	<ul style="list-style-type: none"> Liquid detergent and warm water. 	<ul style="list-style-type: none"> Routinely damp dust. Allow to dry before use.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
FURNITURE, FITTINGS AND EQUIPMENT			
Tooth mugs	<ul style="list-style-type: none"> Wash daily or use disposable. 	<ul style="list-style-type: none"> Detergent and hot water if reusable. 	<ul style="list-style-type: none"> For infected patients, use individual mugs or disposables. If non-disposable disinfect with sodium hypochlorite 0.5%.
Toys	<ul style="list-style-type: none"> After discharge or as required. 	<ul style="list-style-type: none"> Wash, rinse and dry thoroughly. Do not soak in disinfectant if contaminated, Wipe surface with 0.5% sodium hypochlorite or 70% alcohol. 	<ul style="list-style-type: none"> For patients with infections, do not use communal toys, which cannot be easily disinfected. Heavily contaminated toys should be destroyed.
Floors: General wards Laundry Pharmacy Occupational, Physiotherapy Radiotherapy Dental Departments	<ul style="list-style-type: none"> Thorough damp cleaning daily. Cleaning when soiled Cleaning between patients and after discharge (if single room accommodation). Damp mop. Clean spills as per policy. Wash 3 times per day or as necessary. Once daily and as necessary. 	<ul style="list-style-type: none"> Liquid detergent and warm water. Spills: <ul style="list-style-type: none"> Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> See section on floor mops, broom for care. Use colour code mops to prevent cross-contamination between areas. Such as: Green – wards Red – toilets White – kitchens
Floors – special areas: <ul style="list-style-type: none"> Operating Theatre Renal Unit Isolation Unit ICU Labor and Delivery Rooms Neonatal Unit Burns Unit Kidney Unit 	<ul style="list-style-type: none"> Daily damp cleaning and disinfection and as required at the end of each operating list Clean spills as per policy. Operating theatre: Damp clean and disinfect between each patient. Clean the total area at the end of each day. 	<ul style="list-style-type: none"> Detergent and warm soapy water. Disinfectant: <ul style="list-style-type: none"> Sodium hypochlorite 1%. OR NaDCC granules / powder available on the market	<ul style="list-style-type: none"> Damp clean with hot soapy water. Wipe floor with disinfectant after cleaning and leave to dry.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/ Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
FLOORS WALLS AND WINDOWS			
Walls: General Wards Laundry Pharmacy Occupational Physiotherapy Radiography Dental Departments	<ul style="list-style-type: none"> • Thorough washing once every 3 months and when visibly dirty or splashes occur. • High and low damp dusting as necessary. • Disinfect spills as required 	<ul style="list-style-type: none"> • Liquid detergent and warm water. • Bucket. • Clean cloth. Spills: <ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> • Damp clean thoroughly with warm soapy water. • Disinfect spills as per policy.
Walls: <ul style="list-style-type: none"> • Operating Theatres • Kitchen 	<ul style="list-style-type: none"> • Disinfect spills as required. • Twice a day and as required 	<ul style="list-style-type: none"> • Detergent and warm water. Routine disinfectant: <ul style="list-style-type: none"> • Sodium hypochlorite 1%. • Disinfect spills, see policy. Detergent and warm water.	<ul style="list-style-type: none"> • Damp clean with warm soapy water. • Treat spills as described in the guidelines. • Use coded kitchen mop.
Walls (dusting and removal of cobwebs) <ul style="list-style-type: none"> • Light fittings • Pelmets 	<ul style="list-style-type: none"> • Clean when dirty and during terminal disinfection. 	<ul style="list-style-type: none"> • Long handled broom covered with a damp cloth. 	<ul style="list-style-type: none"> • Pay particular attention to corners.
Window screens, Insect wire	<ul style="list-style-type: none"> • Damp clean daily. 	<ul style="list-style-type: none"> • Short mop or cloth. • Liquid detergent and warm water. 	<ul style="list-style-type: none"> • Do not use the short mop For floors. • Wash after use, disinfect and dry.
Windows – glass	<ul style="list-style-type: none"> • Clean when dirty and during terminal disinfection. 	<ul style="list-style-type: none"> • Bucket • Liquid detergent and warm water. 	<ul style="list-style-type: none"> • Damp clean and dry.
Windows: <ul style="list-style-type: none"> • Kitchen 	<ul style="list-style-type: none"> • Once every two weeks and as required 	<ul style="list-style-type: none"> • Liquid detergent and water. 	
Rooms (terminal cleaning)	<ul style="list-style-type: none"> • After discharge of patient. 	<ul style="list-style-type: none"> • Wash surfaces with detergent solution. 	For infected patients: <ul style="list-style-type: none"> • Wash surfaces with 1% phenol or hypochlorite solution as appropriate.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/ Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
SPECIAL PROCEDURES AND SURFACES			
High-level decontamination of surfaces	<ul style="list-style-type: none"> As necessary. 	<ul style="list-style-type: none"> Liquid detergent and water. Methylated spirits on stainless steel or metal surfaces. Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> Pre-clean with detergent solution then wipe/mop with sodium hypochlorite disinfectant.
<p>Kitchen:</p> <ul style="list-style-type: none"> Food Pots, pans Utensils, crockery, trays, feeding and medicine cups Refrigerators Freezers 	<ul style="list-style-type: none"> Cover to prevent contamination by flies, ants, cockroaches and dust after each use before and after preparation. After each use rinse with warm water and dry on a rack. Defrost every two weeks. 	<p>Liquid detergent and warm soapy water.</p> <p>For infectious cases:</p> <ul style="list-style-type: none"> Heat disinfect. <p>OR</p> <ul style="list-style-type: none"> Soak in Sodium hypochlorite 0.5%. Liquid detergent and warm water. 	<p>Wash after use and daily with detergent, hot water and store dry.</p> <p>Dish towels (if used) to be used once for every dish wash:</p> <p>Hand or machine -wash thoroughly at minimum temperature of 60°C with final rinse at 80° C.</p> <ul style="list-style-type: none"> Dry and store. <p>In case of infectious cases, and when dishwashers are not available:</p> <ul style="list-style-type: none"> Soak in sodium hypochlorite 0.5% for 10-15 minutes. Rinse with clean water. Repeat disinfection with fresh sodium hypochlorite 0.5% for 10-15 minutes. Rinse with clean water, dry and store.

Table 13: Health Care Facility Cleaning/Disinfection Guidelines

Item/Task and Location	Frequency of Cleaning/ Disinfection	Agent, Equipment and Supplies Needed	Procedure/Remarks
SPECIAL PROCEDURES AND SURFACES			
<ul style="list-style-type: none"> • Cupboards • Stoves 	<ul style="list-style-type: none"> • Wash once weekly and rinse with clean water. • Scrub once weekly. 	<ul style="list-style-type: none"> • Liquid detergent and warm water. • Vim or scouring powder or grease cutter. 	<ul style="list-style-type: none"> • Vector control if necessary. • Clean 3 times a week with detergent and water or as necessary. • Use grease cutter to remove stubborn stain/grease.
Routine damp wiping of surfaces in: <ul style="list-style-type: none"> • Neonatal Unit • ICU • Transplant unit • Burns unit 	<ul style="list-style-type: none"> • Daily and when necessary. 	<ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> • Damp clean with warm soapy water and wipe with disinfectant.
Operating Theatre tables	<ul style="list-style-type: none"> • After each use and at end of day. 	<ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<ul style="list-style-type: none"> • Wash with disinfectant in between patients and at end of day.
Terminal disinfection of isolation rooms	<ul style="list-style-type: none"> • Soon after discharge Or after death of an infectious patient, <p>e.g. Chickenpox, Cholera Dysentery HBV</p> <p>Measles Rabies, Shingles Tuberculosis Typhoid VHF Other emerging infectious diseases</p>	<ul style="list-style-type: none"> • Liquid detergent and water. <p>Disinfectant:</p> <ul style="list-style-type: none"> • Sodium hypochlorite 1%. 	<p>Wash thoroughly with detergents and warm water then disinfect:</p> <ul style="list-style-type: none"> • All floors and walls. • All mattresses and plastic covered pillows. • Lockers and furniture. • All plastic items. • Mop heads. • Wash bedpans and urinals thoroughly with detergent, hot water and scouring power and then soak in disinfectant for 30 minutes or place in bedpan sterilizer. • Change curtains and aerate room ventilate. • Soak oxygen masks in disinfectant for 15-20 minutes

Annex 10: Health Facility Waste Management Procedures

Education and Training

The purpose of education and training is to minimize the risk of injury associated with waste handling and facilitate efficient waste management. . Employers and contractors must provide education and training to the following personnel:

- Waste generators
- Waste handlers, collectors and transporters
- Key managers instrumental in the implementation of the waste management plan
- Operators responsible for treatment and disposal methods

Education and training programs should be interactive and include:

- Approved work practices
- Regulatory requirements and methods of compliance
- The use of required personal protective equipment
- Waste minimization, segregation, labeling, containment and disposal strategies

Figure 12: Health Care Waste Management Training



Source: WHO. *Health Care Waste Management Within Hospitals*. Geneva: World Health Organization, 1998, p. 15 (modified).

A health care facility waste management policy is only effective if it is used daily, consistently and accurately. Training employees in implementing the policy is critical to a successful health care facility waste management programme. Orientation and in-service training programs for new employees, as well as on-going in-service training for existing employees should be developed and implemented. Training should focus on all principles

of health care facility waste management. It also should highlight employees' roles and responsibilities with respect to the waste management programme (Figure 13).

Health and safety

Health Care Facility Waste Management Policy

A health care facility waste management policy should include continual monitoring of workers' health and safety to ensure that proper handling, treatment, storage, transport and disposal are being adhered to and that appropriate preventive measures are being carried out (Figure 14)

Figure 13: Health and safety at work



Source: WHO. *Health Care Waste Management Within Hospitals*. Geneva: World Health Organization, 1998, p15 (modified)

Occupational health and safety

The Infection Control and Prevention Officer is responsible for reviewing facilities protective equipment, work practices, incidence and accidents monitoring provision of status information, education and training relevant to records keeping.

Health and safety measures

Good health and safety measures include:

- Relevant training
- Issuing of personal protective equipment (PPE)
- Establishment of an effective occupational health program that includes immunization, post-exposure prophylaxis and medical surveillance.

Health and safety training

Health and safety training should ensure that workers know and understand the potential risks associated with health care facility waste, the value of immunization against the Hepatitis B virus, and the importance of using the personal protective equipment available to them.

Management Responsibility

The Ministry of Health and Child Welfare bears overall responsibility for the regulation of potentially infectious health care facility waste. The primary day-to-day responsibility for all the health care facility waste management, lies with each facility generating the waste and with local government or government agencies for ensuring public health and environmental regulatory compliance. The starting point in each health care facility is the preparation of a waste management plan (Figure 15).

Figure 14: First steps towards effective Health Care Management



- Identify present technical aspects, functions and personnel involved in the production, handling, and management of health care facility waste.
- Assess the costs associated with present waste management
- Define management policies for waste management to be used in the future.
- Train employees in policy, health and safety procedures
- Analyze technical procedures, costs and policies annually to identify if additional better practices can be adopted

Developing a Health Care Waste Plan

There are five (5) primary steps toward developing a health care waste management plan. The relevant director should:

Step 1: Advocate for formulation of waste management plans

The health care facility director is responsible for initiating discussions on the plan. This advocacy role is very important.

Step 2: Assess of duties, responsibilities, and practices

The second step to an effective health care facility waste management plan is a comprehensive audit to determine the current status of personnel duties and responsibilities regarding health care waste and to define handling and reporting practices.

Step 3: Assess of health care waste management costs

The third step in the development of an effective waste management plan is an assessment of its costs (refer to costs to consider when auditing). The Finance Officer should examine purchasing practices, including the cost of those items that routinely become health care facility waste and whether they are disposable or reusable, or could be replaced by reusable items.

