



**REPUBLIC OF NAMIBIA**  
**MINISTRY OF HEALTH AND SOCIAL SERVICES**

# **Infection Prevention Control Guidelines**

**March 2010**

**MINISTRY OF HEALTH AND SOCIAL SERVICES**

**INFECTION, PREVENTION AND CONTROL GUIDELINES**

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**March 2010**

# INFECTION, PREVENTION AND CONTROL GUIDELINES

MINISTRY OF HEALTH AND SOCIAL SERVICES  
WINDHOEK, NAMIBIA



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## **Preface**

Hospital infection (nosocomial infection) can be defined as any illness contracted in hospital as a result of admission or treatment received. Healthcare associated infection (HAI) on the other hand refers to infections associated with healthcare delivery in any setting (e.g. hospitals, ambulatory settings and home care). The term (HAI) considers the inability to determine for certain where the pathogen is acquired since patients may be colonized with or exposed to potential pathogens outside the healthcare setting. Concerns for hospital infection and the control thereof have been an issue since the 18<sup>th</sup> century.

Hospital infection is a major contributor to **morbidity, mortality, increased length of stay** and other associated costs both for the patient and the health care system. Studies done in the United Kingdom and the United States of America suggested that 1 in every 10 patients in acute care wards suffer from a hospital acquired infection. In developing countries rates are as high as 15% of all admissions.

Apart from being a major contributor to morbidity and mortality, infections also cause discomfort to patients by increasing their length of stay, disrupting family life and adding additional pressure on health care workers.

The economic impact that infection can have on patients/his/her family in costs incurred in extra visits can be major in terms of coping with added stress and other associated costs, though difficult to quantify.

Hospitals on the other hand have to cope with the additional cost of antibiotics, related costs in extra stay and re-allocation of resources which could have been diverted for other priorities.

**The cost burden of infections** acquired in hospitals or healthcare associated infections due to extended stay for patients and the related costs of bed occupancy, laundry, and catering and staff time can be astronomical; up to 30%.

Infection prevention and control can be defined as measures, practices, protocols and procedures to prevent and control infection transmission in health care settings. It is a rational and economic means to provide patient care whilst protecting the caregiver, care receiver and the environment from destructive pathogens.

**The purpose of this document is to serve as a National Guideline for standardized best practices for infection control procedures in the Namibian Health Care setting.**

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**Ministry of Health and Social Services**

## **Introduction**

The Infection Prevention and Control guidelines are aimed at providing a microbial safe health care environment for patients, visitors and staff. Every individual in the health care system has a responsibility to embrace, incorporate and adhere to infection prevention and control standards.

### **Infection prevention and control practices include:**

- Universal Precautions (aseptic practices e.g. hand washing, using personal protective equipment);
- Waste Management (waste segregation, and disposing practices);
- Cleaning and Disinfection (environmental and medical equipment);
- Isolation (additional precautions);
- Infectious Disease Management and Control, including Multidrug-resistant Tuberculosis (MDR) and Viral Haemorrhagic Fever (VHF);
- Adherence to prescribed Special Procedures;
- Pests Control; and
- Employee Immunization.

**Laxity in the application of any of these infection control practices can have dire consequences and considerable negative public health outcomes.**

### **Purpose of the Guideline**

The overall aim of the Infection Control Guideline is to set National Standards for prevention and management of nosocomial and health care associated infections.

### **Objectives of the Guideline are:**

- To encourage and improve effective prevention and proper management of nosocomial and healthcare associated infections in health care settings;
- To prevent and minimize environmental health hazards associated with microbes for all in- and out-patients, health care givers and visitors to health care institutions;
- To optimize infection control programs and resources in health care institutions;
- To control and minimize transmission of and colonization of resistant organisms; and
- To improve infection control surveillance.

# **PART I**

## **INFECTION CONTROL**

## **Chapter 1**

### **1. Infection Control Procedures**

#### **1.1 Rationale for Infection Control in Hospitals**

Transmission of infection within a healthcare setting requires three elements: a source of infecting organisms, a susceptible host, and a means of transmission of the organism. Health care workers need to understand these to appreciate the importance of infection control.

##### **1.1.1 The Source**

There are different sources of infection in a hospital setting. Human sources of infecting organisms may include patients, hospital personnel or on occasions visitors. These human sources may include persons with acute disease, persons in the incubation period of disease, persons with disease, but with no apparent symptoms or persons who are chronic carriers of an infectious agent.

Other sources can include a patient's own flora which is difficult to control and environmental objects that have become contaminated such as equipment and medication.

##### **1.1.2 The Host**

Hosts for organisms vary and depends on a variety of factors. Some persons may be resistant and though infected, they resist colonization of an infectious agent, while others exposed to the same agent may establish a commensally relationship with the agent and be asymptomatic, still some persons may develop clinical disease as a result of exposure.

There are many host factors that can make patients susceptible to infections. These may include:

- Age (very young and elderly)
- Underlying disease, such as cancer, HIV etc.
- Certain treatment with antimicrobials or other immunosuppressant agents and radiation treatment
- Breaks in the first line defense mechanism of the body caused by:
  - Operations and surgical incisions.
  - Indwelling catheters (urinary catheters, central venous and arterial catheters) that can allow pathogens to bypass the local defenses of the body.

### 1.1.3 Transmission

Transmission of microorganisms in hospitals can occur through several routes and the same organism can be transmitted by more than one route. Five main routes of transmission can be distinguished, namely:

- Contact transmission,
- Droplet transmission,
- Airborne transmission,
- Common vehicle transmission and
- Vector borne transmission.

**1.1.3.1. Contact transmission** is the most important and frequent mode of transmission of nosocomial infections, and are divided into two subgroups.

- (a) **Direct-contact transmission** involves direct person-to-person contact (body surface to body surface) and physical transfer of microorganisms between a susceptible host and an infected or colonized person. This type of transmission occurs when a health worker or carer turns a patient, gives a bath to a patient, or performs other patient care activities that require direct personal contact where the health worker or carer handles a patient with contaminated hands that are not washed or with gloves that are not changed between patients.

Direct-contact transmission can also occur between patients, one being the source of the infectious agent and the other the susceptible host.

- (b) **Indirect-contact transmission.** Evidence suggests that contaminated hands of HCWs are important contributors to indirect contact transmission. These include:
- Transmitting pathogens after touching an infected or colonized body site or contaminated objects, without performing appropriate hand hygiene.
  - Using patient care equipment between patients without disinfecting and cleaning it.
  - Sharing of toys between children in Paediatric units without proper cleaning and disinfection.
  - Using instruments that are inadequately cleaned before sterilization or have manufacturing defects that interfere with effective reprocessing (e.g. endoscopes).
  - Neglecting to handle Personal Protective Equipment (specifically clothing) appropriately can create the potential transfer of infectious agents between patients.

**1.1.3.2. Droplet transmission** is in theory also a form of contact transmission. The source person (infected person) generates droplets when coughing, sneezing or talking. Droplet generation can also occur during the performance of certain procedures such as suctioning, endotracheal intubations, and induction of chest physiotherapy cardiopulmonary intubation and bronchoscope procedures.

The droplets generated by the infected person is propelled through the air for a short distance and deposited on the host's conjunctivae, nasal mucosa or mouth, which are potential susceptible portals of entry for respiratory viruses. These droplets do not remain suspended in the air for long, it therefore do not require special air handling and ventilation. However, evidence in the Severe Acquired Respiratory Syndrome (SARS) outbreak suggests that it is prudent to don a mask when within more than 3 feet of the patient, especially if pathogen is highly virulent.

**1.1.3.3. Airborne transmission** is different from droplet transmission. It occurs by dissemination of either airborne droplet nuclei (small particle [5 micron or smaller in size] of evaporated droplets containing microorganisms that remain suspended in the air for longer periods of time) or dust particles containing infectious agent.

Microorganisms carried in this manner can be dispersed widely by air currents and can be inhaled by a susceptible host within the same room or over longer distances from the source patient by susceptible individuals who have not had any face to face contact with or have not been in the same room with the infectious individual, depending on the environmental factors. Since airborne transmission remains suspended in the air for longer periods of time, special air handling and ventilation are required to prevent it. (Part III on MDR- TB provides more details)

**1.1.3.4. Common vehicle transmission** occurs when microorganisms are transmitted by contaminated items such as food, water, medication, devices and equipment.

**1.1.3.5. Vector borne transmission** occur when vectors such as mosquitoes, cockroaches, flies, rats and other vermin transmit microorganisms; **this route of transmission is less significant in hospitals, but may occur and require prevention measures to control.** (Chapter 9 provides details on Pest Control)

**Environmental transmission is less common**, is derived from the environment and does not involve person-to-person transmission, these include some airborne infectious agents such as Anthrax in a fine powdered form that can be aerosolized and inhaled through the respiratory tract.

## Chapter 2

### **2. Management for Infection Control**

#### **2.1 Management Commitment**

Effective infection control practices can greatly reduce the cost of hospitalization, freeing resources that can be better utilized for other priorities. Management commitment for infection control is of utmost importance since its implementation, review and monitoring needs resources for it to be effective.

#### **Resources:**

- Committed staff  
(Functional infection control committees, Infection control nurses and link nurses)
- Dedicated time  
(To conduct formal and in-service training, auditing, surveillance and meetings)
- Financial resources  
(To finance training, ensure consistent infection control supplies and requirements and conduct regular surveillance from high care units).

#### **2.2 Overall Management Responsibilities**

- Ensuring infection control is one of the priorities in their strategic approach to quality health care provision by assigning focal persons at all levels to ensure organization wide infection control awareness and accountability.
- Committing themselves in monetary terms to support the continuity of the programme. (Resources for training, monitoring and evaluation)
- Diverting adequate resources to preventative measures and control. (Surveillance and supply support)
- Ensuring regular representation of infection control on management meetings.
- Ensuring regular quality training of infection control staff and continuous training of staff at implementation level to optimize the quality of work performance.
- Contributing to the development, review and implementation of policies, guidelines and procedures.
- Establishing an Infection Control Committee with clear terms of reference and representative of the widest spectrum possible at the level of service delivery.

## **2.3 The Elements of an Effective Infection Control Programme**

**These elements include:**

**Surveillance,**

**Risk Management**

**Training of health care workers**

**Monitoring and Evaluation**

**Outbreak investigation and Report**

**Recording and Analysis**

### **2.3.1 Surveillance**

Surveillance is an important component of prevention and control of infections in hospitals. Continuous laboratory surveillance can be very costly; the emphasis should therefore be on reporting suspected cases of infections for investigation to:

- Prevent infections and detect outbreaks of infections in hospital early and allow for timely investigation and control.
- Determine priorities for infection control activities to identify risks and reinforce standard practice.

Surveillance should be carried out in partnership with clinical staff and focus on targeting future preventative activities and resource allocation, especially in high risk areas, such as intensive care and surgical units.

### **2.3.2 Risk Management**

Risk Management involves:

- The early detection and prevention of infection in high-risk areas and routine screening of procedures as part of surveillance.
- The screening of infectious wounds for baseline information to assist in the development of protocols for future and targeted surveillance.
- Reporting of infectious diseases on a daily basis.
- Regular surveillance and audit for general infection control compliance in the various departments and units.
- Regular surveillance of wards and units to audit compliance to isolation procedures.
- Development of specific document arrangements for dealing with infections, including outbreaks, target patient screening and isolation of patients.
- Regular hand washing campaigns conducted to motivate staff and increase compliance.

### **2.3.3 Training**

Training in infection control management and practices for all HCWs and support staff is vital.

(Part I Appendix 2 provide suggestions on topics for a training programme)

The following areas should be focussed on:

- Training of infection control staff on current practices and development of staff in management of programme through formal training, regular conference attendance and subscription to infection control bulletins.
- Planned, regular training activities to inform staff on current practices and impart new knowledge. These activities should include measures to create and maintain a culture of safety and concern for infection control. Appropriate precautions should be reviewed to correct ineffective procedures as part of training. Details of a training programme for different categories of HCWs and other support staff should be developed.
- Planned practical activities to measure and evaluate compliance to standard infection control practices (e.g. hand washing campaigns) as well as additional precautions in cases of highly infectious diseases such as Viral Haemorrhagic Fevers (VHFs).

### **2.3.4 Monitoring and Evaluation**

Monitoring and evaluation should be done to establish the extent of programme implementation and continuously motivate and support implementers. Monitoring tools can be developed with the guidelines as a basis. These monitoring activities should include clinical and administrative support staff.

(Part I Appendix 3 provides some indicators)

#### **Activities should include:**

- Regular clinical audits to determine effectiveness of clinical procedures and identification of areas of non-compliance (infection control adherence in special procedures).
- Auditing of hospital hygiene and environment in relation to:
  - Hand washing facilities (availability of water, liquid soap, disinfectant, any repairs needed).
  - Hand washing practices of all staff members.
  - Cleaning and housekeeping procedures and adherence to use of approved disinfection materials and routine cleaning procedures.
  - Disinfection and sterilization of medical and surgical equipment.
  - Isolation procedures for infectious diseases, including highly infectious diseases.
  - Safe collection and disposal of waste, including linen.
  - Kitchen and food hygiene.
  - Control of insects and vermin.
  - Adherence to universal precautions (hand washing, wearing of personal protective equipment and other)
- Contribute to standard setting and audit of support services.
- Contribute to the production, review and update of policies.
- Establishing the extent of programme implementation.

- Set standards and audit the activities of the infection control unit/ team.
- Propose future research towards improving practice.

### **2.3.5 Outbreak Investigation and Report**

Small outbreaks of disease in the hospital may occur from time to time and these can be effectively handled by the infection control nurse.

Major outbreaks of disease, be it in the hospital or in the community will require concerted efforts and coordination on a wider scale.

#### **2.3.5.1 Outbreak investigation**

Specific procedures for an outbreak investigation should be followed.

##### **Initial procedure:**

- The notification of the suspected outbreak of disease to the infection control unit.
- Outbreak investigation will be undertaken by the infection control department.
- Immediate control measures to be implemented, including
  - Isolation nursing
  - Case finding
  - Data collection
  - Diagnostic screening and laboratory testing.

##### **Continuation phase:**

- The infection control unit will set up an emergency team with all the relevant staff members. Outbreaks in the community should include the District Health Managers and local authority health inspectors.
- Measures to control the outbreak are implemented based on the disease notified and the appropriate preventative and control measures.
- Regular updates are shared amongst staff members concerned, including updates to the community through local media by the MOHSS representative.
- A final report with all details is compiled for review of current practices and consideration of change in practice.

#### **2.3.5.2 Outbreak preparedness**

The infection control unit in collaboration with the Disease Surveillance unit in the MOHSS should develop procedures for outbreak response. The hospital should have:

- Detailed endorsed plans for management of outbreaks, including guidance for ward isolation and specific isolation ( e.g. Viral Haemorrhagic Fevers, Multidrug-resistant TB)
- A lead person and an outbreak control group.
- Local authority involvement, with food and water issues.
- Detailed data collection and reporting mechanisms.

### **2.3.6 Recording and Analysis**

Regular reports should be compiled on all the different activities undertaken, with the emphasis on developing a well functioning unit. A manual or computerized system can be developed for relevant information collection.

Activities must include:

- Screening of infectious disease and outbreak response reports.
- Establishment of a data base for main targets and indicators.
- Review of data collected on infectious disease and analysis of trends.
- Review of audit findings and implementation of recommendations.

## Chapter 3

### **3. Universal Precautions**

**Universal Precautions** to prevent infections in hospital are designed for the care of all patients in hospitals regardless of their diagnosis or presumed infection status. There are a variety of infection control measures that are used to reduce the risk of infection and the transmission of microorganisms in hospitals. These measures are the **fundamentals of infection control**.

**"Standard Precautions"** is the primary strategy and foundation for successful hospital acquired infection (**nosocomial infection**) control. The routine implementation of standard precautions greatly reduces the risk of nosocomial infections in the absence of a definitive diagnosis.

Standard Precautions includes the major features of Universal Precautions that is designed to reduce the risk of transmission of blood borne pathogens from moist body substances. Standard precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals.

Standard Precautions apply to blood and all body fluids (i.e. secretions, and excretions, regardless of whether or not they contain visible blood, non-intact skin, and mucous membranes. (It excludes sweat).

**Additional Precautions** also known or referred to as "**Transmission-Based Precautions**" are those precautions used for patients known (documented) or suspected to be infected or colonized with highly transmissible or epidemiologically important pathogens that can be transmitted by airborne or droplet transmission or by contact with dry skin or contaminated surfaces.

For such situations additional precautions beyond standard precautions are required to interrupt transmission in hospitals.

There are three types of Transmission-Based Precautions: Airborne Precautions, Droplet Precautions, and Contact Precautions. They should be used in a combination together with the standard precautions.

#### **3.1 Hand Washing**

Frequent hand washing is the single most important measure to reduce the risk of transmitting organisms from one person to another. Prompt and thorough hand washing between patient contacts and after contact with a patient, blood, body fluids and equipment is the most important component of infection control and isolation precautions.

Contact between the skin and the environment leads to the presence of two different groups of microorganisms on the skin, namely:

**Transient Flora** is a term that refers to bacteria located in the layers of skin. Transient flora is acquired through contact with patients; other HCWs or contaminated surfaces (floors, tables) during a normal workday. These organisms live in the upper layers of skin and are most likely to cause nosocomial infections. Hand washing removes the transient flora (potential pathogens) and thus reduces the potential of transmission of infection from one person to another.

**Resident Flora** is a term that refers to bacteria located in the layers of skin, Resident flora live in deeper layers of skin and in hair follicles and are not completely removed, even by vigorous hand washing. Fortunately they are less likely to cause infection.

### **3.1.1 Principles of hand washing is to:**

- Reduce the number of microorganisms present prior to an invasive procedure.
- Remove or destroy potentially pathogenic organisms present on hands of HCWs.

### **3.1.2 Hand washing practices**

There are three types of hand washing namely, social, antiseptic and surgical. (Part I Appendix 7 provides specific details)

**Social hand washing** occurs before and after meals, after using the toilet, giving medication, before handling food, contact before, between and after with patients, after bed making, and when hands are visibly dirty.

**Antiseptic hand washing** should be practiced before and after a shift, before and after aseptic procedures (dressings, injections), before performing invasive procedures, before attending to immuno-compromised patients, after handling contaminated materials, such as bedpans or urinals, even when wearing gloves, and when entering and leaving high-risk areas.

**Surgical hand washing** is an integral practice before the commencement of sterile surgical procedures in theatre.

### **3.1.3 General guidelines to support effective hand washing practice**

#### **Taps**

Ideally, elbow operated taps should be installed to minimize contamination of hands. If no elbow operated taps, HCWs should close tap with paper towel after drying hands. Taps must not be situated over basin outlet.

## **Washbasins**

Wash basins should be conveniently located to facilitate regular hand washing. The area should be kept clean, dry and clutter free, with only the stock needed. Washbasins should not have plugs.

## **Wall and floor area**

The wall area around the wash basin should be kept clean and appealing to users, disinfected regularly and kept dry at all times. The floor in vicinity must be slip proof and non-porous.

## **Water**

Water should be freely running and have a comfortable temperature. In the absence of water the alternative to use is Chlorhexidine 0.5% and 70% Alcohol rub.

## **Soap**

- **Liquid soap** for social hand washing should be available in a bottle with a pump action at each washbasin for the use of staff and patients. The bottle should never be topped up with liquid, as inappropriate cleaning can cause the growth of bacteria. Plastic containers with a pump action are available from the pharmacy and can be ordered. Bottles should be cleaned thoroughly before returned to pharmacy.
- **Antibacterial soap** for use by HCWs should be available in a bottle with pump action. The bottle should never be topped up with liquid to prevent growth of bacteria. These anti bacterial products are approved hand washing liquids with a surfactant to allow for good lather and has a residual effect to last longer. Therefore, HCWs does not need to perform a long wash when using these preparations.
- **Soap bars is not recommended, but** if in use, it should be kept in soap containers with drainable holes on the bottom.

## **Towels**

Only disposable paper towels, pre cut to use sparingly should be used. It should be wide enough to dry and clean once properly. Air-drying of hands is not recommended.

## **Bins**

Should be lid pedal operated to prevent re-contamination of hands. Bins should be emptied frequently into black bag for household refuse. HCWs should not discard biohazard material into these bins.

### **3.1.4 Hand and Skin care**

The care of hands and skin is important; as it act as a natural defense against infection. Any breaks or lesions are providing the opportunity for entry of pathogens.

Repeated hand washing and wearing of gloves can cause irritation, dermatitis and allergic reactions. These can be minimized by the use of Chlorhexidine 0.5% or 70% alcohol with 1% glycerin before and after hand washing. The glycerin is added to prevent skin from cracking.

HCWs can use their own hand cream with a lanolin base to keep their hands supple and free of cracks. These creams should preferably be in tube form to reduce the risks of contamination and infection.

HCWs with skin problems such as dermatitis and allergy to latex gloves should seek medical advice, acquire written proof of such condition and inform their supervisor.

#### **Gloves**

- Gloves should only be worn when appropriate to protect hands; it is not a substitute for hand washing. Micro punctures can allow organisms to pass though the skin. The warm environment that gloves provide can be a breeding ground for resident and or transient organisms.

#### **Nails**

- Should be kept short and clean at all times. Nail polish is not allowed as it can harbour germs because of the cracks. Artificial nails are not allowed in the health care setting.

#### **Hand drying**

- Improper hand drying can re-contaminate hands, always use disposable towels and follow the hand washing technique. Wet hands can transfer organisms more effectively, than when dried properly.
- The use of communal towels is not recommended.

#### **Jewelry (watches and rings)**

- Avoid wearing these when using gloves as it can damage the integrity of gloves and interfere with proper hand washing. It can also contribute to increased bacterial breeding and can cause injury to patients during the process of clinical care.

#### **Cut and abrasions**

- Should be kept clean and covered with a waterproof plaster when on duty.

## **Nailbrushes**

- Should not be used for routine hand washing, **ONLY** sterile brushes should be used in theatre on a once use basis before re-sterilization.

### **3.1.5 The DONT's of hand washing**

- Do not add liquid soap to empty dispensers as it may lead to bacterial growth.
- Do not dip/wash hands in standing water (water in a washbasin) as organisms may survive in the water, even if antiseptic is added.
- Do not use dirty soap to wash hands.
- Do not dry hands with cotton towels (breeding ground for organisms as it becomes wet and several people are using it throughout the working day).
- Do not neglect to wash hands when gloves were worn. The wearing of gloves is never a substitute for hand washing.

### **3.1.6 Poor adherence to hand washing**

Numerous studies the world over have found that failure to maintain appropriate hand hygiene is considered to be the leading cause of nosocomial (hospital acquired) infections and the spread of multi-drug resistant microorganisms.

#### **Poor adherence to adequate hand washing practices was found to be due to:**

- Inadequate knowledge and appreciation for hand hygiene and this was found to be a major contributor to poor adherence.
- The effect of hand hygiene products on hands and skin discouraged staff to perform regular hand washing.
- The unavailability of hand washing equipment, water and sinks were also mentioned as contributing to inappropriate hand washing.

#### **Staff felt and reported that:**

- They lack the time to perform hand washing due to the pressure of workload and that frequent hand washing interrupted efficient patient care.
- Hand washing did not influence the clinical outcome for patients.
- It was not necessary to wash hands when gloves were worn.
- Supervisors fail to establish hand washing policies and act as role models.

### **3.1.7 Steps to INCREASE AWARENESS and ADHERENCE for hand washing**

- Disseminate current guidelines widely and train staff on the procedures required for effective hand washing to prevent infection.
- Staff should be educated on how to correctly perform the various hand washing and scrubbing procedures. Posters should be visible at all wash basins to encourage and remind staff of their responsibility.

- Use performance improvement approaches to improve compliance, by linking the results of environmental audit to improved practices.
- Consider the needs of staff for convenient and effective options for hand hygiene to improve compliance. Staff should be motivated and supplied with the equipment and opportunity to practice hand washing at all times.
- Involve hospital administrators and supervisors in promoting and enforcing the guidelines.

### **3.2 Personal Protective Equipment (PPE)**

PPE is used by HCWs to protect themselves and patients from contamination and from the spread of infection. There are various types of personal protective equipment and this section examines them in more detail. (Part I Appendix 8 provides more details on the use of PPE)

#### **3.2.1 Gloves**

Gloves, in addition to hand washing is an important component in infection control. Wearing gloves does not replace the need for hand washing. Using gloves as a protective substitute for hand washing provides a false sense of security, as hands can become contaminated even when gloves are used, especially when they are removed.

**Failure to remove gloves when it is not required is an infection control hazard as it contributes to the spread of infection. (E.g. keeping gloves on after a procedure to write patient notes, not changing gloves between patient contacts or when answering the phone or engaging in any other activity)**

**Gloves are worn for three important reasons in health care settings, namely:**

1. To provide a protective barrier to prevent cross contamination of hands when blood and body fluids (secretions or excretions), mucous membranes and non-intact skin are touched and to prevent transmission of blood borne pathogens.
2. To reduce transmission of microorganisms on hands of personnel during invasive or other patient care procedures involving the skin and mucous membranes.
3. To reduce the risk of transmission from the contaminated hands of personnel from one patient to another. Therefore, the practice of changing gloves between patients and washing hands after removing gloves should be followed at all times.

#### **3.2.2 Glove categories:**

##### **Use of Latex sterile surgeon gloves**

- Worn in theatre during surgical sterile procedures.
- While conducting deliveries and vaginal examinations.
- To treat burn wounds and large open and septic wounds.

- Use in surgical interventions such as: central venous pressure lines and cut downs, insertion of under water drainage systems, exchange transfusions, including T.P.N , treacheostomies, biopsies, suturing of wounds in casualty, lumbar punctures, aspirations, incision and drainage of abscesses.
- Preparation of cytotoxic medication.
- Isolation (strict, protective and Viral Haemorrhagic Fever isolation)

### **Use of Disposable sterile latex examination gloves**

Used for nursing procedures where sterility of one or both hands are required. These gloves fit loosely and are thinner than surgical gloves, thus not to be used in prolonged complicated surgical procedures.

Indications include:

- Urinary catheterization
- Vulva swabbing
- Shortening of drains
- Wound irrigation to handle catheter safely
- Use by Dentist when performing invasive procedures (Incision into soft tissue or surgical procedures).

### **Use of Disposable Unsterile, clean latex gloves**

These gloves are used to protect health care workers against contamination from body fluids and blood.

Indications for use include:

- Cleaning of grossly contaminated wounds (casualty)
- Collection of blood and other specimens
- Putting up intravenous infusions
- Caring for bodies
- Insertion of suppositories and vaginal pessaries
- Stomach and bowel washouts and when performing enemas
- Handling and cleaning of equipment with potential risk for infection (such as suctioning bottles)
- Handling of high risk waste (soiled linen)
- Isolation nursing
- Performing damp dusting in high risk areas
- Protecting skin lesions that are covered with dressing

### **Use of Disposable Unsterile gloves by other health care workers**

- Cleaning of toilets and sluice rooms (cleaners and nurses)
- Cleaning of contaminated areas from blood and bodily fluids (emergency personnel, porters)

- Cleaning of refuse containers and when removing high-risk waste material (cleaners and nurses)
- Handling specimens (nurses and laboratory staff)
- Performing unsterile diagnostic procedures where the possibility of contamination with blood and body fluids exists (nurses and doctors)

### **Use of Long-sleeved plastic disposable gloves**

- Restricted to use in kitchen areas for use when dishing up food. May however be used in high risk areas such as Isolation Precautions for Viral Haemorrhagic Fevers

### **Use of Heavy-duty rubber gloves (not disposable) (also referred to as Utility Gloves)**

- Cleaners should wear it to protect themselves when working in high-risk areas. If not available, long-sleeved plastic disposable gloves can also be used.
- For general cleaning - it should be issued to individuals, washed in detergent after use and stored dry.
- Gloves should be replaced when cracked, torn or showing other signs of deterioration.
- Laundry and Mortuary workers may need gloves with a longer sleeve.

### **Use of Reinforced gloves**

- Resistant to punctures for workers handling waste disposal of heavy bags during collection and incineration
- Staff dealing with plumbing, electricity, autoclaving, radioactive material, **and cytotoxics may need gloves specially designed for the specific activities**

Surgeons should consider double gloves for lengthy operations, research has showed 40% blood penetration for single gloving as oppose to 2% double gloving. However, balance of safety versus discomfort and loss of sensitivity and dexterity should be weighed.

**Staff who has a confirmed allergy to latex gloves should submit written proof to their supervisor to use hypo-allergenic gloves.**

### **3.2.3 Masks**

Masks, eye protection and face shields are worn alone or in combination with other protective wear to provide barrier protection.

A mask (high filtration) that covers the mouth and nose should be worn during procedures and patient care activities where large splashes of blood, body fluids, secretions, and excretions are expected. This should reduce the risk to exposure to blood borne pathogens.

The indications for using high filtration masks include nursing care activities such as and when:

- Nursing large open burns
- Performing deliveries
- Suctioning of tracheostomies and unconscious patients (wearer protected from excess upper airway secretions)
- Preparation of cytotoxic medication and hyperalimentation
- Intravenous therapy (central venous lines, exchange transfusions, cut downs)
- Insertion of an underwater drainage
- Tracheostomy procedures
- Biopsy procedures
- Major wound suturing
- Practicing strict isolation and in some cases of Protective Isolation

### **3.2.4 Gowns**

Gowns and other protective equipment are worn to provide barrier protection and reduce the opportunities for transmission of microorganisms in hospitals. Gowns are specially designed to make them impermeable to liquids.

- 1.** Gowns are worn to prevent contamination of clothing and skin of personnel from blood and body fluids exposure during contact in theatre and maternity sections.
- 2.** Gowns should also be worn during the care of patients with highly infectious disease to prevent transmission of pathogens from patient and their environments to other patients or items in their environment. A disposable plastic apron should be worn underneath the gown for extra protection of staff. In situations like these, gowns are removed before leaving the patient's environment.
- 3.** Sterile gowns are also worn in Protective Isolation.

Other Indications for wearing sterile gowns (single use) include:

- Treatment of large burn wounds
- Conducting deliveries
- Setting up central venous pressure lines and cut downs
- Exchange transfusions
- Preparation of cytotoxic medications
- Insertion of under water drainage

### **3.2.5 Disposable Plastic Aprons**

Protects health care workers' clothes against contamination of microorganisms and thereby preventing cross contamination in the workplace. Plastic aprons are impermeable to moisture and bacteria. It is easy to handle and protects the front of the body that is exposed to maximum potential contamination. Aprons should be used per patient (one apron – one patient)

**Plastic aprons should not be worn for extended periods of time as the friction cause large organisms from skin and clothes to be released into the air.**

**The plastic apron replaces the cotton gown in clinical settings.**

**White aprons** are used where contamination of the health worker uniform is possible:

- Feeding and bathing children in Paediatric and Premature units
- Handling casualties and grossly contaminated wounds
- Performing stomach and bowel washouts
- Handling contaminated linen
- Working in Central Sterile Storage Department (C.S.S.D)

**Red aprons** are used in isolation. Aprons should be removed when used and discarded into the red bin.

### **3.2.6 Goggles (face shields)**

Provide protection against splashes of blood and body fluids that may include pathogens that may penetrate mucous membranes. Goggles need to fit comfortably over spectacles, be light in weight, adjustable, provide clear vision without fogging, and be re-usable and therefore washable.

Indications for use include:

- Maternity wards
- Operating theatres
- Isolation and
- Dental surgery

### **3.2.7 Shoe covers (see Operating Room Procedure Manual)**

**The wearing of shoe covers has no value in the prevention of infection, as it offers no barrier to blood and body fluids. It is usually ill fitting and cause air disturbances, which can spread microorganisms. In handling these shoes, health care workers neglect to wash their hands and are thus transferring organisms from the floor to patients and equipment.**

Shoe covers should **only be worn in theatre** on a single –use basis. Shoes should be safe and impervious to moisture. Care must be taken to wash hands before putting on shoes and after removing them. Shoes are removed before leaving the restricted area and a fresh pair is put on prior to re- entering the area.

### **3.2.8 Caps**

Caps are worn to prevent hair, dandruff or organisms on hair from landing in wounds or sterile surfaces or sterile instruments. It also protects the hair from splashes of blood and body fluid to a lesser degree. When worn, all hair as well as the forehead should be

covered. The balaclava type of cap is worn in cases of highly infectious disease such as Viral Haemorrhagic Fevers.

Indications for wearing a cap include:

- Operating theatres
- Performing emergency surgical procedures at ward level such as the insertion of an underwater drain and central venous lines
- Protective Isolation
- Strict Isolation (balaclava type)
- Preparation of cytotoxic medications and hyperalimentation (T.P.N)
- Food handlers during preparation and serving of food

## Chapter 4

### **4. Medical Waste Management**

The fundamental principle of waste management is minimizing of volume through appropriate classification and segregation.

The process of waste minimizing requires observance and adherence to occupational health and safety prescriptions and legislative requirements. Every individual concerned with generation, handling and disposing of medical waste should ensure the correct handling and safe disposing of waste.

#### **4.1 Definition of Medical Waste**

What is medical waste?

- "Medical waste" refers to waste that is produced during the processes of medical research, diagnosis or treatment.
- This includes discarded sharps, blood and blood products, human anatomical remains/human body parts, chemicals and pharmaceutical waste.
- This is waste that can be classified as bio hazardous as it poses a health risks to hospital staff, the patient or the environment due to its ability to transmit infectious diseases as it could contain blood or infectious body fluids.

#### **4.2 Classification and Disposing of Medical Waste**

##### **4.2.1 Sharps**

###### **Definition**

- This includes objects, devices or instruments that are used to puncture, cut or scrape body parts.

These include the following:

- Needles used during injections, biopsies, venupuncture or for suturing
- Blades including razors, surgical blades, scissors and stitch cutters
- Glass including ampoules, vials, glass vacolitres, suction bottles
- Other sharps can include trocars, lancets, surgical instruments such as dissecting forceps and drill bits
- Sharps can pose as a potential hazard as it can puncture or cut, introducing possibly contaminated blood or body fluid

## Handling and Disposal of Sharps

- As these instruments are contaminated with body fluids and can cut or puncture, they should be placed in a **container** which is:
  - Puncture resistant
  - Does not leak
  - Is stackable
  - Can be sealed
  - Non-reusable immediately after use and
  - Labeled as "biohazard" or has the "biohazard" sticker on

**Note: Currently, designed sharps containers are used but in the absence thereof, containers complying with the above-set criteria can be used.**

- Sharps must be disposed off in these containers at the point of origin and should not be left lying around.
- Do not use glass bottles or containers made with soft material e.g. soft plastic that is not puncture resistant. Bottles can break when tipped over, posing a greater danger.
- Needles should not be removed from syringes or other appliances and should never be recapped or bend after use. Intravenous needles and spikes should also not be placed back into their plastic tubing after use.
- Sharps may never be thrown away in plastic bags or garbage cans.
- Do not shake or overfill sharps containers.
- Needles and syringes should never be used for drawing blood. Prescriptions as indicated in the section on "Specimen Collection" should be followed.
- If sharps are too big for the sharps box, a container can be made by following the prescriptions.
- Sufficient sharps containers must be availed in each unit and should be strategically placed to prevent injuries, e.g. on medication trolleys.
- Care should be taken to keep sharps containers out of reach of children.
- When sharp items such as needles or syringes have to be carried it should be done in a container such as a kidney bowl.
- When a sharps container is full (reached 3/4 of total capacity) it should be tightly closed with a lid or sealed with puncture resistant seal. This will ensure that contents do not fall out when handled.
- After closing the containers it should be collected by housekeeping for incineration.

## Sharps: Injection safety procedures - Disposing of sharps

The avoidance of unnecessary injections is the starting point of injection safety. If injections are medically indicated they should be administered safely avoiding any possible harm to the recipient, administrator and the environment.

#### **4.2.2 Measures defining safe injection practices are:**

##### **The use of sterile injection equipment**

- When reconstituting and administering injections, a sterile syringe and needle should be used for each unit.
- The packaging should be inspected for any breakage and should be discarded if it is punctured/torn/open as the integrity is impaired.

##### **During the process of administering, avoid the contamination of injection equipment and medication**

- When preparing injections, it should be done in a clean environment/area that is free of not only blood and other body fluids, but of any substance such as food or any fluids that can cause cross contamination. (Chapter 5, section 5.5 provides details on cleaning of treatment and dressing rooms.)
- Avoid leaving a needle in the stopper of the vial.
- When opening an ampoule with a file, protect the fingers by using clean small gauze.
- Do not use medication that has expired or has breaches of integrity.
- It is recommended to follow the prescribed storage and packaging instructions of each product.
- Do not use a needle that has touched any non-sterile surface. Rather discard it in the sharps container.

##### **The prevention of needle sticks/pricks to the administrator**

- Avoid recapping needles.
- Syringes and needles should be discarded in the sharps container at the point of origin.

##### **Prevention of access to used needles**

- When sharps containers are full (3/4 of total capacity), it should be sealed and should not be re-opened. Sharps containers should not be shaken.
- Sealed containers should be put away at a safe, designated place (e.g. the sluice room) where it will be picked up for incineration.

##### **Other safety issues**

- Designated sharps containers should be labeled with the "biohazard" label.
- Before administering injections/medication the provider should wash hands with clean water and soap or disinfect hands. If there are cuts or loss of skin integrity on the providers hands it should be covered with a waterproof plaster.

- Gloves are not indicated for injections but if there is anticipation of excessive bleeding or presence of excessive blood, single use gloves should be worn.
- If there is visible dirt or if skin is soiled, clean it prior to administering the injection.

#### **When administering medication**

- Avoid cross-infection via injections by using single-use vials and ampoules.
- Care should be taken to avoid contamination of unused medication, e.g. using a clean needle and syringe every time when drawing up remaining contents.
- Never cover medication with cotton wool, store safely in medication fridge to prevent environmental contamination.

### **4.3 Biological waste**

#### **Definition**

- This includes pathological and biopsy specimens, tissue, organs that was removed during surgery, birth or autopsy.

#### **Handling and Disposal of Biological Waste**

- Persons handling biological waste must wear and use the necessary personal protective equipment (gloves, face masks, apron).
- Biological wastes should be disposed off in red plastic bags and send for incineration.

### **4.4 Cytotoxic Waste**

#### **Definition**

- This is waste material that is or has been contaminated with cytotoxic drugs during the preparation, transportation or administration or chemotherapy.
- Cytotoxic drugs have carcinogenic, mutagenic and/or teratogenic potential and direct contact can cause skin, eye or mucous membrane irritation or ulceration.

#### **Handling and Disposal of Cytotoxic Waste**

- Waste that has been produced during chemotherapy process should be separated from other waste at the point of origin and be disposed off in biohazard bag (**red bag**) labeled "**Chemo**".
- Waste material mix with cytotoxic waste should be incinerated at temperatures recommended for cytotoxic waste.

### **4.5 Pharmaceutical waste**

#### **Definition**

- These are pharmaceuticals that have (but not limited to)
  - expired passed their shelf life;

- been returned by patients;
- no longer comply to the requirements of the Ministry;
- Generated during the production and administration of medication.

### **Handling and Disposal of Pharmaceutical Waste**

- The chemical composition of the material will determine the method of disposal thus any prescriptions should be checked with the manufacturer's indications.
- Liquid mixtures can be disposed off through the usual water/fluid outlets.
- Pharmaceuticals should be placed in non-reactive containers and sent for incineration.

### **4.6 Radioactive Waste**

#### **Definition**

- Radioactive waste is waste (bio-hazardous) that is contaminated with radio-isotopes and is produced during nuclear medicines, radio-immuno assay and bacteriologic procedures.
- Radioactive waste may be solid, liquid or gaseous form.

#### **Handling and Disposal of Radioactive Waste**

- In order to destabilize radioactive bio-hazardous waste it must first be chemically treated and then disposed off.

### **4.7 Bio-Hazardous Waste (other)**

#### **Definition**

- This refers medical waste or items which is contaminated with blood and/or other body fluids or excrement.
- **It can include tubes, urine bags, bandages, gauze, nappies, sanitary pads, but not soiled linen or kitchen waste.**

#### **Handling and Disposal of Bio-Hazardous Waste**

- Bio-hazardous waste should always be handled with gloves and aprons were applicable.
- These items should be separately discarded off (in red plastic bag or biohazard labeled bag) immediately at the point of origin. If not red, a biohazard bag should have the "biohazard" label/sticker or "biohazard waste" words on. The labeling should be visible and clearly displayed.
- It is recommended and preferred that the biohazard bag is placed in a container as this promotes safety during the utilization and discarding processes.

- While still in the container, the bag should be properly tied to prevent content from leaking or falling out when taken out of the container.
- After being taken out of the container, the bag should be placed at a safe designated place (e.g. the sluice room) where it can be picked for incineration.

#### **4.8 Kitchen Waste**

##### **Definition**

- This is left over food or biodegradable products.

##### **Handling and Disposal of Kitchen Waste**

- Kitchen waste should be discarded off in yellow plastic bags.
- Frequent collection of food waste is of utmost importance in promoting general hygiene and should be done after every meal and whenever needed.
- Designated collection areas should be cleaned regularly at least twice a day and be kept free of rodents, insects and flies.
- After removal by cleaners from the ward/unit, these bags will be collected by private contractors.

#### **4.9 Household Waste**

##### **Definition**

- Household waste refers to items such as paper plates, waste paper.

##### **Handling and Disposal of Household Waste**

- Household wastes are to be discarded in black plastic bags which will be collected by cleaners for dumping by local authority at the local refuse site.

#### **4.10 Laundry**

##### **Definition**

- Laundry in the health care setting includes blankets, bed sheets, gowns, patient clothing, scrub suits, mattress, sheepskin, curtains, paper drapes, etc.
- Laundry can be a source of infection as it can be soiled with body fluids and or waste or tissue which could contain harmful micro organisms.

##### **Types of laundry and handling thereof**

###### **Dry dirty laundry**

- Laundry that has been used but is not soiled with any fluids and or feces.

- After removal, dry dirty linen should immediately be put in a cloth bag.

### **Wet soiled laundry**

- This is laundry that has been soiled with body fluids and/or feces or vomit.
- Using personal protective equipment (gloves and apron), remove the soiled linen and place it immediately in a green plastic bag.

### **Mattress/Sheepskins**

- Where available, mattress covers should be used.
- Treat dirty or soiled mattresses/mattress covers/sheepskins as any laundry. If dirty, put in ordinary cloth bag for dirty linen or if soiled with body fluids, put in green plastic bag.
- Ripple mattress should be cleaned with disinfectant.

### **Draping Sheets**

- Paper drapes used during sterile and aseptic procedures should be discarded in a red plastic bag.
- Consult the (Operating Room Procedure Manual) on the use and application of drapes during surgical procedures.