The facility director or designate should conduct this audit, gathering all relevant information from every floor, department and service throughout the facility. The audit should contain detailed information about all personnel time spent in the performance of a health care facility waste generating, handling, or processing.

Costs to consider when auditing*

- Health care facility waste containers, sacks and labels.
- Disinfectants and antiseptics.

- Personal protective equipment such as gowns and rubber or heavy duty gloves, and their frequency of use must be included.
- Disposable bed coverings, bowls, tubing and many other similar items.
- Personnel time
- Vehicles, fuel and driver if the waste is shipped off-site by health care facility personnel, either before or after treatment.
- Contractor costs.

*Source: WHO. Health Care Waste Management within Hospitals. Geneva: World Health Organization, 1998, p. 5. (Modified).

Step 4: Development of health care facility waste management policy

The fourth step in the development of a health care facility waste management plan is to develop a management policy based on the assessment of current practices and costs. A health care facility waste management policy is the compilation of all practices and procedures regularly carried out in regard to health care facility waste, from generation to ultimate disposal.

The policy should be in a written form and describe all levels of responsibility, from the highest administrative authority to janitorial staff. It should be officially approved by the organization’s governing body, endorsed with the director’s signature, and be explained to all employee in all departments.

The policy should be reviewed and updated annually. Annual reviews should include re-assessments of purchasing practices and costs to provide cost comparisons from year to year. This will identify deficiencies and good practices to reduce further health care facility waste, cost, or both (Figure 16).

Figure 15: Health care waste policy



Source: WHO. Health Care Waste Management within Hospitals. Geneva: World Health Organization, 1998, p. 6. (Modified).

Step 5: Responsibility

This final step describes the responsibility of all categories and levels of staff with respect to the health care facility waste management.

Individual Doctors, Nurses and Other Staff:

- Must know the infectious waste policy.
- Place sharps in sharps containers.
- Place infectious waste in infectious waste containers.
- Place other waste in non-infectious waste containers.
- Report any difficulties or suggestions to the Nurse-In-Charge.

Nurse-In-charge of the Ward

- Knows and is able to explain the infectious waste policy.
- Ensures that staff on the ward understands the policy.
- Ensures that staff on the ward place waste in proper containers.
- Ensures that the appropriate colour coded bags are used for infectious waste and non-infectious waste.
- Ensures that appropriate and adequate sharps containers are in place.
- Ensures that sharps containers are removed for disposal and those infectious waste containers are emptied when $\frac{3}{4}$ full.
- Reports any difficulties or suggestions to the Infection Control Officer.

Housekeeping Staff on the Ward

- Must know the infectious waste policy.
- Use the appropriate colour coded bags for placing infectious waste in infectious waste containers and non-infectious waste in the appropriate containers.
- Empty infectious waste containers when $\frac{3}{4}$ full.
- Remove and replace sharps containers when $\frac{3}{4}$ full.
- Report any difficulties or suggestions to the supervisor.

Waste Collection Staff

- Must know the infectious waste policy.
- Remove the bags and dispose in designated areas according to the colour code of bags.
- Remove sharps containers to the incinerator or interim storage location when $\frac{3}{4}$ full.
- Report any difficulties or suggestions to the supervisor.

Housekeeping Supervisor

- Must know and be able to explain the infectious waste policy.
- Ensures that the staff understands the policy and is immunized against Hepatitis B.
- Ensures that adequate supplies of colour coded bags are available to staff.
- Is a member of the Infection Prevention and Control Committee.
- Reports any difficulties or suggestions to the Infection Prevention and Control Officer.

Incinerator Operator

- Must know the infectious waste policy.
- Incinerates infectious waste as necessary.
- Maintains the incinerator in good working condition.
- Reports any problems or suggestions to the maintenance supervisor.

Maintenance Supervisor

- Must know the infectious waste policy.
- Ensures that the incinerator is properly maintained.

- Is a member of the Infection Prevention and Control Committee.
- Reports any difficulties or suggestions to the Infection Prevention and Control Officer.

Infection Prevention and Control Committee

- Ensures that every ward and infectious waste producing area has infectious waste containers lined with plastic bags and identified with explanatory signs.
- Ensures that every ward and sharps producing area has puncture-resistant containers in place and identified with signs or labels.
- Ensures that infectious waste is being properly incinerated or burned.
- Educates staff as to the policies, procedures and dangers of infectious waste handling.
- Ensures that all staff is immunized for Hepatitis B.
- Investigates any reported instances of needle sticks by staff.
- Ensures that infectious waste management policy is being followed by appointing a sub-committee to conduct weekly rounds of the health care facility.
- Reports any suggestions or difficulties with infectious waste handling or disposal, which it cannot resolve to the health care facility's Administrator.
- Holds meeting at least once per month.

Health Facility Administrator

- Must know the infectious waste management policy.
- Ensures that adequate supplies of personnel protective equipment, waste containers, sharps containers, colour coded bags are available to implement the infectious waste policy.
- Ensures that the on-site incinerator is maintained or, if the incinerator is off-site, ensures that an adequate secure storage area is available for infectious waste awaiting disposal.
- Ensures that the on-site burn and/or burial sites are appropriately sited and maintained.
- Reports any problems or suggestions to the Regional Director or to the Director, Environmental Health Services.

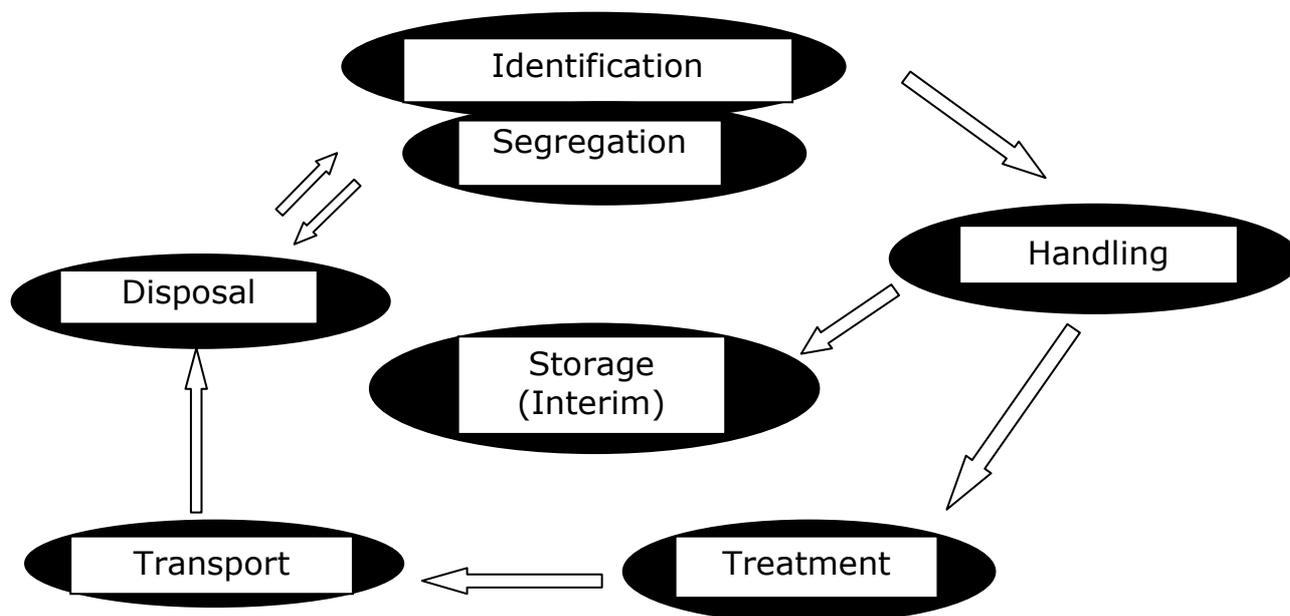
Ministry of Health and Child Welfare

- Develops and/or revises the infectious waste policy for use in the health care facilities.
- Surveys all health care facilities periodically.
- Analyzes and makes recommendations for incineration, burning and burial facilities.
- Inspects all incinerators, burn and burial sites periodically.
- Ensures that adequate incineration facilities are available for all infectious waste.
- Provides technical guidance to the district level health care facility Infection Prevention and Control Committee.
- Ensures that funding is available for the purchase of supplies and equipment needed for the implementation of the infectious waste policy.
- Ensures that funding is available for the transport of infectious waste from the point of generation to the disposal site.

Waste management

Health care facility waste management (both blood borne and standard waste) should be managed through a pathway composed of the following elements, each of which must be addressed in terms of personnel and material costs and occupational and safety risks.

Figure 16: The steps in a waste management plan



Source: Waste disposal. <http://www.igc.apc.org/avsc/ip/waste/wd5.html> (modified)

Step 1: Segregation

- Each type of waste should be placed in the appropriate waste containers.
- A key component of waste minimization is effective separation as early in the process as possible, so that materials are separated before starting a procedure that produces health care waste and potentially contaminate non-risk waste. For example, after use, a syringe becomes a potentially infectious "risk" waste, but its original package does not. When separated properly from the syringe before use, the packaging can be placed into a communal waste receptacle.
- Separating the waste at the point where it is generated can conserve resources by greatly reducing the amount of waste that needs special handling. Poor separation of waste at the point where it is generated leads to large amounts of trash that must be handled as potentially infectious, which can overwhelm the disposal system, lead to improper disposal of medical waste, and put everyone at risk.
- Needles and other sharps pose the greatest risk of injury, and should be disposed of in sharps puncture-resistant containers.

Step 2: Identification

- After health care waste is collected and separated, it should be identified.
- As a minimum, waste identification should be through a colour-coded system (e.g. yellow or red for infectious waste; black for communal waste). If a facility does not have a system in place, it could adopt the WHO system (below).

To separate and identify health care risk waste, a health care facility waste management policy should:

- Include a list of materials that will always be considered as risk waste (such as all needles and syringes).
- Include a list of those that can be classified as a risk waste under certain conditions, (e.g. plaster cast is not a risk waste unless it has blood or body fluids on it).

- Designate containers using defined colour-coding such as:
 - Yellow for infectious waste and sharps
 - Black for non-infectious/non-hazardous (communal) waste
- Designate sharps containers as such and provide appropriate labeling, including the international biohazard symbol.
- Ensure puncture-proof, leak-proof and sealable containers are purchased and used for safe waste transport.(Table 15)
- Place information at each waste separation point to reinforce the policy and to illustrate quickly separation procedures*.

Step 3: Handling

- All health care facilities should evaluate their existing health care risk waste collection, internal transport and storage practices to ensure they are safe, efficient, cost-effective and comply with government regulations.
- Health care facility staff should handle medical waste as little as possible before storage and disposal. The more waste is handled, the greater the chance for accidents.
- Special care should be taken when handling used needles and other sharps, which pose the greatest risk of accidental injury and infection.
- When handling medical waste, strong utility gloves and shoe covers should be worn.
- Always wash hands after removing gloves.

Restricted access to waste

- Each facility should have a limited access waste storage area to contain risk waste awaiting on-site treatment or transport to an off-site facility. This area should be posted with warning signs and locked.
- Waste should be placed in a closed area that is minimally accessible to staff, patients and visitors.
- As few people as possible should come into contact with stored medical waste.
- All containers should have lids to prevent accidental contamination, spillage and access by insects, rodents and other animals.

Step 4: Treatment and Disposal

- There is no one, ideal treatment technology for health care facility risk waste for all situations.
- Facilities should select a treatment method considering investments costs, maintenance and service costs, treatment effectiveness, destructive capability, hazardousness of post-treatment residues, and environmental pollution(Table 13 and 14).
- Following treatment, health care facility risk waste can be disposed of in several ways.
- In general, the final residue of treated health care risk waste can be deposited safely in a special section of a sanitary landfill designated for this purpose.