### **Special Laundry Situations**

- Used sterilized laundry e.g. surgical gowns, should be segregated as any other laundry; wet and soiled in the green plastic bag whilst unsoiled dry dirty laundry should be placed in cloth bags.
- Laundry used during sterile procedures will be send to the launderette and then to the C.S.S.D for packaging and sterilizing.
- Laundry used during the care of **highly contagious disease** cases are to be handled according to specific prescriptions. (Part II Chapter 8, section 7.2.9 provides details on the handling of linen).
- Laundry soiled with **pests** or used for patients diagnosed with pests should be separated from other laundry at the point of use and bags should be labelled as "**infested**". This linen should be treated for pest infestation at the laundrette.

### **General Considerations**

- When clean linen is received, it should be packed out on shelves in the linen room.
- Linen rooms should be cleaned on weekly basis and shelves kept neat and kept clean.
- Clean and dirty linen should never be placed together; not even in the same room. All clean linen must be kept in the linen room when not used.
- A clean-linen trolley should be designated and used to keep clean linen on. These trolleys should be cleaned regularly; at least twice a week.

- Clean linen should be provided to new patients and where linen has been soiled and requires changing.
- Mattress covers and linen savers should be used to protect linen from soiling with any body fluid.
- Correct handling of soiled/dirty linen should start at the point of removal.
- Avoid contaminating hands and self when removing soiled linen by using personal protective equipment.
- Linen should be handled with the minimum level of agitation e.g. when changing bed sheets it should not be flailed/waived when taken off.
- All linen including mattress covers, pillow cases and blankets should be removed for washing when a patient no longer needs to use the bed i.e. when discharged, deceased, transferred. Adhere to the specific prescriptions in cases of infectious disease management.
- Cloth bags should be attached to a trolley and be taken to the point of removal, avoiding carrying of dirty laundry in arms.
- **Laundry bags (cloth and green plastic bags) should not be overfilled and should be securely closed to prevent leakage and content from falling out.**
- Never use linen including dirty linen to clean up spills.
- There should be strict adherence to the segregation of laundry at the point of origin. **This means that when linen is removed from the point of use it should immediately be placed in the applicable bag (cloth or green). Linen should never be heaped up in linen or sluice room and be sorted out later.**
- **Dirty-laundry bags should be left at a secure place (sluice room) for pick-up and removal to the launderette.**
- **Do not stick needles into the mattresses.**

#### 4.11 Waste Segregation

Medical waste should be identified according to its type (e.g. sharp, biological waste) and be separated accordingly in the following colour coded bags. This will also keep waste apart during handling, storage and transportation.

##### Plastic Bags

The Management of each unit has to ensure that red plastic bags or bags labeled as "biohazard" bags are available and that these bags are used to discard medical waste.

##### ➤ **Black:**

- Size: A-10 950 x 750 mm x 70 Microns
- Placed in refuse bins only and used for discarding household waste, e.g. egg cartons, flowers, peels, paper.
- Cleaners will remove the bags from the ward/unit to the hospital collection site.
- Removal from hospital premises is done by the local authority.

➤ **Yellow:**

- Size: A-13 950 x 750 x 70 Microns
- Used for leftover food.
- Nursing, kitchen and cleaners are responsible for removal of kitchen waste from the patients' bedside.
- Bags will be taken from the ward/unit by cleaners and be moved to hospital collection site from which it will be removed by private contractors.

➤ **Red:**

- Size: A-12 950 x 750 mm x 70 Microns
- Used to dispose of infectious/bio-hazardous waste, e.g. body parts, bandages, gauze, catheters, urine drainage bags.
- These are material contaminated with blood or body fluids and is incinerated.
- Facilities with an incinerator on their premises should ensure that waste is collected at prescribed times for incineration.
- For facilities in peripheral areas, this waste is collected and transported by designated personnel to facilities where incineration is done.

➤ **Green:**

- Size: A-11 950 x 750 mm x 70 Microns
- Used for linen soiled or stained with blood or body fluids.
- The bag is sealed and sent to laundry in white cloth bags for washing.
- Green bags containing laundry soiled with pests should be clearly labelled as "infested" and be separated from other linen.

➤ **Clear:**

- Size: A-6 300 x 200 mm X 50 Microns
- Dispatch of specimens to laboratory, weighing of placentas in delivery room and then placed in red bag.
- Bag content will be disposed off as bio-hazard waste.
  
- Size: A-7 450 x 300 mm x 50 Microns
- Attached to bedside lockers for patients use: to be treated as household refuse.
  
- Size: A-8 610 x 425 mm x 50 Microns
- Placed in bins for paper towels and other papers – treat as household refuse.
  
- Size: A-9 750 x 600 mm x 50 Microns

- Placed in mini bins: for used articles, to be return to Central Sterile Storage Department (C.S.S.D.) for re-processing. C.S.S.D. is the department within the hospital where medical/surgical equipment and supplies are cleaned, prepared, processed, stored and issued to various wards/units.
- Size: A-15 750 x 450 mm x 70 Microns
- Only for used theatre instruments: bags may not be used for any other purpose. Issued only to the theatre.

### **Rubbish/Waste Bins**

- Material which rubbish bins are made off should allow cleaning and should be resistant.
- Bins should have fitting lids and should be operated with a foot pedal disallowing any touching by hands.
- All bins should be lined with the applicable colour coded plastic bag thus illustrating the type of waste to be disposed in the bin.
- Waste bins should be cleaned regularly at least twice a week by cleaners and should be free of any exterior or interior staining e.g. free of blood or body fluid spots.

## **4.12 Methods of Managing Health Waste**

### **Storage**

- Health care wastes should never be stored in a ward/unit.
- Waste should be removed on a regular basis from the initial point of assembly (ward/unit) and be taken to the hospital/facility collection site or the incinerator.
  - Red plastic bags – twice a day except at specialized units e.g. theatre, maternity where removal is done on a continuous basis.
  - Yellow plastic bags – twice a day
  - Black plastic bags – twice a day
  - Green plastic bags - twice a day except at specialized units e.g. theatre, maternity where removal should be done on a continuous basis.

### **Transporting of waste**

#### **On-Site Transport**

- Involves transportation of waste from the initial point of assembly to the treatment area. This could be done by means of trolleys or handcarts.
- Care should be taken when handling bags during the transportation process. Bags should be handled by the neck and not rigorously to prevent tearing and spillage.

- All staff working with medical waste should wear the necessary personal protective equipment (gloves, aprons, masks, etc).
- In the event of accidental spillage, universal precautions should be followed when cleaning up. (Chapter 5, section 5.8 provides more detail on the cleaning of blood spills and body fluids.)

#### **Off-Site Transport**

- Yellow bags – these bags will be removed by private contractors and is based on their schedule.
- Black bags – black bags are removed from the hospital premises by local authority refuse removal services and are also done according to the schedule for refuse removal.

### **4.13 Waste Treatment Methods**

This section does not deal with in-depth explanation of the processes as it forms part of quality control but merely defines them.

#### **Incineration**

- This is controlled burning of organic, untreated, unprocessed combustible waste at high temperatures (800-1200°C) into inorganic material. Incineration of waste material reduces its volume and weight.

#### **Autoclaving**

- Process of wet thermal disinfection process used to sterilize reusable medical equipment.

#### **Disposal**

- This is the removal of waste material or incinerated waste to final site of disposal.

## Chapter 5

### 5. Hospital Cleaning Specifications

Environmental surfaces can serve as reservoirs of potential pathogens; they carry the least risk of disease transmission and can be safely decontaminated using the basic concepts of cleaning. However, hand contact with environmental surfaces without the necessary precaution of regular hand washing can contribute to the spread of infection. Though hand hygiene remains the single most important precaution, disinfecting environmental surfaces and equipment is fundamental in reducing their potential contribution to health care associated infections.

#### 5.1 The Use of Chemical Disinfectants

Cleaning, disinfection and sterilization are techniques employed to remove disease causing micro organisms from the hospital environment and equipment used in patient care. Chemical disinfectants do not destroy all pathogens thus where sterility is required and if the facility exists, heat sterilization is the method of choice.

**The incorporation of aseptic technique with these methods will allow the use of instruments without being contaminated, but if aseptic technique is not applied correctly the benefits of disinfection or sterilization will be rendered useless.**

It is important to draw a distinction between the various methods employed in the process of ridding health care equipments and environment of disease causing agents.

#### Decontamination

- This process includes methods of cleaning, disinfection, and sterilization to remove microbial contamination form equipment and the environment.

#### Cleaning

- This is the physical removal of any foreign material, e.g. soil and is usually performed by using detergent and water.

#### Sterilization

- This is the process whereby all micro organisms and their spores are removed/destroyed. This is required for all instruments and equipments etc, which will be used during surgical procedures or will come in contact with open wounds or sterile body sites.

Methods of sterilization are;

- autoclaving

- dry heat pressure
- exposure to ethylene oxide gas

## Disinfection

- This is the removal or destruction of all potentially harmful micro organisms but does not destroy bacterial spores.

Chemical disinfectants don't work when they are;

- used on dirty objects
- not freshly made
- is of the wrong concentration
- mixed with incompatible chemicals

### 5.2 Guidelines when using Chemical Disinfectants

- Do not use chemical disinfectants unless you have to.
- Completely remove blood and body fluids with detergent and water before disinfecting.
- Ensure that disinfection is necessary and that you are using the right disinfectant.
- Wear protective gear if indicated.
- Immerse the instrument/equipment for the right time.
- Rinse equipment with water after disinfecting.
- Discard disinfectant solution after use, clean the container and store dry.
- Do not dilute disinfectant by guessing. **Mix according to the instructions!!**
- Do not use expired solutions and do not top up solutions.
- Do not mix detergents with disinfectants.

### 5.3 Guidelines on the use of Chemical Disinfectants

Disinfectants should only be used where sterilization is not required and cleaning with detergent and water is inadequate.

**All disinfectants should be reconstituted according to the manufacturers' instructions.**

## Alcohol

- This is 70% Alcohol (Ethyl alcohol or Isopropyl).
- Alcohol is effective because of its fast acting ability and evaporates quickly leaving surfaces dry. Flammable, thus caution should be taken
- Used to **physically** clean **surfaces**; does not penetrate.
- Prepared solutions are available through the local hospital pharmacy.

### **Chlorhexidine/Iodine/Idophers (Povidine)**

- Mainly recommended as skin disinfectant e.g. as pre-operative skin disinfectant.
- Highly effective against resident microbial flora of the skin and is effective several hours after initial application.
- Not recommended for general disinfection in hospital.
- Solution is available through the local hospital pharmacy.

### **Hypochlorites**

- Inexpensive and effective disinfectants but can damage and corrode some metals.
- Diluted solutions of hypochlorites lose their activity rapidly and fresh solutions should be made daily.
- E.g. Milton, Jik, Biocide D, available through the local hospital pharmacy.
- When Hypochlorites are mixed, the following should be indicated on the container
  - Date and time solution was mixed
  - Signature of person who mixed the solution
  - Hypochlorite solutions should **only be kept for 24 hours**

### **Recommended Strength for Hypochlorite solutions**

<b>Use</b>	<b>Dilution of solution</b>
Blood spillages	1 in 10
Laboratory discard jars	1 in 40
General environmental disinfection	1 in 100
Infant feeding utensils, catering surfaces and equipment	1 in 800

### **Hydrogen Peroxide**

- Acid used for the disinfection of certain types of equipment.
- Care should be taken when used as it causes irritation and corrosion.

### **Formaldehyde**

- 40% solution in water known as formalin and is used to preserve specimens.
- Not recommended for general disinfection in hospital.

## 5.4 Cleaning of Environmental Surfaces

The number and types of organisms present on environmental surfaces are influenced by: the number of people in the environment and their activities, amount of moisture, presence of material supporting microbial growth and the type of surface.

The strategies for cleaning take into account: potential of direct patient contact, frequency of hand contact, potential contamination of surface with body substances or environmental sources such as dust and water.

The principle of cleaning and disinfection takes account of the intended use of the surface or item in patient care. Cleaning is the first step in the disinfection process. It is a form of decontamination to render the surface safe to handle or use as it removes visible dirt, organic matter and salts. If surface cleaning is not done, it compromises the subsequent procedures performed on the surface or when using the items.

**Environmental surfaces** can be divided into:

**Medical/ nursing surfaces** (e.g. knobs and handles of medical machines, dressing rooms, trolleys used for various nursing activities, e.g. dressing trolleys, treatment rooms,) and

**Housekeeping surfaces** (e.g. floors, walls, windows, doors, door-knobs, patient bedside tables and dinner tabletops, nursing stations, sluice rooms, office space, store rooms, waiting areas, corridors, ablution facilities).

## 5.5 Cleaning of Medical and Nursing Environmental Surfaces

### Cleaning of Treatment Rooms and Dressing Rooms

These rooms should be disinfected by nursing personnel on a daily basis. The household cleaning should be done by housekeeping staff prior to disinfection.

- Ensure that cleaners clean floors.
- Wear disposable unsterile gloves to prepare biocide D solution for daily use in a clean container supplied by the pharmacy.(see instructions under Hypochlorites)
- Pour solution in clean container for the purpose of cleaning and disinfection.
- Use a clean cloth to disinfect areas.
- Wear disposable unsterile gloves and first wipe all surface areas (working areas) with a damp cloth.
- Wear disposable unsterile gloves to wipe walls with a damp cloth.
- Disinfect working areas with Alcohol 70% solution after each procedure or when surface was in contact with a patient.
- Discard solution at the end of the working day.

## **5.6 Cleaning of Equipment Surfaces**

Surfaces should be disinfected on a daily basis with Alcohol 70% by nursing personnel. (These can include stationery equipment tables or moveable trolleys)

- Apply disinfectant with a spray action bottle.
- Wipe surfaces with a disposable towel before using equipment.
- Disinfect during day when visibly dirty.

Barrier protection of equipment surfaces can be useful if surfaces are frequently touched with gloves or are difficult to clean (e.g. of handling the operating light in dental care). The surface can be covered with foil, plastic or fluid resistant covers to protect the surface or equipment. Coverings should be discarded when health care worker is still gloved. Clean covers should be applied after hand washing and before the next patient encounter.

## **5.7 Cleaning of Medical Equipment**

Manufacturers of medical equipment should provide care and maintenance instructions. These instructions should be followed. Cleaning of non-critical equipment that touches intact skin (e.g. stethoscopes, blood pressure cuffs) usually require low to intermediate disinfection.

Cleaning of contaminated re-usable critical medical equipment devices (equipment that enters tissue or through which blood flows) are first decontaminated before sterilization.

Equipment that are regarded as semi-critical (equipment that touches mucous membranes), are first rinsed with water and then sterilized after use to reduce risk of transmission of microorganisms to other patients.

### **5.7.1 Care of Endoscopes**

The association of infection with Fiber optic Endoscopes is small. Reported infections are mainly due to incorrect use or inadequate cleaning. Instruments are limited in number and the time between patients may be insufficient and this may contribute to inadequate disinfection or sterilization.

Handling, cleaning, disinfection, sterilization and storage of these instruments should only be done by trained personnel. The number of instruments for routine use is usually restricted; hospitals should therefore establish the highest standard of disinfection and sterilization without damage to instruments.

### **Category A – Arthroscopes, Laparoscopes, Ventriculoscopes**

Proper and thorough cleaning with Hypochlorite solution ensures rapid cleaning and disinfection to reduce bacteria without damage to instrument before sterilization. No residue of organic material should be visible on the instrument as it can act as a barrier in subsequent cleaning and disinfection.

Sterilization is essential as procedure may involve contact with skin and mucous membranes.

### **Category B – Flexible Fiber optic Endoscopes, Gastrosopes, Colonoscopes**

#### **Cleaning**

- Thorough cleaning of the instrument should be done immediately after use to prevent drying of microorganisms on instrument.
- The insertion tube and channels should be cleaned with a brush to remove all organic material.
- The regular inspection of the instrument is important to ascertain that it is in good condition and to establish any damage or potential for future damage.

#### **Disinfection**

- Wear gloves and an apron for protection.
- Disinfect insertion tube and channel with Hypochlorite solution for the duration of 30 minutes (soaking) in a sterile container.
- Adequately rinse after soaking to prevent possible toxic chemical residue on instrument.
- Dry thoroughly and store in a dry area.
- Clean and disinfect accessories and water bottles.
- Send all accessories and water bottles for sterilization.

### **Category C – Rigid Fiber optic Endoscopes, Cystoscopes**

These are inserted in a sterile cavity and should be sterilized and not disinfected. If chemical disinfection is done, instruments should be submerged into Hypochlorite solution for 10 -20 minutes. Place scope vertically for air bubbles to escape and disinfectant to penetrate all parts.

Follow disinfection guidelines.

### **5.8 Cleaning of Blood Spills and Body Substances**

**HIV** and **HBC** and **HCV** have not reported being transmitted from housekeeping surfaces (floors, walls and countertops). Though transmission risk is not known, the prompt removal of material and disinfection of the affected area is required as part of sound infection control practice.

Large blood spills have a higher potential risk of transmission associated with high numbers of microorganisms. Procedures to adhere to should be documented and be visible for staff to follow. Regular training of staff in environmental surface infection control is highly recommended.

#### **Cleaning of large blood spills:**

- Isolate and secure the area.
- Wear gloves and other personal protective equipment as required.
- Apply Hypochlorite solution (bleach solution) (1:10) on the blood spill and cover with absorbent paper towels.
- Remove visible organic material first with disposable absorbent paper towels.
- Discard soaked paper towels into a leak proof biohazard /labeled red bag.
- Clean and decontaminate area with Hypochlorite solution (bleach solution) (1:10)
- Discard used items in biohazard bag/ red bag.

## 5.9 Cleaning of Housekeeping Surfaces

The objectives to clean health facilities are to achieve the required standard of cleanliness, to ensure that cleaning staff implement approved standard procedures to prevent spread of infection and to achieve a visible healthy environment with minimum hindrance to patients, staff and visitors.

Housekeeping cleaning requires regular cleaning to remove soil, dirt and dust. Dry conditions allow for gram-positive cocci to grow, whereas in moist conditions, gram-negative bacilli grow. Fungi are also growing on dust and like moist fibrous material.

### Housekeeping surfaces

Generally, housekeeping surfaces are cleaned with soap and water or detergent or disinfectant depending on the nature of the surface and the degree of contamination that can occur. Cleaning and disinfection methods vary according to the type and area of surface to be cleaned.

Housekeeping surfaces are divided into two groups:

#### **Minimal hand-contact surfaces** (e.g. horizontal areas like floors and ceilings)

Extra ordinary cleaning and decontamination of floors in health care settings is unwarranted as research has shown that it has no advantage over regular cleaning with detergent and water.

- Floors should be cleaned daily and when spills or soiling occur.
- Specific cleaning detergents should be used according to hospital policy to prevent contamination due to inadequate cleaning. (Part I Appendix 10 provides more details on the duties of housekeeping)

#### **High touch surface areas** (Frequent hand-contact surfaces e.g. such as doorknobs, bedrails, edges of curtains, switches, and walls).

- High touch surface areas: should be disinfected with Hypochlorite (1:100) twice a week and cleaned daily.
- Terminal disinfection is done in isolation and infectious cases. (Chapter 6 section 6.3 provides more details)

- Cleaning of general walls, windows and window curtains should be done on a regular, determined time frame, or when visibly soiled.

### **5.10 Cleaning of Cleaning Equipment**

An important aspect of cleaning is to prevent the contamination of cleaning solutions and cleaning tools. Incorrect use of material and solutions (dilution not correctly done) and the inappropriate cleaning of items used (preparing solutions in dirty containers) can contribute to the growing of microorganisms and thus spread of infection.

To prevent spread of infection through inappropriate cleaning and housekeeping practices, cleaning personnel should have complete instructions in the constitution of cleaning solutions and procedures to follow to maintain clean tools/equipment and a clean environment.

These instructions should include daily cleaning of tools, discarding of extra solutions and washing mops and drying containers to minimize the growth of microorganism.

#### **Daily cleaning practices**

- Mops should be thoroughly washed and dried before re-use.
- Buckets should be cleaned daily before the actual cleaning process starts and immediately after the process ends.
- Cleaning material/ solutions should be replaced frequently.
- Refrain from leaving mops in "cleaning solution" overnight.
- Cleaning of special care areas, such as isolation areas should be done according to protocol and under supervision.

#### **Basic cleaning practices in isolation should include:**

- Wet dusting of surfaces with pre-moistened cloths.
- Careful cleaning in the immediate vicinity to patients to avoid contact with detergents.
- Avoiding the use of cleaning equipment that produces mist or aerosols.

## Chapter 6

### 6. Isolation

Isolation of patients with known or suspected infectious disease significantly contributes to the reduction of the spread of infection and thereby to improved infection control measures. The aim of isolation is to confine the organism and block its routes of spread and these measures should be implemented by all persons.

The objective and purpose of isolation guidelines is to:

- Reduce the risk of transmission of microorganisms from an infected patient to others (including HCWs);
- Provide the patient and family with the best possible care, treatment and support (reassurance) while in isolation; and
- Ensure that HCWs implement the appropriate procedures and measures during the care and treatment of the patient.

The three main categories are defined as Strict Isolation, Source Isolation and Protective Isolation. Isolation policies are influenced by the environment and physical facilities within the hospital setting, however for all these categories the same general procedures and measures apply.

#### 6.1 General Procedures and Measures

##### Procedures to follow

- Define category of infection isolation.
- Inform infection control nurse and notify the disease, if required.
- Identify and set up the isolation room, clearly identified as “**ISOLATION – ACCESS RESTRICTED**”.
- Ensure adequate required equipment and supplies for exclusive use in room.
- Allocate staff and restrict access of pregnant and ill staff members, as well as visitors.
- Inform staff and ensure all staff is aware of the protocols to follow.
- Educate patient, family and visitors accordingly.

#### 6.2 General Measures

##### Rooms/ Patient placement

Single room is preferable, with minimum furniture to facilitate nursing and cleaning procedures. The single rooms in hospitals can be utilized for this purpose, provided that the room is clearly marked. Patients should be placed in a single room with separate hand washing and toilet facilities to reduce opportunities for transmitting

microorganisms, especially cases of contact with fecal material with gastroenteritis caused by enteric bacteria.

**Strict isolation cases should always be placed in single rooms.**

When a single room is not an option, patients can be **cohorting** (patients with the same disease stay together in one room). When a private room and cohorting is not an option, alternative arrangement is required, which should include:

Specific and clear instructions and information to all involved to ensure that patients, visitors and personnel take all the necessary precautions to prevent the spread of infection. Restrictions should be placed on the movement of patients, personnel caring for them and visitors to such patients.

**Equipment and Instruments**

- Dedicated patient equipment should be used to reduce the risk of transmission of infection from patient to patient.
- Disposable or equipment that can be autoclaved should be used.
- General nursing equipment such as baumanometers, stethoscope, and thermometer should be kept allocated to the room for exclusive use.
- Equipment should be disinfected after each use.
- At discharge, disinfect instruments, place in clear plastic bag and dispatch to C.S.S.D.

**Personal Protective Equipment**

**Gowns/aprons**

Disposable plastic aprons should be used and dated on the outside to use for 24 hours. Aprons should be left hanging outside the room (in the corridor) and be disinfected on the outside with Chlorhexidine 0.5% in Alcohol 70%. Water- repellent aprons can be used in strict isolation.

**Gowns should be worn in all cases of protective isolation.**

**Masks**

Routine use is unnecessary as its protection is minimal, however filter type masks should be used for "High risk" cases. Unsterile latex gloves are used for handling infected sites or contaminated material.

**Table: Standard Precautions with Blood and Body fluids.**

No risk of contact with blood or body fluids	<b>Low risk of contact with blood and body fluids</b>	<b>High risk of contact with blood or body fluids</b>
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	Low risk of splashing	High risk of splashing
No Protective Clothing required	Wear disposable gloves, plastic apron or waterproof gown	Wear disposable gloves, plastic apron or waterproof gown, mask and protective eye wear.

*Adapted from: Infection control guidelines: for the Prevention of Transmission of Infectious Diseases in the health care setting, Australia, communicable Diseases Network, 2001*

### **Hands Hygiene and Hand Asepsis**

Hand disinfectant should be kept inside the room. Strict Hand washing protocols before and after contact with the patient should be routinely done. Wash hands and disinfect immediately prior to leaving the room.

### **Waste Disposal**

- **Needle and syringes**

Disposable sharps should be used and immediately discarded in the sharps container. Injuries should be reported according to protocol. (See injection safety protocols)

- **Blood and bodily fluid contaminated items**

Discard disposable waste into the appropriate red bag for incineration.

- **Linen/protective clothing**

- Handle linen with care; do not shake when making bed.
- Place normal soiled linen in linen bag.
- Discard into green bag for contaminated linen and mark as infectious.
- Discard of disposable protective clothing into red bag for incineration.
- Mattresses and pillows must be sealed into plastic washable covers to maintain integrity and facilitate disinfection.

### **Bedpans and Urinals**

- Wear gloves and sluice as normal.
- In enteric precautions, wash with soap and hot water.
- Store these items separately (preferably in room) for exclusive use of patient only.

### **Specimens**

- All laboratory specimens should be regarded as bio hazardous.

- Handle with extreme care and ensure it is leak proof.
- Mark as “**Infectious**” and send with designated person to laboratory immediately.

### **Crockery and Cutlery**

- Uses of disposable items are recommended.
- If disposable items are not used, utensils should be washed with hot water and soap and be used exclusively by patient.
- At discharge, disinfect utensils with hypochlorite (bleach solution) 1:100 before returning it to the kitchen.

### **Visitors**

- Visitors can be allowed, but under strict rules and only with the knowledge and permission of the nurse in charge.
- No children under the age of 16 years should be allowed.
- Visitors should be educated on preventative measures in relation to infection control.
- Provide visitors with the required personal protective equipment at all times.
- No visitors should be allowed in strict isolation conditions.

### **Special Investigations**

Patients should only be transported if critical and essential.

- If transfer is inevitable, inform the department by attaching a biohazard note to facilitate appropriate preparation.
- The bed, trolley or wheelchair used for transport should be disinfected after use.

### **Transportation of Infected Patients**

#### **Transportation within health facility limits.**

Patient movement in the hospital should be limited to the minimum to reduce spread of infection and disease. When transportation is required, the appropriate personal protective equipment (masks, gowns) should be worn or use by the patient to reduce spread of organisms to other patients, visitors and personnel.

#### **Transportation of patients by Ambulance**

Transportation of highly infectious cases between health facilities should be handled with extreme care and the prescribed protocols should be followed. (Part II Chapter 3 section 3.6 provides details for VHF).

Personnel expecting the patient should be informed to enable them to make the required arrangements. Patients should be informed on how they can prevent the spread of infection to others.

### **6.3 Cleaning in Isolation. (Environmental Hygiene)**

The risk of spread of infection is high from contaminated bedside equipment and environmental surfaces if not adequately disinfected.

In addition to standard cleaning practices;

Adequate disinfection of room, cubicle, instruments, bed and bedside equipment, patient utensils, and environmental surfaces are required. (Part II Chapter 7 provides more details.)

#### **Continuous disinfection (Concurrent Disinfection)**

- Strict hand hygiene should be observed at all times.
- Keep cleaning equipment to the minimum, clearly marked and use for isolation area only.
- Ensure cleaning staff are familiar with procedures to follow and are using personal protective equipment at all times.
- Daily cleaning should be done with the current disinfectant in use under supervision; after all other areas are cleaned, except in the case of protective isolation.
- Blood spills and other infectious body fluids should be handled with extreme caution (Part I Chapter 5 section 5.8 provides details).
- Removal of disposable bags should be done twice a day.

#### **Terminal cleaning (Terminal Disinfection)**

- Patient should have a bath or shower within the isolation area and be clothed before discharge.
- All dry linen should be put in a linen bag for laundry, marked as soiled and infectious.
- All wet soiled linen to be put in marked for laundry.
- All soiled, disposable items should be discarded into red plastic bag for incineration.
- All washable areas to be disinfected with biocide D.
- Remove all instruments once it has been disinfected, place in clear plastic bag, mark as infectious and sent to C.S.S.D for sterilization.
- Remove all equipment from the room once it has been disinfected.
- Room should only be occupied when dry and well aired for several hours. (24 hours recommended if possible).
- If room is required earlier, consult with infection control nurse.

### **6.4 Isolation Categories**

The category of isolation depends on the virulence of the organism and its mode of spread. It is recommended that hospitals use three isolation categories. These recommended precautions are entirely determined by the epidemiological features of disease and their routes of transmission, coupled with the minimum standard

precautions necessary. Determining these categories aims at assisting staff members to follow established routines in applying infection control/ isolation precautions consistently.

**1.** Strict Isolation;

**2.** Source Isolation (inclusive of Respiratory Precautions, Enteric Precautions, Wound and Skin Precautions, Blood Precautions); and

**3.** Protective Isolation.

#### **6.4.1 Strict Isolation**

It is practiced to prevent transmission of virulent or highly infectious diseases such as chickenpox, shingles, diphtheria, and infected burns. Patients are only infectious in the Haemorrhagic phase. Staff is in danger through the direct contact with:

Blood and serum, blood stained secretions inclusive of haematemesis material and malena stools, aerolization of the above-mentioned and any aspirate of any orifices.

Any suspected case of **Viral Haemorrhagic Fever** at any health facility should be reported immediately to the infection control unit at Windhoek Central Hospital. (Part II provides complete details)

#### **Strict isolation measures and procedures in other diseases.**

##### **General measures apply, including the following specifics:**

- Single room, doors closed and no visitors allowed.

##### **Gowns/Aprons**

- Disposable water-repellent gowns are compulsory.

##### **Masks**

- Filter type compulsory

##### **Gloves**

- Double - gloving compulsory

##### **Eye Protection**

- Goggles should be worn as a standard

##### **Caps**

- Balaclava type compulsory

### **Shoe Covers**

- Plastic shoe covers compulsory, plastic bags may be used

### **6.4.2 Source Isolation**

General precautions apply, but additional precautions should be taken according to the source type of infection.

#### **Respiratory Precautions**

Diseases include Meningococcal Meningitis (first 48 hours), Measles, and Mumps, Rubella, Chickenpox, Herpes Zoster, Diphtheria, Tuberculosis (first 48 hours after commencement of treatment), Pertussis and Legionnaire's disease.

- General measures/ standard precautions apply.
- Nursing personnel should use filtering type of masks during suctioning.
- Provide patients with disposable sputum container with a lid and paper tissue.

#### **Wound/Skin Precautions**

Diseases include Herpes Zoster, Burns, and Skin and Wound infection.

- General measures/standard precautions apply.
- Wear gowns when extensive wound dressing is done.
- Safely dispose of wound exudates into biohazard bag for inclusion in red bag for incineration.

#### **Enteric Precautions**

Disease include Cholera, Shigellosis, Salmonellosis, Typhoid Fever, Poliomyelitis, Amoebic Dysentery, Enteropathogenic E. coli infection, AIDS (if blood stained excreta), Hepatitis A.

- General measures/standard precautions apply.
- Safely discard urine and faeces down the sluice immediately, using gloves.
- Wash bedpans and urinals with soap and water and store in patient area for exclusive use.
- Discard disposable utensils into clear plastic bag, seal and mark for incineration.
- Wear gloves when handling soiled linen and place in marked linen bag.

#### **Blood Precautions**

Diseases include Typhoid for the first 10 days, Hepatitis B, Jaundice of unknown origin, and AIDS in the non-Haemorrhagic phase.

- General measures/ standard precautions apply.
- Wear goggles when splashing of blood is expected.
- Mark instruments as BIOHAZARD and return to C.S.S.D.

#### **6.4.3 Protective Isolation (Also known as Reverse Barrier Nursing)**

Patients with an immunocompromized status vary in their susceptibility to nosocomial infections. The patient's susceptibility depends on the severity and duration of immunosuppression. They are generally at risk for bacterial, fungal, parasitic and viral infections. Implementation of standard and transmission based precautions should reduce the risk for these patients to acquire bacteria from other patients, visitors, nurses and their environment within the hospital.

As the category states: **Protective** – it aims to protect the patient against contamination of environmental sources and HCWs. It is the persons entering the room and the equipments taken into the room that poses an infection risk to the patient.

Conditions include immunocompromized patients on immunosuppressive therapy, Extensive Burns, Severe and Extensive Dermatitis, Hodgkin's disease, Agranulocytosis, Leukaemia.

- General measures/ standard precautions and transmission-based precautions apply.
- Single room, with closed windows and door preferably at all times.
- Restrict access; no person (nurse or visitors) with a known infection or visible infectious lesions should enter the room or attend to the patient.
- Visitors should only be **two at a time** and should be educated about protection measures.
- Filter type masks should be worn at all times.
- Wear examination gloves and long sleeve gowns for all aseptic procedures and disinfect hands before and after contact with patient.
- Keep all required personal protective equipment inside close to the door for easy wear and appropriate disposal.
- Disposal of used items and removal of personal protective equipment should be done outside the room.
- Change bed linen daily; sterile linen may be required in burn wound cases.
- Maintain strict personal hygiene (clean nails, hair, and uniform).
- Domestic cleaning of room should be done prior to any other cleaning activities in the ward.

## Chapter 7

### 7. Infectious Disease Management

This section includes information on specific infectious diseases (viral and bacterial) and provides specific guidance on prevention, management and control. The guidance primarily focuses on prevention of the spread of disease and protecting the HCW and patient. The nursing and medical management is not addressed in this section.

Infection control has a two-tiered approach.

- Standard precautions are the basic level of infection control for the treatment and care of all patients.
- Additional (transmission-based) precautions where standard precautions may be insufficient to prevent transmission of infection in patients suspected or confirmed to be infected or colonized with highly transmissible pathogens that can cause infections in health care settings.

These additional precautions are based on specific modes of transmission namely:

Airborne transmission

Droplet transmission

Contact transmission

**Infectious diseases can be divided into 3 classes, namely viral, bacterial and resistant microorganisms. This guideline will focus on the most common viral and bacterial classes and the most virulent diseases in Namibia.**

#### Viral Diseases

- Cytomegalovirus infection
- Infectious mononucleosis (Glandular fever)
- Viral Hepatitis (hepatitis A, hepatitis B, hepatitis C)
- Herpes simplex infections
- AIDS
- Influenza
- Measles
- Parvovirus B 19 infection
- Respiratory syncytial virus infection
- Rotavirus infection

- Viral Haemorrhagic Fever (Part II provides comprehensive infection control guidelines).

## **Bacterial Diseases**

- Gastroenteritis and enteric diseases
- Legionellosis
- Listeriosis
- Meningococcal infection
- Whooping cough (Bordetella Pertussis)
- Staphylococcal infection
- Streptococcal infection
- Tuberculosis
- Multidrug Resistant Tuberculosis (MDR-TB) (Part III provides comprehensive infection control guidelines)

## **7.1 Viral Diseases**

### **7.1.1. Hepatitis A**

#### **Aetiology and occurrence**

Acute hepatitis caused by the Hepatitis A virus (HAV), which is a hepatotropic virus and can be encountered both in the community and in hospitals. It can be sporadic or epidemic.

#### **Clinical manifestations**

Initial symptoms include fever, lethargy and abdominal pain, followed by jaundice in a few days.

Incubation period is 15 – 50 days. Mostly asymptomatic, especially in children, and is only diagnosed in the laboratory. Ranges from mild illness lasting a few weeks to disabling disease in rare cases, mortality rate is low. Complete recovery can take several months without recurrence.

#### **Transmission**

Fecal-oral route – from person-to-person and through the contamination of food and water contaminated by human fecal material. The virus is excreted and infectious during incubation period and a week after jaundice presents. Infants may excrete the virus up to six months.

HCWs working in intensive care, pediatric wards, accidents and emergency, laboratory and hospital sewerage systems are at particular risk.

#### **Management**

Standard precautions for continent patients apply.

Additional precautions (contact transmission) for incontinent patients apply. (Single room with toilet facilities if possible, exclusive use of bedpans and urinals)

Adequate hand washing facilities for patients and HCWs is essential.

Routine decontamination and sterilization of instruments applies.

Routine environmental cleaning applies.

Immunization recommended for:

- Injecting drug users
- Hemophiliacs who may receive pooled plasma concentrates
- Patients with chronic liver disease
- Occupational groups at risk

### **7.1.2. Hepatitis B**

#### **Aetiology and occurrence**

Disease caused by Hepatitis B virus (HBV), which is hepatotropic. Incubation period ranges from six weeks to six months. Most people recover, 1% mortality rate. 10% of adults may carry the disease in their blood for a long time, 90% of infants who acquire the infection become chronic carriers and a potential source of infection to others.

#### **Clinical manifestations**

Onset of disease is marked with symptoms of anorexia, vomiting, abdominal discomfort or pain, rash or joint pain. Fever not always present, but jaundice often present later.

#### **Transmission**

Transmitted in the health care setting by parenteral exposure to infected tissue, including blood and other body fluids. The rate of transmission of infection is dependable on the viral titre of the infectious person and it therefore varies from case to case.

May also be transmitted by exposure to mucous membranes, such as eye, nose and mouth to infected material. All people who have not been immunized or was never infected before are at risk of infection.

#### **Management**

Standard precautions should be applied to minimize the risk to exposure.

Adequate hand washing facilities for patients and HCWs is essential.

Routine cleaning and sterilization of instruments applies.

Routine environmental cleaning applies.

### **7.1.3. Hepatitis C**

#### **Aetiology and occurrence**

The disease is caused by infection with Hepatitis C virus (HCV). It is known to be responsible for 90% of all transfusion-related non-A and non-B Hepatitis.

### **Clinical manifestations**

It is frequently asymptomatic, though it causes chronic hepatitis in a high proportion of those infected. This may ultimately result in chronic liver disease, cirrhosis and hepatocellular carcinoma. Acutely and chronically infected people are infectious.

### **Transmission**

Transmitted through parenteral exposure to blood and other body fluids, related to viral load. Associated with endoscopic procedures (upper gastrointestinal endoscopy and colonoscopy).

### **Management**

Standard precautions are adequate and should be applied to minimize the risk to exposure.

Adequate hand washing facilities for patients and HCWs is essential.

Routine cleaning and sterilization of instruments applies.

Routine environmental cleaning applies.

## **7.1.4. Herpes simplex virus infection**

### **Aetiology and occurrence**

Caused by infection with the herpes simplex virus (HSV), a herpes virus. Two serotypes can be distinguished immunologically namely HSV 1 and HSV 2. It is widely spread in the community with 50–90% of adults have antibodies to HSV 1, usually infection occurs during childhood before the age of 5, while HSV 2 usually begins after the start of sexual activity.

### **Clinical manifestations**

The virus causes vesicular lesions of the oropharynx and the genital area that is infectious. It can occasionally cause lesions elsewhere (finger and buttocks). In neonates and immunocompromised patients, it may cause a generalized vesicular rash.

### **Transmission**

Transmitted by droplet spread or direct contact, indirectly by fomites or by a third person. The vesicular lesions contain infectious virus, it may also be present in saliva and in the vagina even when vesicles are not present.

### **Management**

Additional precautions (contact transmission) should be observed for patients with lesions that can disseminate infectious virus.

Wear gloves when in contact with lesions.

Use mechanical ventilation if required.

If saliva risk is present in dental procedures, wear goggles and a mask.

HCWs with lesions should wear gloves and avoid invasive procedures while lesions are present.

HCWs with oral lesions should avoid contact with newborns and immunocompromized patients. HCWs should be excluded from operating rooms and maternity sections.

Routine cleaning and sterilization of instruments applies.

Routine environmental cleaning applies.

### **7.1.5. Human Immunodeficiency Virus / Acquired Immune - Deficiency Syndrome**

#### **Aetiology and occurrence**

Caused by the human immunodeficiency virus (HIV), a retrovirus. Two distinct types, HIV 1 and HIV 2 can be recognized. HIV is primarily a sexually transmitted infection during vaginal, oral or anal sexual intercourse.

#### **Clinical manifestations**

The early stages of infection are known as primary infection, test at this time is negative. Seroconversion can occur between 2 – 4 weeks after contact. Infected persons can be asymptomatic for years, but can transmit the virus to others. HIV causes a severe life – threatening disease called AIDS which occurs in the late stages of the disease, resulting in progressive damage to the immune system resulting in opportunistic infections and organ damage.

#### **Transmission**

Infection begins shortly after primary infection and continues throughout life, though the patient may not have any signs and symptoms of disease. HIV is a blood borne and sexually transmissible disease.

HIV can be transmitted by direct contact with blood and other body fluids, through mucous membranes, and percutaneous injury.

Infection can also be transmitted from mother to baby during pregnancy, labour and delivery and during breastfeeding.

#### **HCWs are exposed to risk:**

Through the direct exposure to blood and body fluids. Blood transfusion in Namibia is safe and thus poses no risk.

Percutaneous exposure risk relates to large quantities of blood, use of hollow needles directly in a vein or artery or a deep injury and blood from a source with terminal illness.

HCWs who are immunocompromized due to illness or therapy or have eczema, large skin wounds or severe acne.

## **Management**

Standard precautions should be implemented. Care should be taken to prevent exposure to blood and exposure to sharps injuries.

Additional precautions (contact and respiratory transmission) are only required for patients with opportunistic infections such as infectious Tuberculosis. These may include wearing masks, goggles and aprons, and gloves when disposing of wet linen as infectious.

### **Isolation of patient in a single room is only required when:**

There is uncontrolled bleeding and diarrhea,  
Secondary infection such as Herpes Zoster or PTB is present,  
The patient is mentally disturbed or if psychological reasons warranted.

HIV testing is not required for all patients, if testing is recommended on the basis of clinical assessment, the patient should be offered appropriate counseling services and confidentiality should be maintained. All TB patients should routinely be offered HIV counseling and testing.

In case of exposure, the risk should be identified following the PEP guidelines and exposure incident should be reported.

Routine disinfection and sterilization of instruments applies.

Routine environmental cleaning applies.

## **7.1.6. Influenza**

### **Aetiology and occurrence**

Disease is caused by infection with either influenza type A or type B virus.

### **Clinical manifestations**

Symptoms include abrupt onset of fever, headache, myalgia, sore throat and cough. Extreme malaise lasts several days and is usually self-limiting with full recovery in 7 days. It is an acute viral infection that occurs throughout the community, including HCWs. The disease can occur in isolated cases, as localized outbreaks, epidemics or pandemics. It is seasonal from mid autumn to end of winter.

### **Transmission**

Aerosolized respiratory secretions are the main source of transmission, but can also be transmitted by direct contact with fomites. It is communicable from onset up to 3 –5 days in adults and up to seven days in children. All people in contact with the infectious person are at risk of the disease, unless they are immunized with current vaccine formulation.

**People at particular risk of complications of influenza include:**

Adults with chronic disease such as cardiac, pulmonary, renal and metabolic disorders.  
Children with cyanotic congenital heart disease, people receiving immunosuppressant therapy.

Residents in long term care establishment.

The elderly in frail health.

**Management**

Additional precautions (contact transmission) should be observed.

Respiratory isolation and treat patients symptomatically.