Disposable Methods for Waste

The following are common methods of waste disposal, which may vary in availability according to location:

(i) Sanitary Landfill (residue ash from incinerators, other solids)

- Specific categories of waste can be disposed of in a properly managed landfill, provided there are procedures in place to protect workers from contact with waste.
- Waste must be non-hazardous based on environmental regulations.
- The landfill method of disposal is inexpensive when compared to incineration.

(ii) Sanitary Sewer (Liquids)

- This is an acceptable method of disposal of blood, suctioned fluids, excretions and secretions, if the liquids have been neutralized and the method is acceptable to local authorities.
- The disposal of such fluids into sanitary sewers must conform to local health legislation and regulations.

(iii) Incineration and Burning

The incineration process and the burning process converts combustible materials into noncombustible ash, achieving a reduction of 90% by volume or 75% by weight. The product gases are vented into the atmosphere, and the treatment residue may be disposed of in a landfill.

(iv) Burial (anatomical parts)

If the parts are not incinerated, they should be buried. The Ottoway pit should be large enough for all the waste generated at the health care facility. It should be fenced to limit access and to prevent scavenging of waste.

Step 5: Storage

Waste bunkers and hoppers.

- When manufactured from steel sheet, adequate stiffening should be provided to prevent drumming or bowing and to allow drainage of any liquid leakage of waste which may occur.
- Clinical waste bags should not be unduly compressed in bunkers and hoppers.
- Bunkers and hoppers positioned outside buildings should have the means of preventing birds, vermin and unauthorized persons obtaining access to the waste.
- The waste should be protected from the weather.

It is recommended that:

- The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy to decontaminate, clean and disinfect.
- There should be a water supply for cleaning purpose.
- The storage area should afford easy access for staff in charge of handling the waste.
- It should be possible to lock the store to prevent access by unauthorized persons.
- The storage area should be inaccessible to animals, insects, rodents and birds.
- Easy access for waste collection vehicles is essential.
- There should be protection from the sun.
- There should be good lighting and at least passive ventilation.
- The storage area should not be situated in the proximity of fresh food stores or food preparation areas.
- A supply of cleaning equipment, personal protective equipment, and waste bags or containers should be located conveniently close to the storage room.

Step 6: Transport

- Waste generated at most health care facilities should be transported from its point of generation to the point of final disposal. This could either be on- or off-site.
- Waste at times has to be transported from one health care facility to another.

On- site transport

Health care facility waste should be transported within the facility by means of wheeled trolleys, containers, or carts that are not used for any other purpose.

A. Infectious Waste

- Dedicated trucks, trolleys or wheeled containers should be used to transport waste containers to the storage/disposal area. Such conveyances should be decontaminated, cleaned and disinfected at least weekly and whenever there is a spillage or leakage.
- The direct handling of sacks/bags should be kept to a minimum to prevent any threat to the health of any staff that is at risk.
- All persons involved in carrying/loading should receive adequate training and while carrying out their duties should wear appropriate personal protective equipment. All staff should be offered Hepatitis B immunization.

B. Chemical/Hazardous Waste

Only designated personnel should transport chemical wastes. Transport within the health care facility should be by laboratory carts with materials carefully packaged so as to minimize potential exposure to employees, patients and visitors if there is a spill or accident.

C. Radioactive Waste

Only designated personnel should transport radioactive waste. This applies for both on-site and off-site transportation

D. Chemotherapy Waste

The transporting of chemotherapy waste is similar to that for intravenous/intramuscular (IV/IM) drugs.

Off – site transport

Regulation and Control System

- The health care facility waste producer is responsible for the safe packaging and adequate labelling of waste to be transported off-site and for the authorization of its destination.
- Packaging and labelling should comply with national and international regulations.
- The control strategy for health care facility waste should have the following components:
 - A consignment note to accompany the waste from the place of production to the site of final disposal. On completion of the journey, the transporter should complete the part of the consignment note especially reserved for him and return it to the waste producer.
 - The transporting organization should be registered with, or known to the waste regulation authority.

- Handling and disposal facilities should hold a permit issued by the waste management agency, allowing the facilities to handle and dispose of health care facility waste.

Special Packing Requirements for Off-Site Transport

In general, the waste should be packaged in sealed bags or containers (Table 15), to prevent spilling during handling and transportation.

Waste vehicles should:

- Be in accordance with the requirements of the waste regulation authority.
- Be dedicated solely to the carriage of clinical waste and not carry any other commodity.
- Have enclosed secure storage facilities containing all necessary equipment and materials to facilitate the prescribed procedure to be carried out in the event of spillage or leakage of medical waste. Hand cleaning materials should be provided including disposable gloves, disposable overall and rubber boots. These should be as described in the health care facility waste disposal policy.
- Have waste containing accommodation separated from the driver and passengers' accommodation by a bulkhead of sufficient integrity and strength to prevent the driver or passenger from coming in contact with the waste in the event of an impact with a similar vehicle at a relative speed of 40 mph.
- Incorporate a system to secure the load during transportation. Sharps containers should be securely stored.

Infectious waste

Health care facility wastes that are known or suspected to contain pathogens likely to cause human disease, is considered "Infectious Substances" and must comply with the packaging requirements as outlined by the United Nations packaging requirements for infectious substances, division 6.2, UN No.2814. The packaging recommended for transporting most health facility waste, with a relatively low probability that infectious substances are present and which are not likely to cause human disease are also outlined in Appendix 4 – United Nations packaging requirements for infectious substances, division 6.2, UN No. 3291.

Sources: Safe management of wastes from health-care activities. Edited Pruss A, Giroult E, Rushbrook P. World Health Organization

WHO core principles for achieving safe and sustainable management

of health-care waste World Health Organization, 2007.WHO/SDE/WSH/07.10

Review of Health Impacts from Microbiological Hazards in Health-Care Wastes.Salkin IF WHO 2004

Table 14: Recommendations for Management of Categories of Health Facility Waste

Incineration	Steam Autoclave Disinfection	Microwave Disinfection	Mechanical/Chemical Disinfection
<p>Reduction of waste volume, weight.</p> <p>Waste unrecognizable after treatment.</p> <p>Acceptable for all waste types.</p> <p>Heat recovery potential.</p> <p>Appropriate method of decontamination of microbiological waste for final disposal in a landfill.</p>	<p>Reduction of volume.</p> <p>Low investment cost.</p> <p>Low operating cost.</p> <p>Easy biological testing.</p>	<p>Significant volume reduction.</p> <p>Waste made unrecognizable.</p> <p>No liquid discharge.</p>	<p>Significant waste volume reduction.</p> <p>Waste made unrecognizable.</p> <p>Rapid waste processing.</p> <p>Waste deodorization.</p> <p>Indicated for the clean-up of blood spills.</p>
<p>Incinerators using coal may not completely burn sharps.</p> <p>Public opposition.</p> <p>High investment operation costs.</p> <p>Formation of dioxins, furans.</p> <p>High maintenance, testing, repair costs.</p> <p>Future restrictive emission laws.</p>	<p>Waste appearance unchanged.</p> <p>Waste weight unchanged.</p> <p>Not suitable for all waste types.</p> <p>Uncharacterized air emissions.</p>	<p>High investment costs.</p> <p>Increased waste weight.</p> <p>Not suitable for all waste types.</p> <p>Potential contaminated shredder exposure to pathogens.</p> <p>Uncharacterized air emissions.</p>	<p>High investment costs.</p> <p>Not suitable for all waste types.</p> <p>Chemical storage and use.</p> <p>Uncharacterized air emissions.</p>

Source: WHO. Health Care Waste Management Within Hospitals. Geneva: World Health Organization, 1998, p.11.

Table 15: Recommendations for Management of Categories of Health Facility Waste

Waste Category	Examples	Types of container to be used*	Handling Disposal**	Special Considerations
Infectious waste	Blood, products, body fluids, dialysis water	Impervious container with lid	Disinfect with 3-3.5% chlorine based compound prior to discharging in sewer	Bags should be ¾ full, sealed, marked with site of origin and removed.
Pathological waste/ anatomical waste	Tissues, organs body parts, fetuses, placenta, surgical waste etc.	Suitable impervious containers or waste storage bags placed in rigid containers with lids	Incineration, burn	Bags should be ¾ full, sealed, marked with site of origin and removed. Mark container with biohazard label
Isolation waste	Viral haemorrhagic fever	National approved sealed, impervious containers with lid	Incineration	Follow national guidelines for VHF
Animal waste	From research laboratory	Impervious container with lid	Incineration, burn	Bag sealed and marked with site of origin
Laboratory waste (highly infectious)	Culture plates and bottles. Diagnostic specimens, vaccines	Impervious container with lid lined with a plastic disposal bag	Autoclave if possible before disposal then incinerate or burn	Bags should be ¾ full, sealed, marked with site of origin and removed.
Sharps	Needles, scalpels, blades, razors, other sharps, clinical glass	Special puncture resistant sharps container	Incineration, burn	Empty ash in pit latrine or disposal site Container ¾ full for disposal
Medical waste	Gloves, Sponges Dressings Sanitary pads Surgical drapes soiled or soaked with blood, body fluids, secretions	Impervious waste holding bag or double plastic bag	Incineration, burn or landfill	Empty ash in pit latrine or disposal site Container ¾ full for disposal
Food waste	Milk, Meat, fish chicken, vegetables etc.	Lined plastic bins covered with tight lid	Incineration, burn or landfill	When ¾ full seal bag and take to disposal site
Other kitchen waste	Empty bulk cartons, Food containers, Food wrappers	Lined bins with lid	Incineration or landfill	Place separately from food. When ¾ full seal and dispose

*Biohazard symbol must be used where appropriate. Colour coding of bags requirements issued at national level. ** All transportation of infectious waste must comply with national laws and regulations. **Source:** Health Canada. Canada Communicable Diseases Report, Supplement Vol, 24S8. Infection Control Guidelines. Ottawa: Laboratory Centre for Disease Control. 1998 pp37-40.

Tips for handling waste containers

- Use heavy-duty long gloves for handling containers.
- Wash hands with liquid soap and running water after removal of gloves.
- Incineration is the best method for destroying micro-organisms.
- Incinerate wastes immediately after collection and transportation to the incinerator.
- Fence the incinerator site to keep out human, animals, insects, rodents and birds.
- Containers should be:
 - Lined with plastic bags
 - Must have sealable lid
 - Place at convenient place for use
 - Must not be used for any other purpose in the health care facility
 - Must be decontaminated, cleaned, and disinfected after each use.

Characteristics of an ideal waste disposal container

The container should:

- Have a well fitted lid
- Be leak proof
- Be non-corrosive
- Be washable.

To build a burial pit*

1. Choose an appropriate site
 - At least 50 meters away from any water source to prevent contamination of the water source.
 - The site should have proper drainage.
 - Be located downhill from any wells.
 - Be free of standing water.
 - Be in an area that does not flood.
 - The site should not be located on land that will be used for agriculture or development.
 - The first meter to be lined
2. Dig a pit 1 to 2 meters wide and 2 to 5 meters deep
 - The bottom of the pit should be 1.8 metres above the water table.
 - Consult the local water engineer/water authority for information about the location of the water table.
3. Fence in the area
 - To keep out animals, scavengers, and children.
4. Keep waste covered
 - Each time waste is added to the pit, cover it with a 10 to 30 cm layer of soil.
5. Seal the pit
 - When the level of the waste reaches to within 30 to 50 cm of the surface of the ground, fill the pit with dirt, seal it with concrete, and dig another pit.

Source: *Waste Disposal.<http://www/igc/apc.org/avsc/ip/waste/wd9b.html>

To build a drum incinerator/burner

When using a drum incinerator In general, a drum incinerator is only useful for small, usually rural, 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.