Influenza immunization for healthy people is given to minimize the incidence of influenza and is recommended for:

- Adults over 65 years of age
- Residents in long term care establishments
- Adults and children (age 6 months and over) with chronic disorder of pulmonary or circulatory systems.
- Children and teenagers (age 6 months and over) on long term aspirin therapy at risk of developing Reye's Syndrome after influenza
- Women in second or third trimester of pregnancy
- HIV infected persons with minimal symptoms and high CD4 counts.

HCWs who develop disease should take sick leave or avoid patient contact.

HCWs should be immunized to further reduce the incidence of influenza.

Routine sterilization of instruments applies.

Routine environmental cleaning applies.

**7.1.7. Measles****Aetiology and occurrence**

Disease caused by infection with the measles virus, the morbillivirus of the paramyxoviridae family. Before vaccine introduction, measles was a common childhood illness. Immunization has decreased the incidence significantly, but periodic outbreaks still occur.

**Clinical manifestations**

Acute, highly infectious disease, symptoms include fever, rash, conjunctivitis, coryza, cough and Koplik spots on the buccal mucosa. The rash sometimes results in desquamation (skin peels off). Disease is more severe in infants and adults, than in children.

Complications include middle ear infections, pneumonia and encephalitis. Late complications due to chronic infection with measles virus is sub acute sclerosing panencephalitis.

### **Transmission**

The virus is transmitted by aerosols or direct contact with nasopharyngeal secretions or less commonly by items recently contaminated by infectious material. Patients are infectious from just before onset of symptoms until about four days after appearance of the rash. Susceptibility is universal in people who never had the disease or were never immunized.

### **Management**

Additional precautions (contact transmission) should be observed.

Isolation of patient is required to prevent spread in health facility.

Additional precautions (droplet transmission) should be observed with instruments in addition to routine sterilization of instruments.

Susceptible persons should wear masks when attending to patients.

HCWs with measles should avoid contact with patients.

HCWs are at risk as measles in adults are often complicated, susceptible HCWs should be given vaccination within 72 hours post-exposure.

Immunization status of children should be checked with each health care encounter and be immunized if eligible.

### **7.1.8. Mumps (Epidemic Parotitis)**

#### **Aetiology and occurrence**

Caused by a virus, incubation period is 12 –28 days. Mainly seen in children from age 5 –15 years of age and in young adults. Epidemics mainly occur in schools and institutions. It is endemic all over the world.

#### **Clinical manifestations**

Mumps is an acute infectious disease, characterized by enlargement of the salivary glands, especially the parotid glands. The glands are inflamed and secrete less than normal. Swelling subsides within 7 to 10 days.

Other symptoms include general malaise for up to 3 days, pyrexia, headache and sore throat. Patient may experience pain when eating and difficulty to open mouth.

Infection is more severe after puberty.

#### **Transmission**

Spread by droplet infection.

#### **Management**

Additional precautions (droplet transmission) should be observed.

### **7.1.9. Poliomyelitis**

#### **Aetiology and occurrence**

Caused by infection with the poliovirus. The incubation period is 7 –14 days

#### **It is a disease under surveillance and is notifiable to WHO as urgent.**

There are 3 types of poliovirus namely:

Poliovirus 1 (Brunhilda) associated with paralytic illness

Poliovirus 2 (Lansing) seldom associated with paralytic illness

Poliovirus 3 (Leon) not often associated with paralytic illness

Any age group can be affected, the older the person, the more severe the disease. Epidemics usually occur in summer and precipitating factors include low resistance, malnutrition, stress and undue fatigue.

#### **Clinical manifestations**

It is an acute communicable disease, notifiable and with signs of inflammatory changes in the nerve cells/ central nervous system especially the spinal cord.

#### **Pre-paralytic stage:**

Onset sudden, slight cold, develops fever, severe headache, depression

Signs of meningeal irritation, neck rigidity, photophobia

Muscles are tender and painful, patient restless

#### **Paralytic phase:**

After 24-48 hours temperature falls and paralysis sets in

Paralysis asymmetrically and sometimes only a few muscle groups involve

Paralysis is flaccid, the legs more than arms

In time, muscle atrophy and limb becomes thinner.

No loss of sensation, pain and tenderness may persist.

Bulbar poliomyelitis

#### **Post-paralytic phase:**

Asymmetrically paralyzed muscles lead to orthopedic problems - scoliosis, dropped foot and shortening of limb.

#### **Transmission**

Transmission is by faecal –oral route. **It is also transmitted by air. It can be ingested via contaminated food and milk; and then found in the faeces.**

## **Management**

Additional precautions (contact and airborne) should be observed.

Isolation of patient in a single room with own toilet facilities.

**Special precautions should be taken when faeces is handled.**

Hand washing of patient and HCW are essential.

### **7.1.10. Rabies (Hydrophobia)**

#### **Aetiology and occurrence**

Caused by the Rabies virus. It is primarily a disease that affects animals. It occurs throughout the world. In Namibia, it is found in the northern parts of the country. People at risk are those likely to be bitten by the infected animal. Incubation period ranges from 2-3 weeks and up to 2 years.

#### **Clinical manifestations**

An acute infectious disease in man characterized by its effects on the nervous system and the fear of water "hydrophobia".

#### **Prodromal stage (first stage)**

Site of bite is painful and burning

Headache, irritability, restlessness, anxiety, vomiting, pyrexia

Voice becomes husky

Swallowing difficult and saliva profused

#### **Excitation phase (second stage)**

Usually lasts less than 48 hours

Recurrent spasms of the muscles of swallowing

Mental excitement, sound of running water leads to spasms

Convulsive seizures, extreme causing opisthotonus

Respiratory muscles involved

Hallucinations, delusions

#### **Paralytic stage (third stage)**

A flaccid paralysis develops

Last only a few hours

Spasms stops and patient becomes unconscious and dies, usually dies in one week of onset of disease.

## **Transmission**

The virus-laden saliva of a rabid animal is introduced by a bite or sometimes by entering a scratch or other fresh break in the skin.

### **Management**

Additional precautions (contact transmission) should be observed.

Strict isolation, concurrent disinfection of saliva.

Wearing of gloves, aprons, goggles and a mask is essential.

Administer post-exposure prophylaxis.

Disinfection of wound within 3 hours to avoid contracting rabies, encourage bleeding freely, avoiding suturing if possible.

Administer antibiotics and anti tetanus toxiod.

Instill anti-rabies hyper immune serum into the wound.

### **Prophylaxis is recommended for:**

Bites where teeth have penetrated the skin.

Exposure to saliva, contact with mucosa (including conjunctiva) and broken skin.

Needle stick injuries where exposure included cerebrospinal fluid, nerve tissue, ocular tissue or internal organs.

### **7.1.11. Rubella**

#### **Aetiology and occurrence**

Disease is caused by infection with rubella virus, a togavirus. In general women of childbearing age are immune because of community immunization programmes, but males remain at risk.

#### **Clinical manifestations**

It is a mild disease with low-grade fever and macopapular rash. Children have general fewer symptoms, but adults frequently have fever, headache, lethargy, mild coryza, conjunctivitis and occasionally arthritis.

#### **Transmission**

Droplets and close contact with infected patients transmit rubella. Patients are infectious about one week before and several days after onset of rash. Infants with congenital rubella may excrete the virus for several months after birth. People who have not been immunized or had not had the disease are susceptible.

#### **Management**

Additional precautions (droplet transmission) should be observed.

Pregnant HCWs should avoid patients, as the risk of congenital rubella is high.

Routine sterilization of instruments applies.

Routine environmental cleaning applies.

### **7.1.12. Varicella-zoster (chickenpox and shingles)**

#### **Aetiology and occurrence**

Disease is caused by infection with Varicella-zoster virus (VZV), a herpes virus. Acute VZV (chickenpox) occurs worldwide, about 95% of people having been infected by early childhood. The incubation period is two weeks.

#### **Clinical manifestations**

Acute VZV infection in humans presents as chickenpox (Varicella). In adults, it can occasionally be debilitating particularly during pregnancy. It is generally more severe in adults (pneumonia), than children and pregnant women are more at risk than non-pregnant women. Neonates and immunocompromized patients are even more at risk and have a potential mortality rate of 20%.

The virus remains latent in the sensory nerves and reactivation of VZV infection occurs as shingles (zoster) usually decades after initial infection. Reactivation takes the form of a cluster of vesicles involving a single dermatome. Blister fluid from the vesicle is infectious, especially facial shingles due to the increased risk of direct exposure, and contact can result in primary Varicella infection in a non-immune contact.

#### **Transmission**

Transmission occurs from person –to –person by direct contact or by droplet or airborne spread from respiratory tract or vesicle fluid. Patients are infectious up to five days before appearance of chickenpox lesions and five days after vesicles first appear in acute infection. Patients with shingles should be regarded infectious for up to a week after the rash appears. Immunocompromized patients are infectious for longer periods.

Susceptibility is universal to people who have not been infected before or immunized. VZV is one of the most infectious of all communicable diseases and in household settings; up to 90% of susceptible siblings had secondary attacks.

#### **Management**

Additional precautions (airborne and contact transmission) should be observed for patients with chickenpox.

Additional precautions (contact transmission) should be observed for patients with shingles.

Masks are not completely effective in preventing transmission; susceptible persons should avoid contact with patients.

Pregnant HCWs should avoid patients.

Routine sterilization of instruments applies.

Routine environmental cleaning applies.

### **7.1.13. Viral Haemorrhagic Fevers (VHFs)**

(Part II provides comprehensive Infection Control Guidelines)

## **7.2 Bacterial Diseases**

### **7.2.1. Gastroenteritis and enteric bacterial pathogens**

#### **Aetiology and occurrence**

The most commonly diagnosed infectious agents include salmonella types, *Campylobacter spp*, *Shigella spp* and *Clostridium difficile*

#### **Clinical manifestations**

Patients usually present with abdominal pain, diarrhea, nausea, vomiting and fever, the most common features of gastroenteritis. Relatively common in the community, individuals may carry pathogens asymptotically for long periods. However, not all cases of diarrhea occur in health care settings and not all-gastrointestinal infections result in diarrhea.

#### **Transmission**

Transmitted by the faecal-oral route, most likely sources in health care settings are other patients, especially in paediatric wards and also food and food products. Cross contamination with *Clostridium difficile* can occur from patient to patient through the contaminated hands of HCWs. All age groups are susceptible, but immunocompromized patients and people on long term antibiotic therapy are at highest risk.

#### **Management**

Outbreaks of gastroenteritis should be investigated and reported to the infection control nurse.

Additional precautions (contact transmission) should be observed. Patients should be isolated in a separate room with own toilet facilities.

Hand washing facilities are essential for both patients and HCWs.

Food handlers should be educated on the appropriate procedures to prevent contamination of food and food products, as it is the most effective method to reduce the risk of foodborne infection.

### **7.2.2. Cholera**

#### **Aetiology and occurrence**

Caused by a bacillus, the vibrio cholera, incubation period is from a few hours to 5 days. The disease occurs in large epidemics and may become endemic in an area.

### **Clinical manifestations**

Acute, infectious, formidable, notifiable disease, with severe diarrhea, massive fluid and electrolyte loss and dehydration. Onset is sudden, intense diarrhea with watery stools (typical rice water stools) within half an hour, the body fluid and electrolytes may be lost, especially potassium and sodium bicarbonate.

Dehydration, eyes become sunken, skin cold and clammy

Pulse rapid, temp subnormal

Cramps in muscle tissue

May vomit and pass into shock or develop renal failure, collapse state may follow.

### **Transmission**

Infection is spread through the contamination of water. Food and vegetables can become contaminated by water containing the microorganism.

### **Management**

Notify the infection control department immediately and isolate the patient(s).

Additional precautions (contact transmission) should be observed.

Specimens should be handled with extreme care.

All watery loose stools should be regarded as highly infectious.

Disinfection of water is critical.

Disinfection of linen and gowns.

### **7.2.3. Diphtheria**

#### **Aetiology and occurrence**

Caused by the *Corynebacterium Diphtheriae* (Klebs-Loeffler bacillus). Incubation period is 1-5 days. Children are primarily affected (ages 1- 5 years), but during epidemics, adults can also become infected.

#### **Clinical manifestations**

Diphtheria is an acute, infectious, communicable, notifiable disease. It causes formation of a false membrane in the respiratory tract and symptoms due to the absorption of toxins.

Other signs and symptoms include:

Onset is gradual, child being off colour

Fever mild, but pulse more rapid (tachycardia)

Tonsillar glands are enlarged and underlying tissue are swollen

Sore throat

“Musty breath”, tonsils covered with whitish-grey membrane, hard to remove. In severe cases the membrane spreads to the soft palate and pharynx.

#### **Transmission**

Transmission occurs through droplets, direct contact, fomites, and contaminated milk and by carriers indirectly. The bacillus is harboured in the nose and throat of individuals and produces a toxin, which then destroys tissue and disintegrate cells.

### **Management**

Detection of source important

Treatment of carriers

Isolation of patients

### **7.2.4. Legionellosis**

#### **Aetiology and occurrence**

Disease is caused by infection with *Legionellosis* spp, most commonly with *Legionellosis pneumophila*. The disease may occur sporadic or as outbreaks and most frequently reported in the summer and autumn. Incidence of disease increase with age and most are reported in people over 50 years of age.

#### **Clinical manifestations**

It is an acute bacterial infection with initial anorexia, myalgia, lethargy and headache, followed soon by fever reaching 40°C. Cough, abdominal pain and diarrhea occur frequently. Severe infections may lead to respiratory failure and death.

#### **Transmission**

Airborne transmission in water droplets is the major, if not sole means of infection. The organism is found in aqueous environments, including contaminated air conditioning cooling towers, hot water systems, humidifiers, spa baths and respiratory therapy devices. People over 50 years are at highest risk, especially those who smoke or have chronic lung disease, renal disease, and malignancy or are immunocompromized.

### **Management**

Standard precautions are adequate as it provide enough protection for HCWs.

Routine sterilization of instruments applies.

Routine environmental cleaning applies, but special attention should be given to the maintenance of potential reservoirs such as heating and cooling systems and the others as mentioned under transmission.

### **7.2.5. Meningococcal infection**

#### **Aetiology and occurrence**

The disease is caused by *Neisseria Meningitidis*. It affects mainly young children and adolescents, but can occur at any age. It can kill healthy children within hours of onset. An increasing incidence of disease and outbreaks has been associated with virulent clones of both serogroup B and serogroup C meningococci.

### **Clinical manifestations**

Bacteraemia is an invasive meningococcal infection, which may present as meningitis, septicaemia, septic arthritis or chronic systemic infection.

It can present as acute bacterial meningitis (fever, headache, vomiting, and neck stiffness) with or without petechial haemorrhages or other skin lesions seen with meningococcal Bacteraemia.

Meningococcaemia without meningitis may occur without a rash, but more usually with a petechial or grosser haemorrhagic rash. Progression to overwhelming shock can be rapid and this type has a much higher death rate than the uncomplicated meningococcal meningitis.

### **Transmission**

*Neisseria Meningitidis* is spread by direct contact, including respiratory droplets from the nose and throat of infected persons.

Nasopharyngeal carriers may be sources of infection. Patients with meningococcal septicaemia or meningitis become non infectious within 24 hours of appropriate treatment. HCWs are at risk, but only if in prolonged contact or if they undertake mouth-to-mouth resuscitation.

### **Management**

Additional precautions (droplet transmission) should be observed for 24 hours after the initiation of treatment.

Notification is vital in the case of meningococcal disease to identify outbreaks. Outbreaks are a public health emergency and a rapid response is required. Immunization to control can be implemented, depending on identifying the population at risk and the magnitude of the outbreak.

Additional precautions for instruments and the environment should be observed.

## **7.2.6. Whooping cough (Pertussis)**

### **Aetiology and occurrence**

Disease is caused by infection with the gram-negative coccobacillus, *Bordetella Pertussis*. Pertussis is endemic in all age groups.

### **Clinical manifestations**

Pertussis is a serious, sometimes fatal respiratory infection. The cough becomes paroxysmal usually within 1-2 weeks and often last 1 –2 months or longer. Patients frequently expel clear, thick mucus and vomiting is common. Infected adults may have a persistent cough, but without the paroxysmal as seen in children

### **Transmission**

Pertussis is a highly infectious disease, spread by respiratory droplets. Incubation period is 7 –10 days. People can be infectious from 7 days after exposure to three weeks after onset of typical paroxysms. The initial catarrhal stage is insidious and the most infectious period. Humans are thought to be the only natural reservoir. An adult or sibling infects children. The risk of infection decreases after administration of antibiotics. HCWs should be aware that Pertussis could occur in adults.

### **Management**

Additional precautions (droplet transmission) should be observed, a single room for at least the first five days.

Suspected cases should be isolated from adults, young children and infants.

If exposure did occur in the previous ten days, erythromycin prophylaxis should be prescribed.

HCWs with Pertussis infection should be treated and should avoid contact with susceptible patients until after five days of antibiotic treatment.

Routine sterilization of instruments applies.

Routine environmental cleaning applies.

### **7.2.7. Staphylococcal infection**

#### **Aetiology and occurrence**

Caused by infection with coagulase-positive strains of *Staphylococcus aureus* and less commonly by coagulase-negative *Staphylococcus epidermidis*. *Staphylococcus aureus* is present on the skin and in the nose of approximately 30-50% of the general population. In hospital staff, the carrier rate can be 60-80%.

#### **Clinical manifestations**

Commonly causes cellulitis and wound infections. It can also cause more serious conditions such as osteomyelitis and bacteraemia. Enterotoxin-producing staphylococci may also cause food poisoning.

#### **Transmission**

Nasal secretions contain large numbers of bacteria that contaminate the hands. It penetrates into the deeper layers of the skin, where it lives and multiplies in the pores and hair follicles. Hand washing may not remove the organisms; antiseptic lotion may help reduce the skin carriage of staphylococci. The source of infection is usually an asymptomatic carrier, or a patient with a purulent staphylococcal lesion.

The risk to HCWs depends on the extent of contact with patient, the underlying medical condition of the patient and the amount of skin shedding by the HCW. Infections are relatively common amongst patients as they themselves can be carriers and shedders of the organisms.

HCWs with exfoliative skin are at increased risk of acquiring or transmitting the disease.

## **Management**

Standard precautions should be observed.

If patient has large numbers of infected wounds, they should be isolated in a single room with its own bathing facilities.

Routine sterilization of instruments applies.

Routine environmental cleaning applies.

### **7.2.8. Streptococcal infection**

#### **Aetiology and occurrence**

Caused by infection with group A (beta haemolytic) *Streptococcus pyogenes*. Cases of streptococcal pharyngitis occur most frequently in temperate climates, throughout the year but peaks in winter and early spring.

Streptococcal impetigo occurs throughout the year, mostly in young children in late summer and autumn.

Erysipelas and scarlet fever occur sporadically, similar to streptococcal pharyngitis.

#### **Clinical manifestations**

Common cause of pharyngitis, skin infections such as cellulitis and wound infections. It can also cause scarlet fever or rheumatic fever and can cause more serious conditions such as necrotizing fasciitis and bacteraemia.

#### **Transmission**

Aerosol transmission by expelled respiratory secretions from symptomatic patients or asymptomatic carriers is common. Patients with purulent discharges are infectious for up to 24 hours after start of treatment. Outbreaks of pharyngeal infections have followed ingestion of contaminated food, milk, eggs and their products. Most people are susceptible to streptococcal pharyngitis or scarlet fever.

## **Management**

Standard precautions should be applied with a single room in cases of an infected wound.

Additional precautions (droplet transmission) should be observed for at least the first 24 hours of effective antibiotic treatment, if a patient has group A streptococcal respiratory infection and is coughing.

Acute septic lesions (impetigo, cellulitis) should be assessed for pathogenic streptococci for both patients and HCWs.

HCWs with lesions should cover it and be isolated from patients for at least the 24-hour period of effective antibiotic treatment.

Routine sterilization of instruments applies.

Routine environmental cleaning applies.

## **7.2.9. Tuberculosis (TB)**

### **Aetiology and occurrence**

Tuberculosis is caused by *Mycobacterium tuberculosis*-complex ssp, predominantly *M. tuberculosis*.

Tuberculosis is usually a pulmonary disease, extra pulmonary TB is much less common, but infection can occur in any organ or tissue including the meninges, lymph nodes, pleura, pericardium, kidneys, bones, joints, larynx, skin, peritoneum and eyes.

### **Clinical manifestations**

Approximately 90-95% of people who have the bacterium become latent carriers who have a lifelong risk of developing clinical (active) disease. 10% of infected adults will develop clinical disease in their lifetime. The risk of developing disease is greater in young children, and people with impaired immune function.

Early symptoms include fatigue, weight loss and night sweats. In more advanced disease, hoarseness, cough with bloodstained sputum and chest pain are common.

### **Transmission**

TB is usually transmitted by exposure to airborne nuclei produced by people with pulmonary disease. Prolonged exposure increases the risk. Symptomatic and asymptomatic people with viable bacilli in their sputum may be infectious. Untreated or inadequately treated patients may be sputum positive for many years.

HCWs can be exposed to infection during procedures such as cough induction, bronchoscopy, intubations and autopsies (patient with undiagnosed TB).

Patients usually become non infectious after 48 hours of starting treatment.

### **Management**

The undiagnosed TB patient represents the most risk. Rapid detection, isolation, diagnosis and treatment are vital.

Additional precautions (droplet transmission) should be observed.

HCWs and visitors should wear filter masks until effective treatment has been initiated after at least 48 hours.

Patients should wear masks when transported for treatment to other departments (e.g. for X-rays)

Patients should be educated to cover their mouths and noses when coughing and spitting into closed sputum mugs.

Medical procedures that present risks are bronchoscopy and the use of respiratory and anaesthetic apparatus.

Immunocompromised patients should not be in contact with active TB patients; appropriate isolation procedures should be implemented.