- Choose a place that is downwind from the clinic to prevent smoke and odors from coming into the clinic.
- Make sure there are sufficient air inlets on the sides of the oil drum and bottom of the fire bed for efficient burning.
- Place the incinerator on hardened earth or a concrete base to prevent grass from catching fire during the burning process.
- Burn only medical waste
- Use a regular community disposal site for general waste. This will conserve both time and resources.
- Treat the ash residue as general waste
- Bury or otherwise dispose of it in a designated area.

Medical waste may 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 – adding kerosene after the fire has started might cause an explosion.

*Source: Waste Disposal. <http://www/igc/apc.org/avsc/ip/waste/wd9b.html>

Record keeping

Effective health care facility waste management requires accurate record keeping to assess waste quantities, annual expenditures and success of waste minimization efforts. The health care facility waste management policy should identify those persons who are responsible for record keeping.

Waste management

Keep records on:

- Amounts of waste generated in each department.
- Amounts of waste generated for entire facility.
- Direct costs for supplies and materials used for collection, transport, storage, treatment, disposal, decontamination, and cleaning.
- Costs for labor and materials for training.
- Costs for labor and materials for occupational health activities such as immunization, needle sticks and other injuries, and post-exposure treatments.
- Costs for repairs and maintenance of incinerator or other treatment technology.
- Costs for contractor services.

Source: * WHO. Health Care Waste Management Within Hospitals. Geneva: World Health Organization, 1998, p. 16 (modified).

Annex 11: Post Exposure prophylaxis

High-risk Procedures

- Blood taking
- Suturing
- Intravenous procedures
- Wound care
- Administering injections

Prevention

- Training of health care workers in Standard Precautions and Transmission Based precautions
- Application of Standard Precautions with all patients
- Engineering controls
- Work safety controls
- Availability and use of appropriate supplies and PPE
- Surveillance of work practices.
- Adequate staff

Facility based Guidelines

The post-exposure guidelines should address:

- Immediate action
- Follow-up action
- Record keeping
- Confidentiality.

Procedure to be followed in the event of occupational exposure

In the event of an injury with a sharp object such as a needle or scalpel that has been used on a patient or in the event of a mucous membrane being contaminated with blood or secretions from a patient the following steps should be followed:

1. Wash exposed area thoroughly with soap and under running water.
2. Rinse eye or mouth with plenty of saline water if contaminated.
3. Report the injury to a senior member of staff or the supervisor.
4. Take antiretroviral drugs recommended for post exposure prophylaxis immediately – these should be started within 1 hour if possible and at the latest within 72 hours of exposure.
5. Ascertain the HIV status of the patient and the exposed health worker after providing appropriate counselling – the standard rapid HIV antibody tests that are currently used in the Voluntary Counselling and Testing programme should be used and the results to tests should be obtained as quickly as possible. A Rapid Hepatitis B test should also be done on the patient and the health care worker's blood after the Rapid HIV Test.
6. Depending on the results of the HIV tests the following actions should be taken:
 - If the source patient is HIV negative no further post exposure prophylaxis is necessary for the exposed health worker
 - If the exposed health worker is HIV positive no further post
 - Exposure prophylaxis is necessary for the health worker, but the health worker should also be referred for further counselling and management on a long term basis his/her HIV infection which has not occurred as a result of the exposure.
 - If the health worker is HIV negative and the source patient is HIV positive then continue antiretrovirals for a period of one month; repeat the health worker's HIV test at 4 weeks, 3 months and at 6 months after the initial test. If the health

worker should seroconvert during this time then provide appropriate care and counseling and refer for expert opinion and long term treatment.

- Safer sex during the monitoring period cannot be over emphasized.
- If the health worker refuses to be tested, he or she may have no claim for possible future compensation and refusal should be noted in both the Occupation health injury log and with the Infection Control log.

7. If it is not possible to determine the HIV status of the source patient then assume that the source is positive and proceed according to guidelines in the previous bullet.
8. Determine the health workers hepatitis B virus immune status and if non immune institute hepatitis B virus vaccination.
9. If the health care worker refuses to be tested for HIV, he/she should be counseled and the event documented.

Antiretroviral Drugs to be used in Post – Exposure Prophylaxis

Dual therapy can be used as it has been shown to work but we are recommending triple therapy in line with our general recommendations for HIV infection. Immediately after exposure all exposed health workers should take:

- Zidovudine 300mg orally twice daily, plus
- Lamivudine 150mg orally twice daily, plus
- Lopinavir – 400/Ritonavir – 100mg twice a day.

OR

- ZIDOVUDINE 300mg orally twice a day
- LAMUVIDINE 150mg orally twice a day

The above regimen is given for one month.

Oral contraceptive can fail with some of the antiretrovirals used in post exposure prophylaxis. Consult a physician for specific information on pregnancy protection.

Counselling regarding side effects should be given to the healthcare worker

This regimen is continued until the results of HIV tests for patient and the health worker are known:

Source Patient	Health care worker	Health care worker Management
HIV +ve	HIV –ve	Starter pack , give ARVs for 28 days then monitor for 6 months. Repeat HIV test at 4 week, 3 months and at 6 months
HIV +ve	HIV +ve	Stop Starter pack and refer to OI clinic
HIV –ve	HIV – ve	Stop Starter pack no further PEP necessary.
Refuses to be tested assume positivity	HIV-ve	Manage as for(i)
HBV+	Previously vaccinated	Give a booster dose of HB vaccine
HBV+	Was not vaccinated	Start Vaccination Course i.e. 3 doses

Figure 17: Flow chart for HIV post exposure prophylaxis

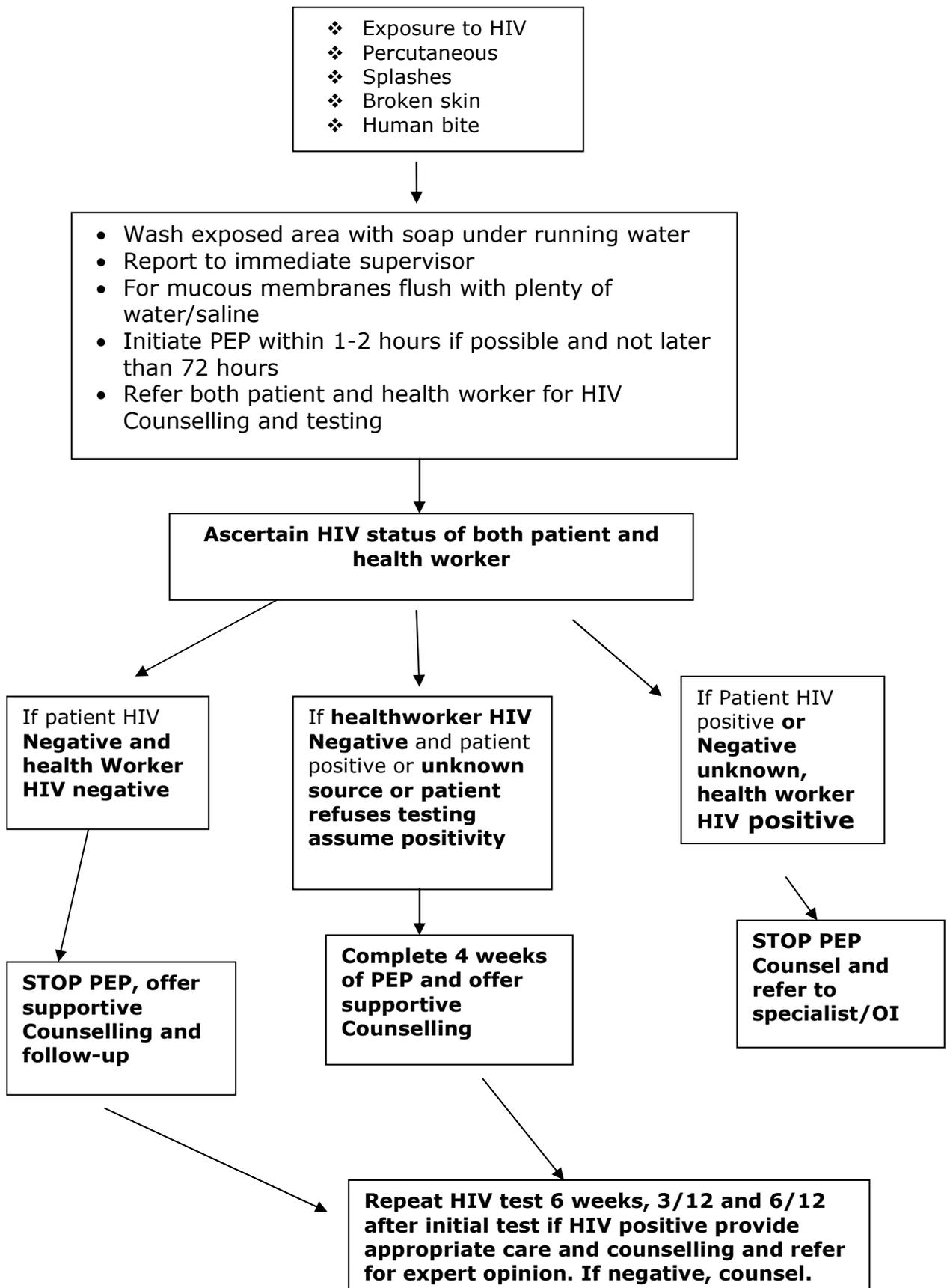
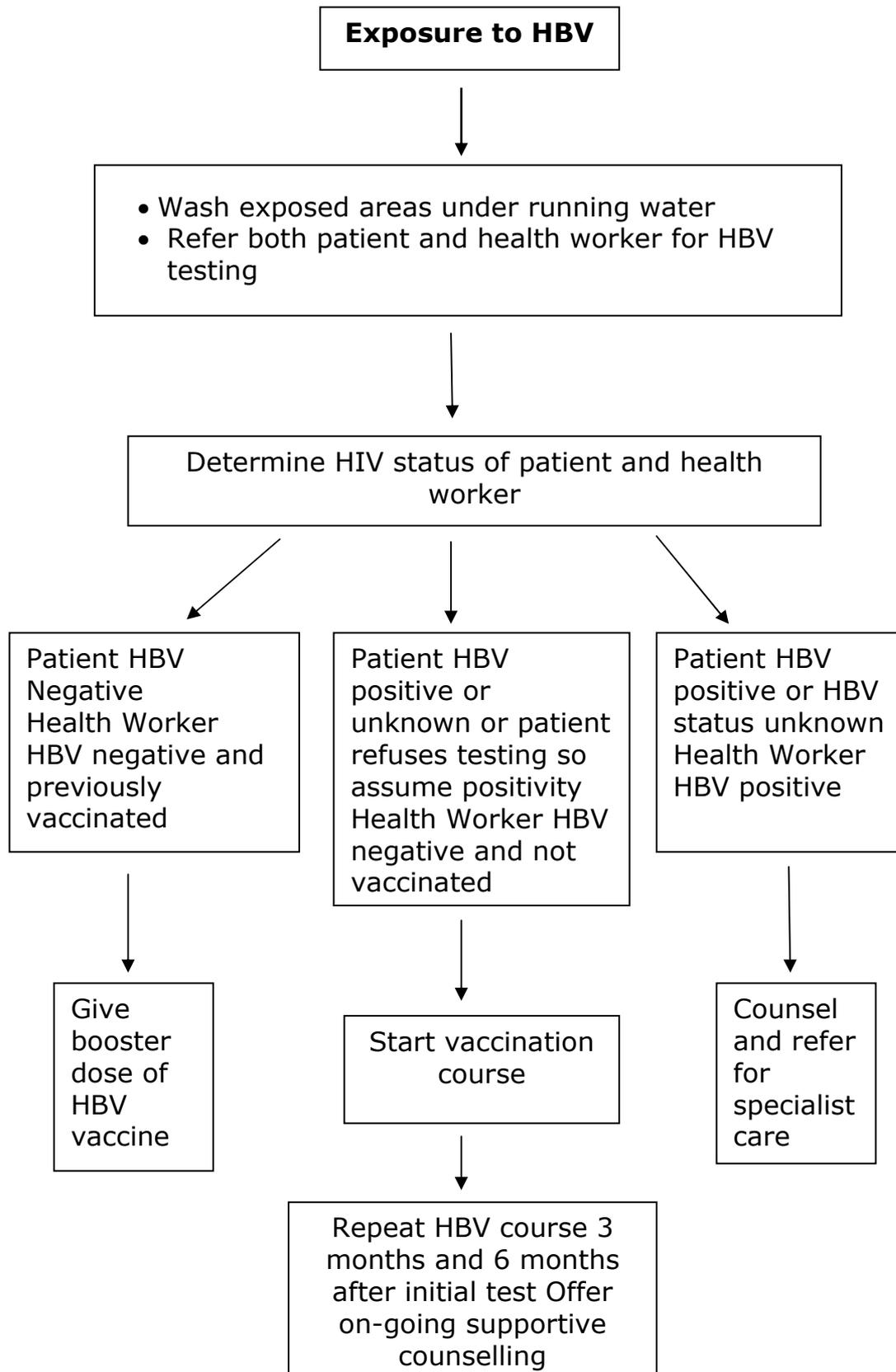