Immunocompromised HCWs should not be involved in the care of TB patients.

### **7.2.10. Multi drug Resistant Tuberculosis (MDR-TB)**

(Part III provides comprehensive Infection Control Guidelines)

## **7.3 Handling of Bodies after Infectious Disease**

Infectious body fluids after death should still be handled with caution and HCWs should therefore continue to take standard precautions when handling the infectious body after death.

### **Preparing the body for movement to mortuary**

- Wear person protective equipment (gloves, masks, aprons).
- Position body and close eyes and mouth.
- Remove all medical attachments (drips, catheters, tubes etc) and discard into the biohazard bag for incineration.
- In case of an unnatural death, do not remove any medical attachments.
- Seal all draining wounds and orifices with waterproof dressings.
- Using gloves, wipe body with current disinfectant of all visible blood and body fluids.
- Place notification of death note on chest, clearly marked "**infectious**".
- Attach identification bands to wrists and ankles and position it so it can be read through the transparent body bag. If body bag is not transparent, attach second identification bands to the outer bag.
- Put body in plastic bag and seal. Put in second plastic bag and seal.
- Wipe outer bag with bleach solution 1:10.

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

- Staff does not need personal protective equipment if the body is well sealed.
- If leaking of fluids does occur during transportation, the trolley should be disinfected wearing gloves.
- The sign of "**infectious**" should be put on door of refrigerator.

### **Viewing of and caring of body**

- Viewing of the body by family and friends should be arranged taking into consideration the risks involved.
- Caring for the body should be done with protection of those involved.
- Family and friends should be informed of the limitations to some infectious diseases which include: Untreated open TB, Viral Haemorrhagic Fever, diphtheria, typhoid fever, anthrax or plague.

## **Transport and burial of infectious bodies**

- Family members and funeral houses (undertakers) should be informed of the risks involved.
- The body should be placed in a coffin and sealed for transport by undertaker.
- Body viewing at the funeral should not be allowed.
- Transportation of bodies across borders should be done in a sealed coffin.

**General issues**

- Appropriate personal protective equipment is worn during autopsy.
- No embalming is recommended.

## Chapter 8

### 8. Special Procedures

#### 8.1. Pre-Operative Skin Preparation

The normal skin protects the body against trauma and offers an effective barrier against pathogenic organisms. The epidermis and its glands reject some organisms when shedding epithelial scales. The continuous contact with the skin and the environment results in the presence of different types of microorganisms namely:

**Transient Flora** – term refers to bacteria located in the layers of skin. Transient flora is acquired through contact with patients; other HCWs or contaminated surfaces (floors, tables) during a normal workday. These organisms live in the upper layers of skin and are most likely to cause nosocomial infections. They are removed by hand washing and normal washing.

**Resident Flora** - term refers to bacteria located in the layers of skin, resident flora live in deeper layers of skin and in hair follicles and are not completely removed, even by vigorous hand washing. Fortunately, they are less likely to cause infection.

#### Purpose of skin preparation

To reduce the number of transient flora on the skin to minimize the potential of infection from the source and thus render it reasonably safe for surgical incision.

#### Special precautions at ward level

##### On admission:

Admission should be preferably no more than 24 hours prior to operation.

All cases are admitted to the same room and should not be placed near patients with infections or septic draining wounds.

Evaluate the general skin condition of the patient and educate on cleanliness if required.

Shaving is no longer recommended as it abrades the skin and increases the risk of infection. If shaving is necessary, it should be done 1-2 hours before the patient take his/her shower.

The patient should take a shower and wash well.

Patient is clothed in a clean theatre gown and hair is covered with a disposable cap.

Bed linen is changed and patient remains in bed until proceeding to theatre.

#### 8.2 Wound Care

Wound dressings should promote rapid healing without complications. In dressing wounds, precautions should be taken to prevent spread of infection.

Optimum wound dressing should:

Maintain highest quality of care in removing exudates and toxic components.

Be impermeable to microorganisms.

Free from wound contamination.

Be removable without causing trauma.

Inspection of wounds (removal of dressing prior to actual cleaning and dressing)

There must be a medical indication to remove a dressing from a wound and these may include:

To remove sutures or clips from wound.

To clean the wound as part of ongoing care.

To determine the indication of increased temperature, report of swelling, discomfort or pain.

Dressings should not be removed long before wound inspection by the medical doctor; it should be done when rounds are in progress and as an aseptic procedure. Explain to patient and ensure that no contamination will result from opening up the dressing.

### **Cleaning of wounds**

Loosen dressing from wound with normal sterile saline.

Dry wounds need no cleaning, the dried blood (crusts) act as a barrier. The disinfectants harm fibroblasts which produce collagen and it delays the healing process.

If wound needs cleaning, swab wound from clean to dirty area, and remove excess moisture before applying the dressing.

### **Dressing of wounds**

Check packs for sterility.

Aseptic technique should be applied to avoid transfer of microorganisms into the wound, using sterile gloves and forceps.

All wounds should be dressed dry, wet dressing encourages growth of microorganisms

Wounds with a surgical drain: Dress the suture line separate from the drain to prevent contamination of fluid (seepage) from drain into wound.

Do not open wound dressing before 48 hours post operative.

Dispose of material safely and regard as hazardous waste.

Gauze dressing is not good; the granulation tissue of the wound grows into interstices of dressing fabric. The exudates oozing from the wound in the first 24 hours penetrates the fibres of the dressing, dries and binds the dressing into the seal so the dressing, scab and dermis becomes one. Removal causes pain and damage to the wound. It ruptures some blood vessels and destroys some of the regenerating epidermis, delaying healing.

### **Wound drainage**

Wound drain is only used when there is a definite indication.

Drains act as retrograde conduits and contaminants can gain entry to the wound through it. The presence of the drain impairs resistance of tissue to infection. Minimize it by using a closed drainage system.

Insert drains through a separate incision, remove when no longer useful (not draining any longer)

Dress drain site independently from wound site.

### **Infected wounds**

Dressing is done to improve local healing of the wound.

Dressings should be done last to prevent spread of infection to other patients

Place material used and removed from wound in a plastic impermeable bag and dispose of as hazardous waste.

### **8.3 Management of Intravenous Lines**

Venepuncture is an invasive procedure which can contribute to the introduction of microorganisms into the blood stream. The aim is to maintain a sterile line and prevent cross infection from HCW's hands and patient's skin.

Intravenous treatment should only commence when medically indicated and not for convenience of staff to have an "open vein" for the future.

### **General principles**

- Inspect equipment and supplies for safety before use. (cracks, leaks, faults, expiry dates)
- Select a suitable vein (consider location and condition of vein, purpose and duration of treatment)
- Avoid areas of flexion and do not use the patient's dominant side.

### **Equipment**

#### **Containers and contents:**

- Inspect bottle or back for cracks or holes (squeeze)
- Check identity and expiry date
- Examine fluid for contamination (invert the container against dark background or in good light). If any suspicion, do not use, sent to pharmacy for examination. Remove all containers of the same batch.

#### **Administration set and Cannula:**

Box must be unopened and undamaged if not, discard.

Double packed, packaging must be intact if not, discard

Check expiry dates

## **Dressing**

Moist vapour dressing to secure Cannula and seal puncture site.

Dressing should allow for visual inspection.

## **Guidelines to insert a Cannula into vein (aseptic technique)**

- Prepare tray with equipment
- Wash hands for aseptic technique
- Apply tourniquet above site/site in upper limbs
- Clean chosen site with alcohol friction for 1 minute from the centre area to area of periphery (inside out)
- Do not palpate vein after cleaning
- Puncture site 0.5 –1 cm from vein, enter Cannula from side or from above.
- Note blood return and advance Cannula through needle.
- Withdraw and remove needle and attach infusion
- Release tourniquet for fluid to flow. Dry any excess fluid around site
- Anchor Cannula with a "sling fashion" prevents to and thro movement and potential for microbes to enter wound.
- Put plaster to secure the insertion site.
- Ensure fluid is adjusted and working well
- Discard biohazard material.

## **Managing intravenous therapy**

Wash hands thoroughly, changing of and discontinuation of therapy should be done aseptic.

## **Change of infusion bag/vacolitres**

- Wash hands with soap and water
- Prepare vacolitres/ infusion bag.
- Clamp off/ close infusion line.
- Remove empty vacolitres, do not contaminate spike.
- Carefully insert spike into bag and restart infusion.

## **Change of infusion lines**

- Wash hands with soap and water.
- Change every 72 hours, even if line is working well.
- Change set completely if there is a change in infusion. (E.g. from fluid to blood)

## **Change of Cannula**

Cannula can cause septicaemia if kept in indefinitely.

- Change every 48-72 hours.
- Close off infusion and remove gently, apply pressure to site with clean cotton wool, put dressing on site.

If not possible to change every 24-48 hours, be extra careful in monitoring the line for infection.

### **Check of infusion flow and infusion sites**

- Check frequently, immediately after insertion and 4 hourly. Never switch off infusion therapy, rather attend to the problem.
- Do not use infusion line to collect blood specimens.
- If infusion is not running properly, do not forcefully let go, as clots may trap bacteria and pushed it up into blood stream. Air vent bottle with airways, not needles.
- Interstitial infusion must be discontinued immediately, re-sited and Cannula must be replaced.
- If long after re-siting, replace everything; do not continue with an administration set that hanged for hours on end.
- Discard all partially used intravenous fluids.
- If there are any signs of infection or phlebitis, discontinue and remove.

### **Removal of Cannula**

- Wash hands and wear gloves.
- Apply pressure on site and gently remove Cannula, apply pressure until bleeding stop.
- Clean around site and apply a clean dressing.

### **The addition of medication to containers should be avoided for risk of contamination**

Addition of medication to intravenous infusion has disadvantages and dangers. If added to vacolitres/infusion bags, toxic or inactive products may be formed which carry the risk of microbial contamination.

Additions to vacolitres/ infusion bags should only be done by a pharmacist.

Additions should as a rule is with small single dose vial.

In the case of use of multi-vials, decontamination of topper with alcohol base solution and refrigeration is critical, discard used vials after 48 hours.

Medication should never be added to glucose solution, blood products and nutrient solutions as these provide an excellent culture for growth of microorganisms.

### **At ward level:**

Additions should be done in separate small vacolitres, following the prescription and should only be done by a Registered Nurse.

- Preparation is an aseptic technique and should be done in the treatment room.
- Bag should be labeled correctly, with the dosage clearly written.
- The connection site at the infusion line should be swabbed with an alcohol base solution and allowed to dry before connection is established.
- Empty bags should be removed immediately and not left hanging until the next medication round.

#### **8.4 Management of Intravascular Devices**

They provide a route to administer medication, blood products, monitoring haemodynamic function, obtaining blood specimens and for emergency vascular access. They provide potential routes for infectious agents to enter the blood stream; the risk however can be minimized by observing appropriate infection control practices.

These devices can be inserted in the peripheral veins (less than 5 cm) or in central veins lying in central parts of the body, such as the chest and abdomen, (longer than 15 cm). The central lines remain inside for longer periods of time.

Serious infections are associated with these devices as most patients who need them have underlying disease that makes them more susceptible to infection.

#### **The risks are:**

- Prolonged hospitalization, associated with prolonged insertion.
- Heavy microbial colonization of insertion site.
- Heavy microbial colonization of catheter hub or Cannula.

#### **Minimizing infection:**

- Ensure the device is safe to use: check expiry date and the integrity of the pack.
- Select appropriate catheter with small lumen to reduce incidence of trauma that may increase the risk of infection.
- Remove access hair from the area of insertion, do not shave, and rather clip off hair.
- Clean insertion site with antimicrobial solution and allow drying.
- Sterile insertion is required, date and time to be documented in patient's notes.
- Stabilize the device with tape to reduce the potential for complications such as phlebitis, sepsis, subcutaneous infiltration and Cannula movement.
- Sterile maintenance of device; swab entry with antimicrobial solution before use to prevent entry of infectious agents into the vascular system.
- Thorough hand washing is required before putting on gloves or when maintaining, changing solution containers, lines or dressings.
- Daily inspection of site is required for signs of infection, if noted, remove immediately.

- Should be changed 24 -48 hourly, but if contamination is suspected, or integrity of device has been compromised, remove the administration set. Dates of removal or change should be documented.
- Set appropriate limits on duration of device use.
- Removal of device should be aseptic.
- Devices are single use and must be discarded as biohazard material.
- Ensure the patient and family is educated on the reasons for intravascular therapy, ensure understanding of risks involved and the importance on not interfering with the therapy in any way, other than by a HCW.
- Ensure that the immediate environment of the patient is kept clean and free from dust and soil as part of environmental cleaning.

### **8.5 Management of Total Parental Nutrition**

Infection risk reported from Total Parental Nutrition (T.P.N.) ranges from 6 – 7%, and is associated with prolonged treatment in a central vein and the likelihood of growth of bacteria and fungi. The fats and proteins in T.P.N. add to the potential of bacterial growth. The objective is thus to maintain a sterile intravenous line and prevent contamination of the solution.

#### **Special precautions**

In addition to intravenous care,

- Prevent contamination of blood stream due to inadequate surgical sepsis at insertion.
- Avoid introducing an unsterile catheter.
- Change line as recommended.
- Avoid contamination of nutritional fluids during preparation. (Pharmacy)

#### **Insertion of the Catheter**

It is a surgical procedure; preparation should be consistent as with any other major invasive procedure.

- Surgical scrub, wear sterile gowns, gloves and faces masks.
- Use Povidine solution to clean site for 2 minutes, and allow skin to dry.
- Put on a fresh pair of gloves to insert catheter.
- Apply sterile occlusive dressing. (Allow for easy observation and prevent to and thro movement of catheter that may allow bacteria to enter into wound)

#### **Administration of T.P.N. solution**

- Commence administration of fluid once catheter position is confirmed with X-ray.
- Allow running for 24 hours and discard any remaining solution.
- Start with a new solution each day and check frequently to maintain flow.
- Do not use the line for any other purpose to prevent contamination of site and catheter.

### **Management of T.P.N. infusion**

- Thorough hand washing is required.
- Ensure a sterile field when preparing equipment.
- Adequate disinfection should be done of the new container and the connections between old and new with alcohol solution. (Disinfect new port and old administration set junction).
- Regularly observe the site for phlebitis and report.
- Replace the dressing using aseptic technique, every 2 -3 weeks.
- Always use aseptic technique to clean site, and to change sets, catheters and dressings.

### **8.6 Management of Urinary Catheterization**

Urinary infection is the most common nosocomial infection, representing about 10% of all cases in the shortest period of time. 50% of patients can acquire an infection by day 15 as during this time there is a linear relationship between acquisition of new infections and the duration of catheterization. The infections risks are increased with negligent care of indwelling catheters. Catheters should be removed as soon as possible to reduce the prevalence of bacteria associated with prolonged catheterization.

#### **Principles to minimize risk of urinary tract infection**

- Avoid unnecessary catheterization or re- catheterization.
- Observe strict aseptic technique, HCW should be trained in the procedure.
- Establish and maintain a closed drainage system.
- Maintain appropriate catheter toilet.
- Educate the patient.

#### **Valid reasons for catheterization are to:**

- Relieve acute or chronic urinary retention.
- Pre- and post- operative or pre-delivery urinary drainage (empty the contents of the bladder).
- Bladder drainage in paralyzed patients.
- To accurately measure the output in the critically ill patient.

#### **Selection of catheters**

- Latex rubber – short term, up to 10 days.
- P.V.C – up to 6 weeks.
- Silicone – long term, up to 6 weeks.

Always use the smallest sized catheter that will be adequate for the patient. The larger the catheter, the more friction it will cause to the urethral mucosa, which in turn may cause infection.

### **Insertion of catheter**

- Aseptic technique should be observed by a trained HCW.
- Clean the urethral orifice with soap and water before procedure and patient can continue to do so if he/she is performing self-catheterization.
- The site should be cleaned with Povidine solution and allowed to dry before insertion.
- Sterile water-soluble lubricant should be applied to the catheter to reduce friction and trauma to the urethral opening and urethra.

### **Avoid trauma to neck of bladder and urethra**

- Use the right size catheter, do not force catheter in, it can cause necrosis of meatus.
- Secure the catheter to upper thigh to prevent movement and traction. Ensure that it is not twisted or flattened.

### **Inflate balloon with right amount of sterile water**

- Sterile water should be the only medium to use in case fluid leaks into the bladder.
- In general, 5 ml will keep catheter in place. A larger amount of water may influence drainage of bladder and cause retention of urine.
- Larger amounts of water (15 – 30 ml) strictly apply to prostatectomy.
- If suprapubic, dress site with a sterile dressing.
- When removing the catheter, deflate with a syringe to ensure all the water is withdrawn.

There exist misconceptions that leaking of catheters is due to it being too small, it is not true, give anticholinergic drugs to decrease muscle spasm.

### **Establish closed drainage system**

- **Change of drainage bag** is only indicated if bag is leaking, if flow is obstructed or when catheter is changed. (Aseptic)
- **Emptying drainage bag**
  - Hands washed or spray before and after handling of bag. Gloves must be worn.
  - Do not disconnect the bag from the catheter.
  - Clean outlet tap with chlorhexidine 0.05% in 70% alcohol.
  - Use a separate container to collect urine for each patient, avoid contact between tap of bag and container.

**-Specimen collection** (Chapter 8 section 8.7 provides details)

### **-Prevention of retrograde flow of urine to the bladder**

Bag should have a non-return valve.

- Ensure catheter is secured to prevent movement, twisting or traction.
- Maintain unobstructed down flow of urine. (Bags should not lie in bed with patient, place in urine stand at all times)

### **-Bladder irrigation**

Discouraged with closed system, unless blockage by blood clots or after bladder surgery.

A triple lumen catheter (3 way foley's) for continuous irrigation to eliminate disconnection and re-connection should be used.

The safest way is to increase patient intake of fluids, if not restricted otherwise.

### **-Maintenance of catheter toilet**

Crucial in the prevention of infection, should be done twice daily.

To prevent build up of normal secretions encrustation on catheter.

Wash with soap and water and clean with a clean cloth.

### **-Patient education**

- Increased intake of fluids to facilitate removal of organisms, unless medically contraindicated.
- Regular washing of perineum/vulva twice daily and after bowel motion.
- Regular cleaning of catheter and insertion site to avoid encrustation.
- Avoid traction of catheter.

### **-Antibiotics**

Avoid indiscriminate use of antibiotics, no evidence exists that it reduces risk of infection, may rather lead to resistance.

### **-Intermittent catheterization**

Not recommended unless medically necessary.

Aseptic technique is critical since the risk of infection is much greater than normal.

## **8.7 Specimen Collection**

**The section deals with the specimen collection in relation to infection control and does not necessarily cover the preparation or the procedure itself.**

### **Important considerations**

- Specimen containers and tubes should be **labeled** before the specimen is collected. Labeling includes;
  - Patient name and registration/admission number.
  - Ward/unit from where patient is admitted or from where the specimen is being send.
  - Age of the patient.
  - Relevant medical diagnosis.
  - Nature/type of investigation.
  - Date and time of specimen collection.
  - Name of authorizing physician or physician under whose care the patient is.
  - Any special indications e.g. urgency of investigation.
- Appropriate personal protective equipment should be worn when collecting samples, e.g. disposable latex gloves, aprons.
- A **sufficient quantity** of the specimen should be collected to prevent multiple pricks.
- Take care **not to contaminate** the outside of the container and the container label with the specimen while collecting the specimen. The patient should also not be exposed to or touch the sample or infectious area.
- It is recommended that when collecting specimens, a **trolley** with all procedural items be prepared and used. This includes sharps containers, bio-hazard bag, specimen containers.
- **Aseptic techniques** and **universal precautions** should strictly be adhered to while following the procedural guide.
- Specimens collected for micro bacterial activity should not be placed in formalin, alcohol or any disinfectant if the specimen is collected for culture tests.
- Before any specimen is collected, the procedure should be **explained** to the patient and ensure that the patient grants consent for the procedure.
- All specimen samples should be handled as potentially infected. Special care to be taken with specimens from patients suspected/diagnosed with **highly infectious diseases** (see section on infectious diseases) includes;
  - Universal precautions should strictly be adhered to;
  - Specimens should not go the normal route but should immediately be taken to the laboratory by an identified person and be tested immediately due to the urgency for diagnosis.
- After placing the specimen inside, containers with screw on tops e.g. sputum containers should be tightly closed.
- Specimens should as soon as possible be sent to the laboratory for testing.
- **Specimen registers/books should be completed after the sample has been collected and sent to the laboratory, e.g. cough register for sputum samples.**

## 8.7.1 Specimens Collection Procedures

### Blood specimens

- Wash hands and wear disposable gloves.
- Attach a sterile needle to the vacutainer. Use of needles and syringes for drawing blood is against injection safety procedures.
- Apply a tourniquet above the area where the venopuncture will be made.
- Prepare the patient's arm (area where venopuncture will be performed) by swabbing with clean cotton swab and 70% alcohol.
- Let the area air dry.
- **Do not pad the cleaned area with hand. It will contaminate the already cleaned area.**
- Insert the needle into the vein and attach the indicated tube to the vacutainer.
- After collecting the correct amount of specimen, release the tourniquet and withdraw the needle from the puncture site.
- Immediately place a clean cotton swab with a bandage on the punctured area to stop any bleeding.
- Dispose of the contaminated cotton swab and sharps according to the waste management principles.

### Cerebrospinal fluid (CSF)

- Prepare the patient's skin as for a sterile procedure. See skin preparation section.
- A lumbar puncture needle is inserted into the spinal canal.
- Cerebrospinal fluid is then directly caught into the specimen container.

### Eye swabs

- While the patient looks up, pull the lower lid down.
- Using a sterile cotton bud, roll over the conjunctival sac.
- Place the swab in the transportation container.

### Hair specimens

- Isolate a bundle of approximately 100 strands of hair in the occipital region and twist together.
- Cut hair as close as possible to the scalp.
- Place the hair sample in a zip closable bag.
- If the hair is too short to clip and cut together, cut hair directly into the zip closable bag using thinning shears.
- Do not place any hair that has fallen to the floor or counter into the bag.
- Remove and discard gloves.
- Disinfect the scissors and clips by placing them in 70% isopropyl alcohol disinfecting container. Allow these supplies to remain in the disinfecting container for at least 20 minutes.
- Remove and place the clips and scissors on clean paper towels and allow them to air dry.

### **Nasal swabs**

- If the patient has nasal discharge, ask them to clear the discharge by blowing his/her nose using an unscented tissue.
- Children should be assisted.
- Wash hands and put on gloves.
- Insert the swab into the nostril and then drawn along the nose floor with gentle rotating movements.
- Withdraw the swab and place into the transporting container.
- Push the end of the swab firmly to ensure that the swab is inserted into the end of the transport tube.
- Secure the transport tube cap.
- Remove and discard gloves.

### **Penis/Urethral swabs**

- Patient should not pass urine for at least 4 hours prior to specimen collection.
- Massage the urethra from proximal to distal to present any discharge.
- Using a cotton swab, discharge present at the meatus is smeared on a slide and air dried and then placed on an appropriate transport medium.
- In the absence of a discharge, a thin dacron tipped plastic or metal swab is moistened with normal saline and placed 2-3 cm inside the urethra and gently rotated once or twice and removed
- If no slide is made the lab with prepare one from the swab placed in the transport medium.

### **Sputum specimens**

- Sputum specimens should be collected at the following intervals;
  - Spot – specimen is collected immediately on the spot where patient is screened.
  - Morning – early morning sputum collected next day (morning) before the patient/clients takes in anything and before brushing teeth.
  - Spot – another sample is collected the time when patient returns to health facility
- The procedure should be performed outdoors or in a well-ventilated room.
- The patient should rinse his/her mouth and cough deep spitting the sputum in the specimen container, closing the lid securely.
- Ensure that it is sputum and not saliva which is collected.
- The nurse aiding the patient should stand behind the patient and should wash hands after collecting the specimen.

### **Stool specimens**

- Patient should pass stools into a bedpan.

- The collector should wear gloves but in highly contagious diseases universal precautions of infection control for that specific disease should strictly be adhered to.
- By using a spatula adequate amount should be collected and placed into the specimen container.
- Samples collected for amoeba, giardia and cysts should immediately be sent to the laboratory.

### **Throat swabs**

- Ensure that the patient did not take any antibiotic lozenges for at least 6 hours or gargle before the specimen is collected.
- Holding the tongue down with a tongue depressor, swab against the infected site at the posterior pharyngeal wall.
- Make sure that the swab does not touch the mouth or the throat.
- After swabbing, place the specimen in the transporting container.

### **Urine specimens**

- Urine specimens should be kept below 4°C or be examined within 2 hours.
- **Mid-stream specimens**
  - As this is midstream specimen, the patient will void in stages.
  - For male patients, thoroughly clean the prepuce and terminal portion of the penis.
  - In female patients, the perineal area and vulva should be swabbed. Take care that vaginal discharges do not contaminate the urine specimen.
  - The first catch should be collected in bedpan as it cleans the urethra.
  - About 15-20 ml of the second stream should then be collected in the specimen container (sterile receptor).
  - The remaining urine is then emptied in a bedpan.
- **Catheter specimen**
  - A patient should not be catheterized for a catheter specimen and specimens should never be taken from the urine bag.
  - Urine can be aspirated when a catheter is in situ.
  - Clean the catheter sleeve (rubber tubing near the connection between the catheter and the bag) with Hibitane or 70% alcohol leaving it to air dry.
  - The specimen should be collected with sterile syringe and needle.
  - Expel the specimen into a specimen container (sterile receptor).

### **Vaginal/Cervical swabs**

- The patient should empty her bladder before the procedure.

- Using a sterile speculum separate the vaginal walls and inspect the affected site under good lighting.
- Swab the infected site either at the vaginal wall or from cervical lesion.
- Place the swab into the transporting container and remove the speculum.

### **Wound and Pus swabs**

- Clean the area around the wound with normal saline.
- Put the swab into the wound and withdraw.
- Place the specimen swab into the transport container.

### **8.7.2 Specimen Transportation**

- Specimen should be placed in double pocket bags/kangaroo bags; one slot for specimens and the other for completed forms.
- Specially designed/designated transportation boxes should be used.
- These boxes should be;
  - labelled with bio-hazard label
  - leak proof
  - easy to carry
  - robust/made of hard material (preferably plastic)
  - easy to clean
  - have cooling mechanism
- Spills should be cleaned up observing universal precautions.

## Chapter 9

### 9. Pest Control

Pests can serve as agents for the mechanical transmission of micro organisms, or as active participants in the disease transmission process by serving as a vector.

They can be found in a well-cared for environment but they are more often the result of neglect, thriving in unsanitary conditions. Some pests spend their entire life in or on the bodies of their host, taking their nourishment from the host's body fluids. Others spend part of their existence in a host and another part entirely independent. Others merely visit from time to time for their food, which is usually blood.

HCWs should know which pests and plagues are harmful to man, what diseases they may cause and how to prevent and control these health hazards.

#### General control measures include:

- Maintaining good household and environmental hygiene.
- Preventing the accumulation of refuse and water.
- Ensuring the proper storage and handling of food in a clean environment.
- Providing adequate information and education to the community on prevention and control.
- Reporting the first signs of pests to the health facility administrator.
- Pets and personal effects (toys, flowers etc) should not be allowed in critical care situations e.g. ICU or treatment area of highly infectious cases.
- **Linen contaminated with pests should be separated from other linen. They should be placed in a green bag labeled as "infested".**

#### 9.1 Bedbugs

The bedbug feeds on human blood and the blood of chickens, household pets and rodents. They feed at night and hide during the day in cracks, of building, furniture and bedding.

The species that mostly attack man are: *Cimex lectularius* and *Cimex hemipterus*.

#### Harms

The bite causes irritation and lack of sleep. There is no known disease spread by bedbugs.

#### Prevention

- Maintain good environmental and household hygiene.
- Repair cracks and crevices in furniture.
- Disinfect furniture and mattresses regularly, place in sun.

## **Eradication**

- Report to local Health Inspector and fumigate according to environmental regulations.

## **9.2 Cockroaches**

Cockroaches live on decomposed organic material, especially food containing starch, sugar, meat, dairy as well as vegetables. They avoid light and movement of others and hide in cracks and holes. They feed mainly during the night. They prefer heat, but can survive in extreme cold and even in steam pipes and drains.

They carry a variety of microorganisms and deposit it on food and work surfaces.

### **Prevention and control measures**

- Maintain good environmental hygiene.
- Store food in packaging material to prevent contamination.
- Prevent build up of filth in grooves by regular thorough cleaning practices.
- Continue to check for breeding grounds.
- Regularly fumigate for cockroaches at home, using the prescribed insecticides available on the market.

### **Prevention and control in health care settings**

- **Do not put food in bed lockers or any other unauthorized place in hospital.**
- Report sightings of cockroaches to the local Health Inspector office for authorized and planned fumigation in the ward.
- Additional advice can be obtained from local municipalities and other private health institutions.

## **9.3. The House Fly (Musca Domestica)**

Flies can transmit pathogenic microorganisms from refuse where it develops or feeds onto human food. It cannot digest solids, it spits a drop of moisture on food to make it easier to eat and in this process it excretes its waste matter on the food. The fly's sticky feet and hairy legs also carry microorganisms.

### **Harms**

The housefly can transmit serious diseases such as typhoid fever, poliomyelitis, desentry, trachoma, cholera and gastroenteritis.

Houseflies can cause secondary infection if their larvae hatch in the wounds or food.

### **Prevention and control measures**

The onus of prevention of fleas is that of the occupier of a premise.

- Place all refuse in bins and keep it properly closed. Clean and wash bin regularly or use plastic to line bin.
- Remove garden and other waste, which cannot be placed in a refuse bin.
- Use well-rotted, dried manure for gardens from a reliable nursery.
- Ensure all food and drinks are properly covered at all times.
- Ensure that refuse liable to decompose is suitably processed, removed or disposed to the satisfaction of the local authority.

#### **9.4 Fleas**

They lay their eggs in cracks of building and floors. Larvae hatch and are found in cracks and crevices, under carpets and in dust. They need little food, but moisture.

They feed exclusively on the blood of hosts, but can survive for up to 125 days without food. Other than man, they feed on dogs, rodents, cattle, pigs and badgers.

#### **Harms**

The effect of a bite is irritation and itching- scratching may lead to secondary infection. The human flea can transmit Bubonic plague and Typhus from rats to man and from man to man.

#### **Prevention, control and eradication measures**

- Maintain good environmental and household hygiene.
- De-flee pets regularly.
- Exterminate rats (set traps, poison, fumigate).
- Rat proofs should be compulsory for houses and institutions.
- Care should be taken of furniture and old carpets.

#### **Treatment**

- Wear personal protective equipment and clean clothes and bed linen as in the case of lice infestation.
- Use insecticide on visible fleas.
- Educate community on prevention to prevent re-infestation.
- If ward becomes infected, remove patients and spray ward and disinfect.
- Report and investigate for rodents.

#### **9.5 Lice (Pediculosis)**

Man can become infested with different species of lice namely:

The head louse (*pediculus humanus*) *capitis*, found on nape of neck and behind ears

The body louse (*pediculus humanus*) *corporis* found on body, axillae and around waist.

The crab louse (*phthirus pubis*) or pubic louse

The pediculus humanus is about 2-3 mm in size, larger than the phthirus and has a grayish –white colour.

**The eggs of the louse, called nits attached to hair, gets into creases in bedding and hatches from it. Lice live on the blood of the host. The bites cause irritation and itching. Scratching may lead to secondary infection.**

### **Harms**

Diseases are transmitted to man when scratching introduces the excreta or vomitus of infected lice into the abrasion of the skin. Such diseases include Louse borne Typhus, Relapse Fever and Trench Fever.

### **Transmission**

Spread by direct contact of heads or bodies.

### **Prevention and control measures**

- Mainly occurs due to neglect, inspect shared accommodation and children's hair regularly.
- Prevent overcrowding in shared accommodation facilities, such as schools.
- Prevent sharing of combs, toiletries, caps and hats by children.
- Ensure to wash bedding and clothing in hot water as a rule.
- Children with lice infestation should not be allowed attending school until deloused and no nits are present anymore.
- Control measures are based on good personal hygiene by bathing regularly with special attention to hair as well as combs.

### **Treatment of head lice**

Community level treatment can be done with a mix of equal amounts of vinegar, olive oil and paraffin. Leave overnight and repeat twice. Wash hair in morning with hot water and comb with a fine comb to remove nits.

### **Treatment of body lice**

The louse mainly lives in the bedding and clothing and only visits the body for food. Transmission is by bodily contact and sharing of infested clothing and bedding. Wash clothes and bedding with hot water and sun-dry.

### **Treatment of pubic lice**

Transmission is by bodily contact, not necessarily sexual contact. This type of infestation has a detrimental effect on people because of the shame attached to it.

Treat as for head lice.

## **Hospital treatment**

- Wear personal protective equipment.
- Delousing should take place in a single room; wear a plastic apron when combing hair. Shaving of hair not necessary, if needs be, get consent of patient.
- Carefully handle contaminated clothing and bedding. Wear gloves, place in a plastic bag and seal. Send infected linen to the laundry in green plastic bag.
- Bath patient and wash hair with soap, apply Benzyl Benzoate or paraffin onto affected areas. Cover the head for 24-48 hours, wash again and comb hair with a fine comb to remove nits. Repeat this treatment after 1 week.
- Educate patient and family on prevention of re-infestation.

## **9.6 Mosquitoes**

Mosquitoes breed in shallow still pools of water, and especially in damp areas with weak sunlight. It may host the malaria parasite and can cause disease.

### **Prevention and control measures**

#### **Endemic areas**

Educate the community to prevent mosquitoes breeding in standing water by adding a few drops of paraffin or diesel to water.

Educate community to protect themselves from bites by wearing protective clothing, use skin repellent and mosquito nets.

#### **Health authority measures**

Treat possible breeding grounds and domestic houses according to local health authority regulations, prior to the malaria season.

Treat hospital premises with insecticides, if required, with long acting insecticide.

Install mosquito netting in health facilities in endemic areas.

## **9.7 Rodent Control**

Rodents vary in size and type and include the house mouse, the roof rat and the Norwegian or common rat.

Wild rodents include prairie dogs, ground squirrels and gerbil species.

### **Harms**

- Rodents can spread the plague.
- Other diseases that can be spread by rodents, include:
- Rabies (bitten by a rabid animal)
- Salmonella (food eaten that is contaminated by rodent faeces)

### **Prevention and control measures**

- Notify health authorities of suspicious cases of illness or mortality of domestic or wild rodents.
- Suspected premises should be vacated and inspected and treated accordingly.
- Unsanitary, dilapidating buildings and premises should be vacated and demolished as it can harbour rodents and contribute to spread of diseases.
- Maintain good environmental hygiene and housekeeping.
- Regular inspection by the local Health Inspector of food premises and general stores should be done.
- Remove refuse according to regulations.
- Store food and food products in rodent proof containers.
- Eradicate rodents by baits, trapping and fumigation, but ensure people and pets are not affected.

### **9.8 Scabies**

Scabies are due to the contamination of the skin by the *Sarcoptes Scabiei*, a mite. It spreads by bodily contact due to prolonged, close contact. The mites cause inflammation and itching of the skin. Scratching may aggravate the inflammation and vesicles and scabs may become infected and result in septic sores.

#### **The distribution of lesions is fairly classic**

- Hands, particular at the webs of the fingers
- Anterior surfaces of the wrists, elbows
- The belt line
- Genital area and breast area (in females particularly) in adults
- Lesions may be found on other parts of the body.

#### **Prevention and control measures**

- Educate the community on preventative measures on a regular basis.
- Maintain good personal and environmental hygiene.
- Avoid sharing of bedding and clothes in overcrowding conditions.
- Avoid contact with an infected person.
- Avoid scratching to prevent inflammation.

#### **Treatment**

- Wear personal protective equipment when treating affected individuals.
- Remove bedding and linen and place in green linen bag, sealed for laundry.
- Use Tetmosol soap as prophylaxis to wash hands and for patient to wash with.
- Treat all members of the family and any other contacts.
- Bath with anti-scabies agent in the evening, apply Benzyl Benzoate on the whole skin, especially where rash is present and between toes and fingers.

- Bath again in the morning, and continue the process daily until inflammation is resolved.
- Wash clothing and bedding in hot water and sundry.
- Repeat treatment after 1 week to allow for eggs that were not killed during first treatment to hatch.
- Continue to maintain good personal hygiene.
- Educate patient and family to prevent re-infestation.

### **9.9 Ticks**

Eggs of ticks are deposited into the sand and they hatch to develop into nymphs and become adult ticks. Ticks can transmit serious diseases to domestic animals. The bite of a tick causes irritation and the wound may become infected.

#### **Harms**

Ticks transmit the following diseases to man:

- Tick-bite fever, spread by the hard veld tick.
- Relapsing fever, from lice or ticks.
- Congo fever, spread by the Hyalomma (bont-leg tick). Refer to management of Viral Hemorrhagic Fever.
- Rocky Mountain spotted fever and Q –fever.

#### **Prevention of tick infestation and extermination of ticks**

- Wearing of personal protective equipment when exposed to the risk of tick contamination. De-ticking of clothes after exposure to contamination of ticks. De-ticking of domestic animals. (Do not allow into house or onto beds) Use insecticides and pesticides.
- Soak contaminated clothes in **gammexane**.

**PART I**  
**APPENDICES**

## **Appendix 1: Responsibilities of Infection Control Management**

MINISTRY OF HEALTH – Quality Assurance Unit

Key person should be the Nurse Manager for nursing services

### **Develop Policies and Guidelines for Infection Control.**

- Issue Policy and implementation guidance.
- Ensure effective management and control arrangements at different operational levels in MOHSS.
- Review guidelines and resource needs assessment including training needs on a regular basis.
- Ensure annual update on current infection control practices during annual meetings.
- Review and analyze surveillance data annually and develop infection control indicators and standards.
- Develop a national risk management and prevention and control framework.
- Develop an appropriate research agenda.
- Advise and assist Regional Management in:
  - Developing systems for monitoring of compliance for infection control guidelines and practices
  - Developing systems for national surveillance, its implications and required interventions
  - Developing outbreak response protocols

MINISTRY OF HEALTH – Regional Management Level

### **Key person should be the Nurse Manager for nursing services**

- Monitor adherence to national and regional infection control guidelines and practices:
- Evaluate infection control resource needs, including training needs.
- Participate in annual review of infection control guidelines and practices.
- Compile and communicate annual reports to National Quality Assurance Unit.
- Appoint or allocate a focal person at regional level to manage, coordinate and support activities at district level:
- Ensure surveillance and monitoring at district level.
- Review and analyze surveillance data and reports.
- Support annual training activities and meetings.
- Advise and support implementation of preventative and control measures.
- Ensure adequate updated outbreak response protocols.

MINISTRY OF HEALTH – District Management Level

## **Key person should be the Nurse in Charge of infection control in the District Hospital**

Provide specialist infection control to the district management team and nurses in charge of district facilities in relation to:

- The prevention, surveillance, management and control of infection.
- The implementation of preventative and control measures.
- Identification and management of outbreaks.
- Annual training of implementers.
- The development of communication links within the district.
- Review facility surveillance reports and compile annual reports for Regional Level.
- Monitor and support facilities for adherence to policies and guidelines.
- Evaluate infection control resource needs, including training needs.
- Conduct regular meetings and forums for infection control management.
- Contribute to the annual review of infection control guidelines.
- Hospital Infection Control Team - Members
- Medical Practitioner / assigned for infection control
- Nursing Manager in Charge of Hospital
- Infection Control Nurse/ Nurse assigned to infection control

### **Functions of the Hospital Infection Control Team**

Team authority to facilitate appropriate programme functions at all times.

Ensure:

- Adequate resource allocation for effective infection prevention, management and control.
- Provision of appropriate technical support to the team on technical aspects related to infection control (maintenance, cleaning, catering, laboratory etc.).
- Regular infection control training (induction, in-service and continuous education) programmes are conducted.
- Regular monitoring and evaluation of programme implementation and timely intervention for effective infection control.
- Participation in periodic review and update of policies and guidelines.

Hospital Infection Control Committee

*Core Members*

- Medical Practitioner in Charge of Hospital
- Medical Practitioner / assigned for infection control
- Nursing Manager in Charge of Hospital
- Infection Control Nurse/ Nurse assigned to infection control
- Infection Control link Nurses from all clinical departments

- Laboratory Technician
- Pharmacist
- Administrative Support Manager (cleaning, catering, maintenance)
- Health and Safety Manager (Occupational Health Officer)

#### **Co-opted Members (members attending when required)**

- Nursing Unit Manager – Operating Theatre
- Nursing Unit Manager – Central Sterilizing Depot
- Nursing Unit Manager – Specialized services such as - ICU, Surgical, Paediatrics, Medical Wards, High Care Ward
- Clinical Instructors
- Surgical, Medical Practitioners
- Works department representative (maintenance)

Composing a team representative may be difficult as not all hospitals have the posts. Striving for the best possible representation would assist in meaningful discussions, decision-making and appropriate action.

#### **Functions of the Hospital Infection Control Committee**

- Identify the needs of the facility in relation to infection control. (e.g. waste management, food safety, sterilization etc).
- Prioritize needs and develop a strategic plan (3-5 years) and make recommendations for adequate funding to present to management.
- Analyze infection control risks and make recommendations to acquire new equipment, pharmaceuticals and products for effective infection control practices.
- Develop an annual infection control programme budget in relation to agreed upon priorities, resource needs and scheduled activities.
- Develop monitoring and evaluation tools and conduct regular monitoring and evaluation visits to review the infection control programme implementation.
- Participate in regular review of infection control guidelines and practices.
- Ensure regular review and adaptation of policies and guidelines to local priorities.
- Ensure regular training, surveillance and auditing for effective infection control practices.
- Ensure regular cleanliness surveys are conducted and regular hand washing campaigns.
- Ensure the identification of structural needs for infection control as part of facility repair and maintenance.
- Ensure the development of a hospital outbreak response protocol.
- Conduct regular management meetings to review programme implementation.
- Scrutinize and approve infection control reports for submission to Regional and National level.

### **Role of the Infection Control Doctor**

The Infection Control Doctor is usually the consultant Microbiologist. In the absence of such person, the hospital management can assign the task to a doctor who specializes in infectious disease management or who is willing to take on the additional responsibility. The doctor should have access to laboratory facilities and authority to arrange for laboratory test if required for infection control purposes.

Additional responsibilities include:

- Provision of leadership for the infection control committee.
- Establish and maintain close working relations with the Infection Control Nurse and Infection Control Link Nurses.
- Development of antibiotic regimens for infectious disease management with the support of the pharmacist.
- Guide and assist with infectious disease surveillance and monitoring.

### **Role of the Nursing Manager (District Hospital)**

- Participate actively in committee meetings.
- Promote the development of improved nursing techniques.
- Ensure infection control training programmes are developed and implemented for all members of staff.
- Ensure supervision is conducted and periodically participate in monitoring and evaluation activities.