Figure 18: Flow chart for HBV post exposure prophylaxis



In HBV exposure:

- Obtain special blood tests to monitor treatment on or close to the day of the injury and two weeks later.
- Discuss with the physician the status for Hepatitis B immunoglobulin and/or Hepatitis B vaccination. If Hepatitis B immunoglobulin is indicated, this is normally given within 24 hours of exposure to give maximum protection.
- The Infection Prevention and Control Officer shall investigate every exposure incident/ accident that occurs in the health care facility. This investigation is initiated within 24 hours of the occurrence of the incident/accident.

Record Keeping

The employee completes an Accidents/Incidents and Spills Form

Confidentiality

As with all medical information, the information is confidential. Information is disclosed only with the health worker's signed consent to the ICO and Occupational Health Manager or facility risk manager for the purposes of a cause analysis to prevent a similar injury in the future..

Source: Guidelines for Antiretroviral therapy in Zimbabwe. National Drug and therapeutic Policy Advisory Committee and AIDS and TB Unit MOHCW May 2010
APIC Text , 3rd Edition, 2012. Available on line at www.apic.org

Annex 12: Safe practices dentistry

Dental units

I. Introduction

Dental patients and health care workers may be exposed to a variety of micro-organisms via blood, nasal, oral or respiratory secretions. These micro-organisms may include cytomegalovirus, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Herpes Simplex Virus Types 1 and 2, Human Immunodeficiency Virus (HIV), *Mycobacterium tuberculosis*, Staphylococci, Streptococci, *Neisseria meningitis* and other viruses and bacteria, especially those that infect the upper respiratory tract.

Infections may be transmitted in the dental clinic and dental laboratory through several routes, namely:

- Direct contact with blood, oral fluids or other secretions
- Indirect contact with contaminated instruments, clinic equipment, or environmental surfaces
- Droplet and Airborne contaminants present in either spatters or aerosols of oral, nasal and respiratory fluids.

Limiting contamination

There are means of limiting contamination by droplets, spatter, and aerosols namely:

The appropriate use of PPE by the dental worker

The use of high-velocity air evacuation

Proper patient positioning

Appropriate use of rubber dams

Avoiding contact with objects such as charts, telephones, etc. during patient treatment

Hand washing

For routine dental procedures, such as examinations and non-surgical procedures, hand washing with plain liquid soap is adequate.

For surgical procedures, an anti-microbial surgical hand scrub is recommended.

Personal Protective Equipment

Non-sterile gloves are appropriate for examination and non-surgical procedures.

Gloves designed for single use should not be washed, decontaminated or re-used.

Fluid impervious or surgical masks should be worn anytime the dentist and staff are working in close proximity to patients.

Protective eye wear/face shield should be worn:

- When lavaging with water will result in splattering or spraying
- When the dentist and/or staff has acne or dermatitis.
- When preparing a tooth with high-speed hand pieces.
- When polishing a restoration.
- Face shields should be changed when necessary.

Protective clothing:

Gowns, plastic aprons, laboratory coats, clinic jackets, should be worn for contact with patients.

Protective clothing should be changed daily or when visibly soiled or penetrated by fluids. Reusable protective clothing should be washed, using a normal laundry cycle.

Disposal of personal protective equipment

Protective garments and devices (including gloves, masks, eye and face protections) should be removed before personnel exit areas of the dental office used for laboratory or patient care activities.

Needles and Sharp Instruments and autoclavable (multi-use) syringes

- Between injections, the multi-use syringe should be re-capped using the standard single hand "scooped"* method or with a mechanical device such as a forceps to stabilize the needle sheath to prevent needle stick injury.
- Multi-use syringes should be used for the same person only.
- When an autoclavable syringe is used, the unsheathed needle should be placed in a sharps container.
- Local anaesthetic cartridges whether partially discharged or fully discharged must always be disposed of in a sharps container.
- In the event of an occupational exposure to blood or secretions the health facility-based PEP guidelines should be followed (Annex 11).

*Recapping needles is a high risk procedure and although commonly used in Dentistry will be replaced when new technology is available.

Control of Environmental Contamination

- Environmental surfaces, which are difficult to decontaminate/clean, should be covered with a disposable fluid impervious sleeve/drape (e.g. light handles, hand operated controls, X-ray unit head).
- Coverings should be changed after each patient.

Linen

Disposable drapes shall be discarded in the designated waste disposal bin.

Waste disposal

- Sharp items such as needles and scalpel blades should be placed in puncture-resistant containers marked with the biohazard label and should be sealed when three quarters full for disposal.
- Human tissue including teeth may be handled in the same manner as sharp items, but should be placed in a disposable leak proof plastic bag and sent for incineration. Extracted teeth should not be given to dental patients.
- Blood, suctioned fluids, or other liquid waste should be decontaminated (NaDCC or 0.25% sodium hypochlorite) and poured carefully into a drain connected to a sanitary sewer system.

Caution shall be taken in emptying the containers to avoid splashes or spilling of potential infectious material.

Decontamination, cleaning and sterilization of instruments and equipment

A. Generic Guidelines

Dental instruments are classified into the following categories depending on their risk of transmitting infection and the need to sterilize them between uses:

- **Critical**

Surgical and other instruments (forceps, scalpels, burs, etc.) used to penetrate soft tissues or bone. These should be autoclaved or dry heat sterilized after each use.

- **Semi-critical**

These are instruments such as mirrors and amalgam condensers, highspeed and low-speed hand piece attachments, that do not penetrate soft tissues or bone but contact oral tissues. These devices should be sterilized after each use. If sterilization is not possible, high-level disinfection should be done. Agents used for high-level disinfectant for those items which cannot be heat sterilized include OPA, hydrogen peroxide. These should be used according to manufacturer's instructions.

- **Non-critical**

These are devices that only have contact with intact skin. Clean and disinfect using a low level disinfectant e.g. blood pressure cuffs, X-ray lead aprons.

Principles of Instrument Decontamination

Decontamination is considered the most critical step in instrument processing since processes intended to kill micro-organisms (e.g. disinfection and sterilization) may not be effective if organic soil has not been removed by cleaning.

If instruments cannot be immediately decontaminated, they shall be placed in a rigid, leak-proof receptacle containing a holding solution (such as an enzymatic cleaner) to prevent hardening of proteinaceous matter until ready for processing.

The decontamination process shall be physically separated from dental treatment areas and other instrument processing functions. If instrument processing must be performed in patient treatment areas, strict separation of patient treatment, instrument decontamination, wrapping and sterilization shall be observed. (Appendix 9)

Sterilisation

Following decontamination, all reusable critical and semi-critical dental instruments that are heat stable must be sterilised routinely between uses by autoclaving, dry heat or high-level disinfection. Manufacturers' instructions should be followed.

Sterile Storage

All sterile supplies, including reusable dental items, shall be stored in a manner that will preserve their sterility until used.

B. Specific Procedures for the Dental Unit.

1. Equipment and environmental surfaces that are in contact with health care workers during patient treatment shall be barrier protected or cleaned and disinfected between patients and at the end of the day, using a 0.5% sodium hypochlorite solution. Plastic wrap or other impervious backed paper may be used to protect surfaces against contamination by blood and/or body fluids and to cover areas that are difficult to disinfect, such as:

- Handles for the overhead dental lamp
- Patient's head rest
- High speed evacuation
- Low speed evacuation
- Metal instrument tray beside dentist
- Air/water syringes on both sides of chair
- Assistant's instrument tray
- X-ray head
- Exposure button for X-ray unit.

2. Air/ water syringes (if not disposable) shall be:

Autoclaved after each patient and covered with a disposable wrap.

3. Single-use disposable instruments:

- High speed evacuator tips
- Low speed evacuator tips
- Saliva ejectors
- Air/water syringes
- Prophylaxis angles
- Prophylaxis cups and brushes
- All cotton supplies

These items shall be used for one patient only and discarded appropriately. Blood contaminated disposables shall be placed in colour-coded autoclavable bags for incineration.

4. Post-procedure decontamination and sterilization of instruments.

- High-speed dental hand piece and low-speed hand pieces components used intra-orally, reusable prophylaxis angles, and oral surgery instruments are decontaminated, cleaned and autoclaved between patients.
- Sterilization with liquid chemical agents or dry heat is not recommended for dental hand pieces and prophylaxis angles.
- Other reusable intra-oral instruments attached to, but removable from, the dental unit air or water lines, such as ultrasonic scaler tips and component parts and air/water syringe tips, shall be reprocessed as described previously (Appendix 9).
- Instruments should be dried for 20 minutes to prevent rusting then wrapped for autoclaving.
- Heavy duty gloves should be used for instrument manipulation.
- Steam sterilization cycles should run for 30 minutes at 121°C. However, a 40-minute cycle should be used for the first run of the day.
- Bowie-Dick test should be conducted daily and noted into a daily log book with the name, date and time of the test.
- Biological testing should be done quarterly and noted into a quarterly log book with the name, date and time of the test.

5. Maintenance of air and water lines

- Anti-retraction valves should be installed and maintained to reduce the risk of possible aspiration of patient material into the hand pieces and the water lines.
- High-speed hand pieces should be run to discharge water and air for a minimum of 20-30 seconds after use on each patient.
- At the beginning of each day, the water should be allowed to run for several minutes to flush the water lines that connect to the dental instruments.
- Sterile water or sterile saline should be used during procedure involving the cutting of bone.
- Devices that do not penetrate the skin or come in contact with sterile areas of the body, such as several types of endoscopes should be decontaminated, cleaned and disinfected by immersion in a 2% glutaraldehyde solution for 20 minutes.

6. Biopsy Specimens (See Section III : Isolation Precaution)

Dental laboratory

(a) Methods of Transmission

Pumice – Polishing

Acrylic – Dust
Impressions – Blood, saliva, mucus
Dentures – Repair, obturators, realign.

(b) Guidelines

1. Polishing

Pumice used in the polishing unit should be mixed with water. A detergent may be added to the water.

Change pumice in the polishing trough after the polishing of an old denture. This is so that any infection from the old denture will not be transmitted to the new denture during its subsequent polish.

2. Acrylic Dust

The operator during working off of acrylic dentures can inhale acrylic dust. Such dust can cause respiratory problems if inhaled in large quantities. The use of an appropriate facemask during these procedures will reduce or eliminate the inhalation of the infectious acrylic dust.

3. Impressions

Mucus, saliva and blood can be washed away under running water and the impressions dipped in Betadine or other disinfectants useful for this purpose. The dental technician should take precautionary measures and undertake these cleaning and disinfection procedures, while wearing gloves and goggles.

The impressions should be immersed in an appropriate high-level disinfectant for recommended contact time. The solution is discarded after use.

Re-usable impression trays should be decontaminated, cleaned and heat sterilized between patients.

(c) Treatment of Prostheses Entering the Laboratory

A combination of factors, including time considerations and the lack of heat stability of many items, makes heat sterilization of all prostheses entering the laboratory impractical. For most prostheses, cleaning and chemical disinfection will remain the principal mechanism of reducing contamination. The following general procedures are recommended:

- Initially scrub all prosthetic devices with a brush and antimicrobial soap to remove gross debris and contamination.
- Heat sterilize brushes or store them in a container filled with an approved disinfectant.
- Immerse prostheses in a solution of 0.5% sodium hypochlorite or other intermediate to high-level disinfectant for the recommended contact time.
- After disinfection, rinse the prostheses under running tap water, dry and complete required work.

(d) Practices for the Dental Laboratory

Receiving area – A receiving area should be established separate from the production area. Countertops and work surfaces should be cleaned and then disinfected daily with an appropriate surface disinfectant used according to the manufacturer's directions.

Incoming cases – All cases shall be disinfected as they are received. Containers shall be sterilized or disinfected after each use. Packing materials shall be discarded to avoid cross contamination.

Disposal of waste materials – Solid waste that is soaked or saturated with blood or body fluids should be placed in sealed, sturdy impervious bags. The bags should be autoclaved then incinerated.

Production area – Persons working in the production area should wear a clean uniform or laboratory coat, a face mask, protective eyewear and disposable gloves. Work surfaces and equipment should be kept free of debris and disinfected daily. Any instruments, attachments and materials to be used with new prostheses or appliances should be maintained separately from those to be used with prostheses or appliances that have already been inserted in the mouth. Brushes and other equipment should be disinfected at least daily.

Outgoing cases – Each case should be disinfected before it is returned to the dental clinic. Dentists should be informed about infection control procedures that are used in the dental laboratory.

Education

All dental staff should have staff development on infection prevention and control (orientation and initial in-service education plus annual refresher training). A log book of attendees should be maintained with the name, date and times of training. Dentists, dental assistants and dental therapists should also be part of the IPCC.

Annex 13: Safe practices in the laboratory

Introduction

The primary goal of this section is to provide basic information on laboratory bio-safety. More in-depth information can be found in manuals detailing the subject.

Biosafety Guidelines

- All laboratory personnel and others whose work requires them to enter the laboratory must be knowledgeable about the chemical and biological hazards with which they will come in contact through their normal work in the laboratory, and be trained in appropriate safety precautions and procedures.
- All situations in the laboratory that should be dealt with as an emergency should be clearly identified and made known to all employees of the laboratory.
- All laboratory employees should be competently trained to deal with emergency procedures.
- All laboratories must have clear written procedures for dealing with spillages or other accidental contamination.
- The laboratory should be kept neat, orderly and clean, and storage of materials not pertinent to the work shall be minimized.
- Protective laboratory clothing (uniforms, coats, gowns) should be made available, and worn properly by all personnel including visitors, trainees, and others entering or working in the laboratory. Protective laboratory clothing should not be worn in non-laboratory areas. Suitable footwear with closed toes and heels and preferably with non-slip soles should be worn in all laboratory areas.
- Safety face and eyewear, (e.g. glasses, goggles, face shields, or other protective devices) should be worn when necessary to protect the face and eyes from splashes, impacting objects, harmful substances, UV light, or other rays. Contact lenses should be worn only when other forms of corrective eyewear are not suitable, and always with goggles.
- Eating, drinking, smoking, storing food or utensils, reading newspapers, applying cosmetics, and inserting or removing contact lenses should not be permitted in any laboratory work area.
- Long hair should be tied back or restrained.
- Oral pipetting is prohibited in any laboratory.
- Hypodermic needles and syringes should be used only for parenteral injection and aspiration of fluids from laboratory animals and diaphragm bottles. Extreme caution should be used when handling needles and syringes to avoid needlestick injury and the generation of aerosols during use and disposal. Needles should not be bent or re-capped, and should be promptly placed in a puncture-resistant container for disposal.
- Latex gloves should be worn for all procedures that might involve direct skin contact with toxins, blood, infectious materials, or infected animals. Gloves shall be removed carefully and treated and disposed as contaminated material as described below. Heavy duty rubber gloves shall be decontaminated as per manual guidelines.
- After removal of gloves hands shall be washed before leaving the laboratory and at any time after handling materials known or suspected to be contaminated.
- Work surfaces should be cleaned and decontaminated with suitable disinfectant at the end of the day and after any spill of potentially dangerous material. Loose or cracked work surfaces should be replaced.
- All technical procedures should be performed in a manner that minimizes the creation of aerosols.
- All contaminated or infectious liquid or solid materials including culture plates, should be autoclaved before disposal or reuse or disposed as biological waste. Contaminated materials that are to be autoclaved or incinerated at a site away from the laboratory shall have the outside disinfected chemically or be double-bagged and then transported to the autoclave or incinerator in durable leak-proof containers which are

closed and wiped on the outside with disinfectant before being removed from the laboratory.

- Access to the laboratory should be severely restricted at Levels 3 and 4. Decisions on entry into Levels 1 and 2 laboratories should be at the discretion of the lab manager (e.g. only persons who have been advised of the potential hazards and meet any specific requirements such as immunization should be allowed to enter the laboratory area).
- Hazard warning signs shall be posted outside laboratories operating at Levels 2, 3 or 4. Where the infectious agent(s) used in the laboratory require special provisions for entry, the relevant information should be included in the sign.
- All spills, accidents/incidents and overt or potential exposures should be reported in writing to the supervisor. The Accident/Incident Spill Report Form shall be completed. Appropriate medical evaluation, surveillance, and treatment shall be provided as required.
- Laboratory personnel should be protected against relevant infection by vaccination where possible.

Source: * Biosafety Guidelines. <http://www.duke.usask.ca/~whiteiv/bioman3c.html>; WHO Laboratory Biosafety Manual 3rd edition 2004

Classification of biological agents

The inherent risks of a pathogen are judged according to:

- The severity of the disease it causes
- Routes of infection
- Its virulence and infectivity
- Existence of effective therapies
- Vaccination
- Presence or absence of vectors.

Biological agents are classified into four (4) risk groups, which primarily reflect the judgments made on their inherent risk. There are four (4) corresponding levels of containment.

Biological spills

Biological spills outside biological safety cabinets will generate aerosols that can be dispersed in the air throughout the laboratory. These spills can be very serious if they involve micro-organisms that require Level 3 containment, since most of these agents have the potential for transmitting disease by infectious aerosols. To reduce the risk of inhalation exposure in such an accident, occupants should leave the laboratory immediately. The laboratory should not be re-entered to decontaminate or clean up the spill for at least one hour. During this time the aerosol may be removed from the laboratory via the exhaust ventilation systems, such as biological safety cabinets or chemical fume hoods, if present (see Table 17 for cleaning and disinfection in the laboratory).

Spills on the Body

- Remove contaminated clothing. Soak affected area of clothing in disinfectant and place in a plastic bag. Send to laundry. If contaminated with a risk level 4 organism the clothing should be incinerated
- Wash exposed area vigorously with soap and running water for one minute.
- Report the incident to the laboratory supervisor.
- Obtain medical attention (if necessary).

Biosafety Level 1 Organism Spill

- Wear disposable gloves.
- Soak paper towels in disinfectant and place over spill.

- Place paper towels in a plastic bag for disposal.
- Clean up spill area with fresh paper towels soaked in disinfectant.

Table 16: Summary of Risk Groups and Levels of Containment *

Risk Group	Biosafety Level	Description of organism type	Containment Level	Examples of pathogens handled at this level
1	Basic Biosafety Level 1	Agents most unlikely to cause human disease.	Good microbiological practice recommended for all work with microorganisms should minimize risks for inadvertently culturing pathogenic organisms or non-pathogenic organisms proving harmful. Basic teaching lab	<i>Bacillus subtilis</i>
2	Basic Biosafety Level 2	Agents that may cause human disease and may be a hazard to laboratory workers but unlikely to spread to community. Laboratory exposure rarely produces infection. Effective prophylaxis or treatments are usually available.	Good microbiological practice mandatory, including protective clothing and biohazard sign Most work can take place on open bench but safety cabinets are required for operations generating significant aerosols Diagnostic services Research Laboratory	<i>Salmonella</i> spp. <i>Shigella</i> spp. <i>Streptococcus pneumoniae</i> <i>Staphylococcus aureus</i> <i>Cryptococcus neoformans</i>
3	Containment Biosafety Level 3	Agents that may cause serious human disease and may be a hazard to laboratory workers. May be high risk of spread to community. Effective prophylaxis is usually available.	Risks of airborne contamination reduced by working in biosafety cabinets (Level 1 or 2) Restricted access Directional airflow	<i>Mycobacterium tuberculosis</i> <i>Histoplasma capsulatum</i> <i>Bacillus anthracis</i>
4	Containment Biosafety Level 4	Agents that cause severe human disease and are a serious hazard to laboratory workers. May be high risk of spread to community. Usually no effective prophylaxis or treatment available.	Work performed in closed cabinets in maximum containment laboratories with airlock entry and shower exit, special waste disposal	Ebola virus Marburg Virus

Sources: Health Canada. Laboratory Biosafety Guidelines. http://www.hc-sc.gc.ca/hpb/lcdc/biosafety/docs/lbg4_e.html; WHO Laboratory Biosafety Manual 3rd edition 2004

Biosafety Level 2 Organism Spill

- Alert people in immediate area of spill.
- Put on additional personal protective equipment. This may include a back fastening gown or jumpsuit, disposable shoe covers, safety goggles, surgical mask or full-face shield.
- Cover spill with paper towels or other absorbent materials.
- Pour a freshly prepared 1% hypochlorite (10,000ppm available chlorine) around the edges of the spill and then into the spill. Avoid splashing (see Section VIII: Housekeeping).
- Allow a 10-15 minute contact period.
- Clean up the spill area with fresh paper towels soaked in disinfectant, after the spill has been absorbed.
- Place paper towels in a plastic bag and incinerate or burn.

Biosafety Level 3 Organism Spill

- Attend to injured or contaminated persons and remove them from exposure.
- Remove contaminated clothing and shower and seek medical attention
- Alert people in the laboratory to evacuate.
- Close doors to affected area.
- Call appropriate emergency number for emergency response.(i.e. n
- Notify safety officer, infection control focal person)
- The spill should be dealt with by designated personnel wearing gown, apron and a respirator. The spill can be treated with disinfectant as for Biosafety Level 2

Biosafety Level 4 Organism Spill

Follow the procedure for Biosafety level 3. For protective clothing use scrub suits, rubber boots, gloves, a second pair of gloves, a respirator, head cover and protective eye wear

(Refer to WHO, USDHHS, CDC. Infection Control for Viral Hemorrhagic Fevers in African Health Care Setting. WHO/EMC/ESR/98.2).

Blood Spills

See Standard Precautions and Housekeeping.

General first aid

1. First aid is defined as any one-time treatment of scratches, cuts, burns, splinters before medical care.
2. First aid equipment should be readily available in each laboratory.
3. Following any first aid, a nurse or physician qualified to handle chemical emergencies should provide further examination and treatment.
4. It is recommended that each laboratory have staff trained in basic first aid and cardiopulmonary resuscitation.
5. Someone knowledgeable about the accident/incident should always accompany the injured person to the medical facility.
6. Minor injuries requiring first aid should always be reported to a supervisor and recorded on an Injury/Exposure Report Form. Reasons for this are as follows:
 - A minor injury may indicate a hazardous situation, which should be corrected to prevent future injuries.
 - It is important to document an injury as having been "work related" if the injury later leads to serious complications, such as from an infected cut. A copy of the injury report should go to the IC officer and Employee Health Officer so that an analysis of the incident may be taken to improve future practices.

Personal Protection during First Aid

Persons responding to a medical emergency shall adhere to Standard Precautions.

1. For most situations in which first aid is given, the following guidelines should be adequate:
 - For controlling minimal bleeding and for handling and cleaning instruments with microbial contamination, disposable gloves should be sufficient.
 - For controlling severe bleeding, disposable gloves, a gown, a surgical mask and protective eye wear are recommended.
2. After care has been rendered, hands and other skin surfaces shall be washed immediately and thoroughly with soap under running water and dried with disposable towels. Hands should always be washed after gloves are removed, even if the gloves appear to be intact.

Cleaning and disinfection in the laboratory

It is important that a regular routine of cleaning and disinfection is maintained to ensure a safe working environment in the laboratory. Disinfectants recommended for use are listed in Table 17. Daily records should be kept in 'cleaning and disinfection' logs.

Table 17: Cleaning and Disinfection in the Laboratory

Item	Agent	Procedure/Remarks
Equipment		<p>All disposables must be discarded in black bags or sharps containers and incinerated.</p> <ul style="list-style-type: none"> • Equipment, which has become contaminated, must be rendered safe to handle before it is thrown away or washed and used again.
<p>Blood analyser</p> <p>Centrifuges</p> <p>Incubator</p>	<p>Disinfect according to manufacturer's instructions.</p> <p>For routine use:</p> <ul style="list-style-type: none"> • Methylated spirit. <p>After breakages:</p> <p>1% hypochlorite</p>	<ul style="list-style-type: none"> • Wipe with tissue or cotton wool soaked in alcohol at the end of the day. <p>After breakages:</p> <ul style="list-style-type: none"> • Flood affected area with disinfectant. Leave for no longer than 10 minutes. • Remove with tissue or cotton wool and rinse with clean water. • Dry thoroughly.
<p>Laboratory discard Jars</p> <p>(Collect only reusable glassware and instruments)</p>	<ul style="list-style-type: none"> • Sodium hypochlorite 0.25% (2500 ppm). 	<ul style="list-style-type: none"> • Soak in disinfectant for a minimum of 10 minutes, wash thoroughly. • Do not soak metal instruments longer than the recommended time as they will corrode (autoclave if possible). • Rinse thoroughly first with tap water. • Never top-up discard jars. • Use 'in-use' disinfectant test to monitor effectiveness of disinfectant as level of organic matter will vary daily • Wash container thoroughly after use.
<p>Other laboratory glassware and instruments</p>	<p>Steam sterilize where possible to render glassware safe to handle. If disinfection is necessary use:</p> <ul style="list-style-type: none"> • Sodium hypochlorite 0.25% (2500 ppm). 	<p>Soak equipment for at least 30 minutes.</p> <ul style="list-style-type: none"> • Rinse clean according to laboratory requirements

Table 17: Cleaning and Disinfection in the Laboratory (Contd.)

Item	Agent	Procedure/Remarks
Safety cabinet	Sodium hypochlorite 0.5%. To treat spills, refer to policy. If cultures inoculated in the cabinet are consistently contaminated fumigate with formaldehyde.	Ensure cabinet is sited correctly. If not, it will not function effectively. Wipe bench and inner walls at end of every day. Check air-flow regularly and change filters as per manufacturer's instructions. Fumigate only if absolutely necessary and before filters are changed. Fumigation is a high-risk procedure and should be supervised by experienced personnel.
Environment (refer to Section VIII: Housekeeping)		
Bench tops Floors Walls	<ul style="list-style-type: none"> • Sodium hypochlorite 0.5%. • To treat spills refer to policy. • Liquid detergent and water. • To treat spills refer to policy. • Liquid detergent and water. • To treat spills refer to policy. 	Wipe at the end of each day or as necessary. Walls adjacent to bench top that may come into contact with contaminated aerosols should be disinfected at the same time. Wash floors daily and as necessary. Wash walls weekly.

Source: The Zimbabwe Essential Drugs Action Program. Disinfection in Health Care Facilities in Zimbabwe. Harare: Ministry of Health and Child Welfare, 2001.

Annex 14: Mortuary

Degree of risk of transmission

Pathologists and mortuary staff may be exposed to a variety of micro-organisms during the procedures required when handling dead bodies. The degree of risk of transmission of infections depends on the pathogen involved.

High risk

Hepatitis B and C	Rabies
Viral Hemorrhagic Fever	Anthrax
Plague	Ebola

Moderate risk

Hepatitis A	Poliomyelitis
Diphtheria	Dysentery
Cholera	Meningococcal septicemia ± meningitis
Typhoid/paratyphoid fever	Tuberculosis

Low risk

Leprosy	Tetanus
Measles	Mumps
Rubella	Whooping cough
Ophthalmic neonatorum	

Exposure to the pathogens causing infection can be through a number of routes:

- Aerosols, particles and splashes generated during a post mortem
- Air expelled from the lungs when lifting a body
- Leaking fluids
- Sharps injuries with instruments, damaged bones, spicules

The mortuary staff should be notified of the degree of risk associated with the handling of the body by either the nursing staff or the attending physician.

Limiting transmission of infection

Personal Protective equipment

- Scrub suits, plastic aprons, goggles, surgical masks should be worn for all post mortem procedures (unless TB, MDR or XDR-TB is noted then use an N-95 respirator) gum boots, caps, mortuary gloves.
- Grey dust coats should be worn when transporting specimens to the laboratory

Disinfectant use:

- Phenolics 1-2%
- Chlorine- based disinfectants. Use 0.5% for environmental cleaning and for spills

Annex 15: Surveillance

Introduction

There are several definitions of surveillance; the core is captured in this definition for health facility based surveillance:

1. The regular collection, collation and analysis of information on infection events and rates, either continuously or at regular intervals and the timely dissemination and feedback to those who need to know.
2. Surveillance is also defined as systematic, active ongoing observation of occurrence of disease in a population and of the events that increase or decrease the risk of the disease occurrence. If the incidence, distribution and associations of the diseases are known, then resources can be targeted, and the incidence reduced. (This definition can be applied to both hospital and community based surveillance)

In a Health facility environment surveillance determines:

- Incidence/prevalence of infection acquired in a hospital /clinic
- Effectiveness of infection prevention and control procedures
- Presence of "Alert Organisms" which require:
 - investigation for hospital transmission e.g. MRSA or TB
 - special infection control procedures
 - notification

The collection of quality data helps to:

- Identify problem areas and allow focused solutions
- Plan for budgets, staff allocation and the purchase of appropriate equipment
- Motivate staff to use the correct infection control practices

Carrying out surveillance is part of the ICC team/committee's function. The key objective is to detect and contain pathogens or clinical conditions related to healthcare associated infections (HAI) which may result in clusters or common source outbreaks. The information gathered from surveillance is used to formulate new policies or revise current policies. Surveillance has shown to effectively reduce HAI over a period of time.

Planning a surveillance programme

Responsibility

The surveillance programme is the responsibility of the ICC chair and the IC officer. However the role of the ICC is strengthened by the addition of other members of the ICC to the surveillance team. These could include for example a microbiologist from the laboratory, the pharmacist or pharmacy technician.

Basic Principles

Surveillance programs should be based on sound epidemiological and statistical principles. If surveillance data are properly collected and analysed, they can provide information that can be used to improve the quality and outcomes of healthcare and to promote public health.

Those who are responsible for implementing and assessing surveillance programmes should be familiar with the general principles of epidemiology.

Definitions

The following are definitions of terms, as used in healthcare surveillance. Many of the definitions are adapted or taken from the "Principles of Epidemiology in Public Health Practice: An Introduction to Applied Epidemiology and Biostatistics."

Attack rate: type of incidence rate used to measure the frequency of new cases of a disease or condition in a specific population during a given time period; expressed as a percentage.

Baseline: the number or value used as the basis for comparison.

Case: an instance of a particular disease, injury, or other health condition that meets selected criteria.

Case definition: a set of uniformly applied criteria for determining whether a person should be identified as having a particular disease, injury, or other health condition; usually incorporates clinical, laboratory, and other diagnostic criteria.

Cluster: a group of cases that occurs closely related in time and place without regard to whether the number of cases is more than expected (often the expected number is not known).

Denominator: the lower portion of a fraction used to calculate a rate or ratio.

Distribution: frequency and pattern of an event in a population.

Endemic: usual presence of a disease or condition in a specific population or geographical area.

Epidemic: the occurrence of more cases of a disease than expected in a given area or among a specific group of persons during a specified time period; synonym of outbreak.

Epidemiology: the study of the distribution and determinates of health conditions or events in specified populations and the application of this study to the control of health problems.

Incidence rate: a measure of the frequency with which an event occurs in a population over a defined time period. The numerator is the number of new cases occurring during the defined time period, and the denominator is the population at risk.

Numerator: the upper portion of a fraction used to calculate a rate or ratio. In surveillance, it is usually the number of cases of a disease or event being studied.

Population: the total number of persons in a specified place or group.

Prevalence: the number of cases or events or conditions occurring in a population.

Prevalence rate: the proportion of persons in a population who have a particular disease or condition at a specified point in time (point prevalence) or over a specified period (period prevalence).

Proportion: a type of ratio in which the values in the numerator are included in (i.e., are a subset of) the denominator.

Rate: an expression of the frequency with which an event occurs in a defined population per unit of time. In healthcare surveillance, it is often used more casually to refer to proportions that are not truly rates (e.g., attack rate or incidence density rate).

Ratio: the value obtained by dividing one quantity by another.

Sensitivity: the ability of a test, case definition, or surveillance system to identify true cases (persons who have the health condition of interest).

Specificity: the ability of a test, case definition, or surveillance system to exclude persons who do not have the health condition of interest.

Validity: the degree to which a measurement, test, study, or other data collection method actually measures or detects what it is supposed to measure.

Basic Statistical Measures Used for Surveillance

Common statistical measurements used in surveillance programs in the healthcare setting are measures of frequency (e.g., rates, ratios, and proportions), measures of central tendency (e.g., mean and median), measures of dispersion (e.g., standard deviation), and percentiles. They are described briefly here.

Measures of Frequency

Rates, ratios, and proportions are used to measure the occurrence and risk of an event in a specific population during a given period. These frequency measures are based on the same formula: $x/y \times 10^n$, where x (the numerator) and y (the denominator) represents the two groups being compared and 10^n represents a constant.

Rates

Rates can be used to track trends and to monitor changes in the frequency of an event in a population from one time period to another (e.g., the occurrence of bloodstream infections in patients in an intensive care unit [ICU] before and after interventions implemented to reduce the risk of infection). The most commonly used rates in surveillance programs for healthcare settings are incidence, attack, incidence density, and prevalence.

An incidence rate measures the occurrence of new cases or events in a specific population during a given time period. The formula for calculating an incidence rate is $x/y \times 10^n$ where x is the number of new cases or events in a population during a given time period, y is the number in the population at risk during that time period, and 10^n is used to transform the result into a number that has at least one digit to the left of the decimal point. An attack rate is a type of incidence rate that is expressed as cases per 100 population, or as a percentage (i.e., where n is 2 and $10^n = 100$). An incidence density rate is another type of incidence rate in which time, such as device-days or patient-days, is incorporated into the denominator. The formula for incidence density is the number of new cases in a population during a given time period divided by the time each person in that population is observed during that period, totaled for all persons $\times 10^n$.

A prevalence rate measures the occurrence of existing (old and new) cases in a specific population during a given time period. The formula for prevalence rate is the number of existing cases in a population during a specific time period/number in that population during that time period $\times 10^n$.

Ratios and Proportions

A ratio is a fraction in which the values in the numerator (x) may or may not be included in the denominator (y). A ratio can be used to express a relationship between two independent groups. A proportion is a ratio in which the population in the numerator is a subset of the population in the denominator. A proportion is frequently expressed as a percentage.

Examples using ratios and proportions:

In a 6-month period, 39 patients in a critical care unit developed TB—26 cases are female and 13 are male.

1. The ratio of female cases to male cases is determined using the formula $x/y \times 10^n$ in which x is 26, y is 13, and 10^n is 1 ($n = 0$). The ratio of females to males would be $26/13 \times 1 = 2/1$ or 2:1. Thus there are two females for every male, or twice as many females as males who developed VAP. In this ratio, the values in the numerator (females) are not included in the denominator (males).

2. The proportion of the 39 TB cases who are male would be calculated using the formula $x/y \times 10^n$ in which x is 13, y is 39, and n is 0. The proportion of cases who are male would be $13/39 \times 1 = 1/3$ or 1:3. Thus one third or one of every three, TBP cases are male. This proportion can be expressed as a percentage if 10^n is 100 ($n = 2$) where $13/39 \times 100 = 33\%$. In a proportion, the values in the numerator are always a subset of those in the denominator.

Measures of Central Tendency

Measures of central tendency describe the values around the middle of a set of data. Two measures of central tendency used in healthcare surveillance are the arithmetic mean and the median. The mean is the mathematical average of the values in a set of data. Although the mean is commonly used, it is important to remember that its value is affected by outliers (extremely low or high values). The median is the middle value in a ranked set of data. Because half of the measurements in the data set lie below the

median and half of the measurements lie above it, the value of the median is not affected by outliers.

Measures of Dispersion

Measures of dispersion measure the distribution of a set of data around its mean. Commonly used measures of dispersion in hospital epidemiology are the range, deviation, variance, and standard deviation.

The range is the difference between the smallest value and the largest value in a set of data. The deviation is the difference between an individual value in a data set and the mean (average) for the set. The variance is the deviation around the mean of a distribution. The standard deviation is a measure that reflects the distribution of values around the mean.

Percentiles

Percentiles are used to indicate the relative position of a measurement with respect to other measurements in a set of data. The median is the 50th percentile in a distribution of numbers because half of the values in the distribution are lower and half are higher than the median value. In addition to the median, commonly used percentiles for reporting surveillance data are the 10th, 25th, 75th, and 90th percentiles

Surveillance Methodologies

Surveillance has four fundamental components:

- Collection of data
- Analysis
- Interpretation
- Dissemination to decision makers/stakeholders

The data collected will be dependent on the objectives of the surveillance and the action to be taken at the end of the surveillance. Surveillance must have a clear purpose and use standard definitions.

Six methods of surveillance that can be used in a health facility environment are outlined below. The extent and complexity of the programme will depend on the availability of resources and the time available.

Clinical Review

The patient's clinical notes are used as the source of information which can provide clues to possible nosocomial infection.

The following information can be collected and entered into a clinical review record log:

- Patient's Ward
- Gender
- Age
- Date of admission
- Presence and number of invasive devices
- Artificial ventilation
- Antibiotics prescribed
- Evidence of pyrexia
- Underlying risk factors e.g. diabetes, hypertension, Filariasis or obesity
- Nature and site of wound (if any) and evidence of wound breakdown

If the information collected suggests a nosocomial infection further investigation in the clinical management and associated infection control practices will help to identify the cause of the problem and suggest solutions.

This type of surveillance requires minimal resources and is dependent on well maintained, up to date clinical records.

Routine Ward/Clinic Rounds

These are essential tools to monitor infection control practice and should be done at least weekly and daily in the event of an investigation or an outbreak. These will:

- Provide support for Ward/Clinic staff and identify problems in infection control supplies
- Identify any new infections in critical/problem areas
- Allow time to discuss individual patients and review records

Regular IPC Ward Rounds encourages the development of a good working relationship between the IPCO and the other health workers. The IPCO is able to assess infection control practice and through informal teaching has an opportunity to improve areas of weakness.

Laboratory based (ward-linked) surveillance

The Laboratory records daily:

- All positive culture reports either from all specimens sent to the laboratory OR
- From selected specimens e.g. blood culture, wound swabs, CSF, stool, urine and sputum OR
- In relation to selected 'Alert Organisms' which can be determined by the individual Health Facility (See Table 16 for examples).

The following data should be collected:

- Patients Name and Hospital Number
- Ward Name and Date Specimen collected and sent to Laboratory
- Type of Specimen
- Organism isolated
- Antibiotics tested and susceptibility of organism (sensitivity and resistance)
- Details of clusters (more than one) of species with the same pattern of sensitivity and susceptibility (antibiogram) in patients from the same unit of the health care facility. A cluster may indicate an outbreak in that unit

If there is any doubt as to the significance of the results the ICO should consult the microbiologist in charge and if necessary the Clinician responsible for the patient.

On the Ward/Clinic

The ICO visits the staff responsible for the ward/clinic and the patients with positive results to institute preventative infection control measures including isolation if necessary or to identify the possible outbreak of infection and appropriate solutions

Table 18: Examples of organisms that can be included on the alert organisms list

No.	Category	Unit/Ward	Examples of "alert organisms"
1.	Clusters of infections caused by the same pathogen within the same unit (or originating from the same unit)	Burns unit	<i>Pseudomonas</i> sp. <i>Staphylococcus aureus</i>
		Surgical ward	Gram negative bacteria: <i>Escherichia coli</i> <i>Pseudomonas</i> spp Gram positive bacteria: <i>Streptococcus faecalis</i> <i>Staphylococcus aureus</i>
		Pediatric ward	Diarrheal pathogens e.g. <i>Salmonella</i> spp. Skin infections e.g. <i>Streptococcus pyogenes</i>
2.	Notifiable pathogens requiring standard precautions and additional transmission based precautions	Any unit/ward	<i>Salmonella typhi</i> <i>Vibrio cholerae</i> <i>Mycobacterium tuberculosis</i> (or AFB positive sputum smear) <i>Neisseria meningitidis</i> <i>Clostridium difficile</i>
3.	Surgical wound infections	Surgical wards	<i>Escherichia coli</i> <i>Pseudomonas</i> spp <i>Streptococcus faecalis</i> (<i>Enterococci</i>) <i>Staphylococcus aureus</i>
4.	Multi drug resistant (MDR) bacteria from any source		MDR <i>Klebsiella</i> sp. MDR <i>Pseudomonas</i> spp Methicillin resistant <i>Staphylococcus aureus</i> (MRSA) MDR/XDR <i>Mycobacterium tuberculosis</i> Vancomycin resistant Enterococci (VRE)

Advantages:

- This is an effective practical form of surveillance
- Outbreaks are detected more quickly and easily
- Multi-drug resistant pathogens are identified and isolated
- Patients with a positive AFB result/communicable infection can be quickly isolated and/or transferred to an infectious disease hospital if possible.
- Gives a good overall view of the prevalence of nosocomial pathogens in the hospital environment.
- Assists the ICO identify which patients and areas require special attention.
- Can also be combined with in-depth surveillance of high risk areas
- The use of the 'alert organism' list reduces the time required for this type of activity and means the surveillance can be tailored to the facility requirements

Disadvantages:

- Patient may be colonized with e.g. a multi-drug resistant organism but show no signs of infection
- Patients chart must be reviewed in depth to assess significance of infection
- Is only possible in a facility with a functioning microbiology laboratory using standardized antibiotic susceptibility testing procedures.

Targeted surveillance

This type of surveillance uses methods which allow the IPCO to focus attention directly on potential infection control problems. This also allows the use of limited time more effectively to identify nosocomial infections.

Targeted surveillance may focus on:

- Site specific surveillance: e.g. UTIs, wound infections, chest or lung infections
- Unit directed, targeting specific areas e.g. ICU, burns unit, OI clinic or neonatal unit
- Medical devices (e.g., intravascular and urinary tract catheters), invasive procedures (e.g., surgery)
- Organisms of epidemiological significance (e.g., methicillin-resistant *Staphylococcus aureus* [MRSA] and TB).

Targeted programs usually focus on high-risk, high-volume procedures and on those HAIs and adverse outcomes that are potentially preventable.

Hospital wide (comprehensive) surveillance

This type of surveillance is done in order to detect the prevalence of nosocomial infections in the health facility.

The following method is used: All patients are observed over a defined time period e.g. one month

Relevant information is recorded including:

- Total number of patients admitted in the time period
- Length of stay
- Sex and age of patients
- Area to which admitted
- Invasive procedures performed
- Evidence of nosocomial infection and site of infection

This type of surveillance will give an assessment of the quality of care in the health facility and if repeated annually can also be used to assess the effectiveness of new infection control measures. However, it is a time consuming exercise, inefficient and expensive. The information collected cannot be used to calculate an overall facility infection rate; rather, rates should be calculated for specific HAIs in defined populations in the facility, such as central line-associated bloodstream infections in an ICU or surgical site infections after a specific operative procedure. Overall rates have been discouraged by most experts because crude overall rates are not sensitive enough to identify potential problems and therefore cannot be used to target performance improvement activities. In addition, they are not appropriate for measuring trends over time, making comparisons between groups either within a facility or between facilities, or benchmarking.

Computer generated surveillance

There are a number of computer software programs that are used to collect and analyze clinical and laboratory data relating to the management of patients. Many of these programs can be used for the statistical analysis of infection control data; however they are expensive and can only be used in areas that have a consistent supply of electricity.

Developing a surveillance programme that suits the facility

The type of surveillance selected will depend on the time available to do the surveillance and the back-up facilities in terms of laboratory support and the available budget. For a hospital with a microbiology facility the laboratory-based surveillance is very effective. If the laboratory support is not available then the clinical review would provide useful information.

So it is important to develop a balanced approach for the IPCO to participate actively in the ward or clinic rounds, reinforcing and mentoring best clinical practices and collecting data for a surveillance of infections of interest to the IPCC.

Data Presentation

Once data have been gathered and analyzed, they must be presented clearly and concisely, greatly helping others to understand the study, why it was done, and the outcomes. Data are generally presented graphically in one of three forms: tables, graphs, or charts. All well-constructed tables, graphs, and charts present a limited amount of information that is easily understood, and, ideally, each can stand alone.

Resources

The Association for Professionals in Infection Control and Epidemiology

The Association for Professionals in Infection Control and Epidemiology (APIC) was established in 1972 to provide education and science-based information to strengthen and improve the practice of infection prevention.

Centers for Disease Control and Prevention

CDC has IPC documents and references freely available via the internet at, <http://www.cdc.gov> and also has specific TB infection control implementation materials for free downloading at <http://www.cdc.gov/globaliads/Resources/pmtct-care/tuberculosis-infection-control.html>

The World Health Organization (WHO) has a number of documents related to IPC and TB accessible on the website <http://www.who.int/about/en/>

The International Federation of Infection Control (IFIC)

Is an organization of societies and associations of healthcare professionals in infection control and related fields worldwide. The goal of IFIC is to minimize the risk of infection within the healthcare setting world-wide through development of a network of infection control organizations for communication, consensus building, education and sharing expertise. is an umbrella organization. Membership in IFIC is extended to societies of healthcare professionals in infection control and related fields in countries throughout the world. Their website is <http://www.theifc.org/>

The Infection Prevention Society

Their website is <http://www.ips.uk.net/>

Infection Control Association Network (ICAN)

ICAN was created in 2009 to address the needs of new infection control officers and practice guidance in Africa. Their website is <http://www.ICANetwork.co.za>

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