### **Terms of Reference of Infection Control Nurse**

A nurse formally trained in Infection Control, able to provide specialist and appropriate guidance to health care workers in the hospital and district on infection control practices.

Detailed responsibilities include:

- Training in infection control practices (formal and informal), at induction and on a continuous basis.
- Continuous education on infection control for implementers with assistance of link nurses.
- Auditing the environment for compliance to standard practices, using monitoring and evaluation tools. (Hand washing, safe waste disposal).
- Respond on issues of concern on daily and ad hoc basis.
- Routine screening of patients (surveillance) in high-risk areas.
- Risk management to prevent infection, protect staff and patients and detect outbreaks.
- Monitoring infectious disease management in isolation and surveillance laboratory testing.
- Collect process and analyze data to review and manage the programme.
- Report to the Infection Control Committee on a monthly basis.

- Conduct regular meetings with link nurse to identify issues of concern and support nurses in addressing such issues effectively.
- Maintain infection control equipment inventory.
- Ensure compliance with local and national guidelines.
- Liaise with relevant district health structures and others where appropriate.

### **Role of Nurse Unit Manager**

- Maintain hygienic conditions in unit, consistent with infection control policies and guidelines.
- Monitor aseptic techniques, including hand washing and isolation practices.
- Maintain adequate supply of infection control related supplies and materials in the unit.
- Ensure that all HCWs adhere to infection control practices at all times.
- Report suspicion and evidence of infection promptly and implement isolation precautions immediately.
- Ensure and monitor appropriate cleaning and clinical waste disposal and management by all staff.

### **Role of the Infection Control Link Nurses**

- Act as a resource person and liaison officer with the Infection Control Nurse.
- Have sufficient clinical experience and authority. Undertake role alongside other responsibilities. Should get special training to undertake role fully as part of continuous professional development. Serve as role models for colleagues.
- Facilitate liaison between the infection control nurse and the unit (clinical area) on all aspects of care and clinical support services.
- Directly responsible to ICN on infection control issues (policies and guidelines).
- Act as a resource person for ward/unit staff on issue pertaining to infection control.
- Assist in the education of staff in the clinical area in the principles of infection control.
- Participate in the review of infection control policies and guidelines.
- Inform the ICN of infectious cases in unit/ward and consult on appropriate arrangements.
- To conduct regular surveillance rounds and keep documentation. Provide daily supervision on infection control practices in relation to adherence.
- Provide information to assist in early detection on outbreaks of infection.
- Provide feedback to infection control nurse on issues of concern.
- Attend Infection Control meetings on a regular basis.

### **Role of Hospital Pharmacist**

- Provide the Therapeutic and Infection Control Committees with summary reports on antimicrobial use.

- Obtain, store and distribute pharmaceutical preparations correctly and educate staff on the appropriate handling of such to prevent contamination and infection.
- Maintain records on antibiotic distributions to wards/units.
- Obtain information on disinfectants, antiseptics and other anti-infectious agents and advise committee on:
  - Active properties in relation to concentration, temperature and length of action.
  - Toxic properties including sensitization or irritation of skin and mucosa.
  - Substances incompatible with antibiotic use.
  - Physical conditions that may influence the potency of products.
  - Harmful effects on material.

### **Role of the Laboratory Technician**

- Develop guidelines for appropriate specimen collection, handling and transportation.
- Ensuring laboratory practices meet appropriate standards and ensure safe laboratory practices to prevent contamination and infection.
- Perform specified testing.
- Participate in guideline and policy development.
- Attend infection control meetings regularly.
- Participate in monitoring and evaluation visits.

### **Role of Cleaning Services**

- To implement regular and routine cleaning of all surfaces and maintain a high level of hygiene in the facility.
- Ensure that cleaning areas are classified according to their varying need for cleaning and implement the policy accordingly.
- Determining appropriate work systems to ensure cleaning, laundry and waste disposal are efficiently executed on a daily basis.
- Regularly inform maintenance on building problems repair, cracks, and defects.
- Prevent and monitor for the presence of pests and report to the local Health Inspector.
- Provide training to new staff and regular updates on new techniques and procedures.
- Develop and execute extensive training on an annual basis to address the pertinent aspects of:
  - hand washing,
  - cleaning methods, correct use of diluting agents and equipment,
  - waste disposal

### **Role of Laundry Services**

- To implement the policies and guidelines for collection and transportation of linen.
- To protect clean linen from contamination during transportation.
- Ensure safety of laundry staff in prevention of exposure to sharps or contamination with potential pathogens.
- Ensure the appropriate disinfection of infectious laundry before the normal washing processes.
- Ensure that staff is supplied with protective clothing and wear it according to protocol.
- To maintain appropriate supplies for optimal functioning of laundry services.
- Ensure laundry services are implemented in accordance with guidelines.

### **Role of Food Services Department**

The Management of the food service department should be:

- Knowledgeable in food safety, the storage and preparation of food and the safe use of equipment, and take the responsibility to:
- Define criteria for purchase of food products and equipment to maintain a high level of safety.
- Ensure food handling methods are free from contamination during storage, preparation and distribution of food.
- Ensure a safe working environment for staff.
- Issue written guidelines and instructions on staff responsibilities for hand washing, protective clothing, care of dish cloths, and daily disinfection duties.
- Ensure special considerations are implemented in handling food and utensils for infected or isolated patients.
- Ensure the correct handling of kitchen waste according to policy.
- Establish a programme for training of staff in food preparation, cleanliness and food safety.

### **Role of Maintenance**

The management of Maintenance in close collaboration with the Administrative Officer of the hospital should play a coordinating function with all relevant departments and be responsible for:

- Regular inspection of buildings for plumbing, heating, ventilators and cooling systems faults and problems and keep adequate records on inspection.
- Ensuring that faulty systems are replaced and repaired according to manufacturer's instructions.
- Conducting regular inspection of all surfaces, walls, floors and window frames and initiate timely repairs.
- Developing an incident reporting system with all the relevant units for timely response to critical aspects of care provision.
- The development of procedures for emergency repairs (e.g. broken down autoclave)

- Notify infection control of anticipated interruption of services such as plumbing or air conditioning.

### **Role of Central Sterilization Services Department**

The unit serves all hospital areas with sterile supplies, including the operating theatre. The person managing the unit should have knowledge and experience of medical supplies and equipment. The unit should:

- Clean, decontaminate, test, prepare for use and store all sterile hospital equipment.
- Develop and monitor policies on sterilization methods, according to type of equipment.
- Ensure optimum sterilization conditions (temperature, humidity, duration and pressure).
- Ensure appropriate cleaning and decontamination of re-usable equipment, including wrapping procedures.

### **The CSSD Manager should:**

- Oversee the use of different methods to monitor sterilization processes.
- Ensure regular technical maintenance of equipment according to standards and manufacturers requirements.
- Report any defective equipment timely.
- Maintain adequate records of each autoclave run and ensure long-term availability of records.
- Communicate to relevant departments on issues of concern.
- Attend the infection control meeting when required.
- Participate in monitoring and evaluation visits.

## **Appendix 2: Critical aspects of an Infection Control Training Programme**

- Formal training of managers of infection control and all nursing staff.
- Induction of new employees to the basic infection control procedures through lectures, which can be evaluated and feedback to infection control department.
- Yearly infection control updates on current issues for nurses.
- Yearly and regular updates for domestic workers and other health care providers by link nurses that can be evaluated through environmental audit by infection control unit and infection control link nurses and through daily observational audits.
- Nursing and medical students assigned to unit as part of learning, role of infection control discussed, student goes on monitoring visit and educational experience is evaluated.
- A rolling programme is developed to include all aspects as part of an in-service training programme for the year. Evaluated by number of trainings conducted, number of staff attended by category, wards targeted and learning experiences of attendees.

### **Appendix 3: Auditing the Effectiveness of the Infection Control Programme**

Auditing provides for in-depth review of critical aspects of programme management at all levels. The infection control unit can audit the programme in the following aspects:

#### **The Structure**

- Policies/ guidelines in place, regularly reviewed and implemented
- Functional infection control team
- Functional link nurse system
- Formal links established with all relevant departments
- Risk management team
- Required supplies available to implement quality infection control practices
- Annual plans and budget for infection control activities

#### **The Process**

- Regular meetings and reports to Quality Assurance Unit
- Regular planned and unplanned clinical auditing of departments for compliance to infection control practices
- Regular monitoring and evaluation of hospital environment for compliance to infection control practices.
- Regular surveillance for infectious agents in high-risk areas and appropriate action implemented in cases of highly infectious disease management
- Regular formal training on infection control practices
- Regular continuous education on auditing findings
- Regular review of current practices in line with new developments and research

#### **The Outcomes**

- General awareness of staff increased
- Improved compliance for infection control practices
- Regular auditing conducted
- Regular formal training and continuous education conducted
- Common non-compliance aspects identified and addressed
- Common infections known
- Current practices in line with current infection control practices
- Regular committee meetings
- Regular reports submitted to Quality Assurance Unit
- Regular review and adaptation of policies, guidelines and practices

## **Appendix 4: Standard and Additional Precautions for Effective Infection Control**

### **Standard Precautions**

Standard Precautions is the primary strategy for successful **nosocomial infection** control. The routine implementation of standard precautions greatly reduces the risk of nosocomial infections in the absence of a definitive diagnosis.

Standard Precautions includes the major features of Universal Precautions that is designed to reduce the risk of transmission of blood borne pathogens from moist body substances. Standard Precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals.

#### **Standard Precautions apply to:**

- Blood, including dried blood,
- All body fluids (i.e. secretions, and excretions, regardless of whether or not they contain visible blood. (It excludes sweat), and
- Non-intact skin and exposed mucous membranes.

#### **Standard Precautions include:**

- Regular and thorough hand washing.
- Wearing of gloves, aprons, masks and gowns.

### **Additional Precautions**

Additional Precautions also known or referred to as: "**Transmission-Based Precautions**" are those precautions used for patients known (documented) or suspected to be infected or colonized with highly transmissible or epidemiologically important pathogens that can be transmitted by airborne or droplet transmission or by contact with dry skin or contaminated surfaces. For such situations additional precautions beyond standard precautions are required to interrupt transmission in hospitals.

There are three types of Transmission-Based Precautions: Airborne Precautions, Droplet Precautions, and Contact Precautions. They should be used in a combination together with the Standard Precautions and include:

- A single room for the infectious patient with separate toilet and bathroom facilities. If not a known area of isolation, room is clearly marked:  
**"ISOLATION – ACCESS RESTRICTED"**

- If a single room is not available or possible, cohorting of patients (a room is shared by patients with same infection and is clearly separated from the rest of patients)
- If a single room has no toilet facilities, a dedicated toilet should be allocated for the use of patient (s) to prevent infections from faecal material (diarrhea and enteric bacteria or viruses)
- Additional protective clothing:
  - Well fitted mask for respiratory infections,
  - Balaclava type of mask, double gloving and shoe covers in VHF.
- Dedicated patient equipment is allocated for the entire time of admission.
- If possible, staff is allocated to deal with infectious patients
- The movement of patient(s) and staff are restricted.

**Appendix 5: Table of Diseases that Require Additional Precautions as part of Infection Control**

<b>Mode of Transmission</b>	<b>Examples of Diseases</b>
<b>Airborne Transmission</b>	Tuberculosis – suspected or confirmed Varicella (chickenpox) Zoster (shingles, disseminated) Zoster (shingles in immunocompromized patients) Viral Haemorrhagic Fevers
<b>Droplet Transmission</b>	Neisseria meningitidis/septicaemia/meningitis Whooping cough (Bordatella Pertussis) Influenza Measles Parovirus B 19 infection Respiratory syncytial virus infection Rubella Group A streptococcal infections in infants and young children Group A streptococcal pneumonia or scarlet fever in all age groups
<b>Contact Transmission</b> (direct or indirect contact with dry skin or contaminated surfaces)	Resistant bacteria MRSA Herpes simplex (neonatal and mucocutaneous) Skin infections (impetigo, scabies, Pediculosis, lice) Varicella (chickenpox) Zoster (shingles, disseminated and localized) Infants/young children or any incontinent patient with: Enteroviral infection Hepatitis A Rotaviral enteritis, shigellosis, giardiasis or other form of gastroenteritis.

Not all diseases are included, only those that presents a high risk of transmission in the health care setting and though some are rare, they may have major public health implications if not managed correctly. (E.g. Poliomyelitis)

*Adapted from: Infection control guidelines: for the Prevention of Transmission of Infectious Diseases in the health care setting, Australia, communicable Diseases Network, 2001*

**Appendix 6: Table: Outline of Personal Protective Equipment Requirements for Additional Precautions. (Transmission –Based Precautions.)**

<b>Requirement</b>	<b>Additional Precaution Type</b>		
	<b>Airborne Transmission</b>	<b>Droplet Transmission</b>	<b>Contact Transmission</b>
<b>Gloves</b>	Nil	Nil	Contact with patient, immediate environmental surfaces and equipment
<b>Apron/ Gown</b>	Nil	Nil	If clothing of HCW will have substantial contact with patient, equipment and environment
<b>Mask</b>	Filter mask for TB, other surgical mask	Surgical mask	Protect face if blood splash is likely
<b>Goggles/Face shields</b>	Protect face if splash is likely	Protect face if splash is likely	Protect face if blood splash is likely
<b>Special Handling of Equipment</b>	Standard Precautions	Standard Precautions	Single use or sterilize if re-use
<b>Single Room</b>	Yes, or cohort if same infection, door closed	Yes, or cohort if same infection, door closed	If possible or cohort if same infection
<b>Transport of Patients</b>	Surgical mask for patient, inform area receiving patient	Surgical mask for patient, inform area receiving patient	Notify area receiving patient
<b>Other</b>	Encourage patients to cover nose and mouth when coughing or sneezing, wash hands after blowing nose Provide 1 meter separation between patients in cohort	Provide 1 meter separation between patients in cohort	Remove gloves and gown and wash hands before leaving patient's room

*Adapted from: Infection control guidelines: for the Prevention of Transmission of Infectious Diseases in the health care setting, Australia, communicable Diseases Network, 2001*

## **Appendix 7: Hand washing Techniques**

### **Social Hand Washing Technique**

Takes about 15 seconds

1. Use elbows to turn on water and pump liquid soap from container
2. Wash hands under running water
3. Lather hands and wrists vigorously, paying attention to fingertips, thumbs and between fingers
4. Rinse hands; turn off the tap with elbow
5. Dry hands thoroughly with paper towel
6. If tap cannot be turned off with elbow, close tap with paper towel just used.

### **Aseptic Hand washing Technique**

The use of vigorous rubbing to create friction, thorough rinsing and proper drying are key factors in effective hand washing and maintenance of skin integrity.

It involves four stages:

1. Remove all wrist and hand jewelry at the beginning of shift before decontamination of hands. Inspect hands for cuts and breaks, cover with waterproof dressing and report to supervisor.
2. Wet hands with warm water, keep hands lower than elbows, apply recommended amount of liquid to hands, rub vigorously for 15 seconds until lather is formed, covering all surfaces of hands and fingers, tops of fingers, thumbs and areas between fingers and under nails.
3. Rinse thoroughly with running water, keeping hands down so that the water runs from the wrists to the fingers.
4. Dry hands with disposable towel, starting from the fingertips towards forearms and elbows, with special attention to the areas between the fingers. Use the disposable towel to turn off tap, if not an elbow tap or if it does not automatically shut off.

Decontaminate hands with alcohol base rub, apply product to palm of one hand and rub hands together, covering all surfaces until hands are dry.

### **Antiseptic hand rub technique**

Antiseptics do not remove visible dirt, or contaminants from blood or body fluids.

1. First wash hands with soap and water.
2. Apply enough anti-septic to cover the entire surface of hands and fingers (about a teaspoonful).

3. Rub the solution vigorously into hands, especially between fingers and under nails until dry.

To reduce the build-up of antiseptic hand rubs on hands, wash hands with soap after every 5 applications of hand rub.

### **Hand washing without water**

HCWs may clean their hands with antiseptic products in the following situations:

Emergency situations where there is insufficient time or facilities;

When hand washing facilities are inadequate; and

In circumstances where an alcohol based preparation provides a more effective option for those that are allergic to latex gloves.

### **Surgical Hand Washing Technique (see operating room procedure manual)**

#### **General Preparations**

Ensure that finger nails are short and clean.

Inspect hands for cuts and abrasions.

Remove all jewelry as it harbours microorganisms and may become a potential foreign body in the operative field.

1. Wet hands and arms properly under running water.
2. Apply scrubbing lotion on hands and thoroughly wash hands for one minute, especially between fingers. Rinse with water in between washes.
3. Wash forearms to above the elbows with scrubbing lotion for one minute. Leave soap lather on arms for three minutes. Use a sterilized brush.
4. Apply scrubbing lotion to a sterile nail brush and scrub the finger nails of both hands for one minute.
5. Rinse brush and discard into container for used brushes without contaminating hands.
6. Rinse hands and apply fresh scrubbing lotion and wash for two minutes.
7. Rinse hands and arms from fingertips to elbows.

#### **Drying of hands and arms.**

After scrubbing, hands and arms should be dried before the sterile gown is donned.

1. The circulating nurse will open both layers of the gown pack. Do not stand close to the trolley as the water may drip onto the trolley.
2. The scrub nurse will take a towel with the right hand and start drying the Left hand from the finger tips up to the elbow. Keep hands and arm away from body.

- 3.** The second towel will be used with the left hand to dry the right hand from hands to elbow.
- 4.** The used towels are disposed off into the paper towel bin.

During the process of scrubbing, hands should be held higher than the elbows to allow water to run from the cleanest area to the area of the upper arm.

## **Appendix 8: Handling of Personal Protective Equipment**

### **Handling of Masks**

1. Wash hands or spray hands with disinfectant.
2. Remove mask from dispenser and place over mouth and nose. Bend metal strip to form a contour over Nose Bridge.
3. Tie the upper tapes at the back of neck to fit comfortably.
4. Wash hands or spray hands again. When removing a mask, handle only the tapes and not the mask, dispose in rubbish bin immediately.
5. Wash hands or spray hands again.

A mask should never hang around the chin, must never be disposed off in a pocket or used more than once. A wet mask is no longer effective as a bacterial filter and should be changed immediately.

### **Handling of Surgical Gloves (see Operating Room Procedure Manual)**

1. Check for breaks in packaging.
2. Scrub hands as prescribed for surgical procedures and dry with paper towel.
3. Use correct technique of donning gloves to prevent contamination of the outside of the glove.
4. If gloves torn or puncture during use, replace immediately.
5. Remove gloves correctly to prevent contamination of hands with blood or bodily fluids.
6. Dispose immediately into red bag for disposal.
7. Wash hands well and dry with paper towel.

### **Handling of Caps**

1. Wash or spray hands.
  2. Remove cap from dispenser and place over head and hair so that all hair is covered. Tie well at the back of the head.
- Caps with rims should be pulled lower over the forehead to prevent it from slipping out of the rim and exposure hair during procedures.
  - If contamination of the cap occurs with blood or body fluid, it must be replaced immediately.
3. Remove cap after procedure and dispose of it in the appropriate container.
  4. Wash or spray hands after disposal of used cap.

### **Gloving Technique (see Operating Room Procedure Manual)**

1. With the left hand, grasp the cuff of the right glove on the fold. Pick up the glove and move back from the table.

2. Insert the right hand into the glove and pull it on, leaving the cuff well down over the hand.
3. Slip the fingers of the gloved right hand under the averted cuff of the left glove. Pick up the glove and step back.
4. Insert the hand into the left glove and pull it on, leaving the cuff turned down over the hand.
5. With the fingers of the right hand, pull the cuff of the left glove over the cuff over the left sleeve. If stockinet is not tight, fold a pleat, holding it with the right thumb while pulling the glove over the cuff. Avoid touching the bare wrist.
6. Repeat step 5 for the right cuff, using the left hand to complete gloving the right hand.

### **Gowning Technique (see Operating Room Procedure Manual)**

Sterile gowns are worn to provide a barrier between sterile and unsterile areas and to exclude the skin as a possible contaminant.

1. Reach down to the sterile package and lift the folded gown directly upward.
2. Step back away from the table, into an unobstructed area, to provide a wide area of safety for self and the procedure to follow.
3. Holding the folded gown, carefully locate the neckband.
4. Holding the inside front of the gown just below the neckband with both hands, let the gown unfold, or fall open away from the trolley keeping the inside of the gown toward the body. Do not touch the outside of the gown with bare hands.
5. Holding the hands at shoulder level, slip both arms into the armholes simultaneously.
6. The circulating nurse brings the gown over the shoulders by reaching inside to the shoulders and arm seams. She securely ties or fastens the back of the gown at the neck.

## Appendix 9: Disinfection and Decontamination of Equipment

Equipment or Site	Routine or preferred method	Comments
Airways & Endotracheal tubes	1. Single use 2. Heat disinfection - reusable	Return CSSD for sterilization
Ampoules, vials and tubes	No disinfection required, wipe with clean cloth	After use place in sharps container for incineration
Antiseptic solution containers	Reusable	Wash thoroughly before refilling
Baby bottles, feeding cups, spoons	Wash with soap and water after use.	Disinfect in Milton (Hypochlorite solution) 25ml:1litre
Baby bottle brushes	Use detergent to clean	Wash and rinse after use, hang up to dry
Baby scale	Clean before and after use.	Spray with 70% Alcohol and wipe. Use new paper towel for each baby
Baths and showers	Clean after each use. Dry thoroughly. Part of daily dusting and cleaning.	Disposable cloths to be used for cleaning. Use 10% Hypochlorite solution
Bath hoists	Clean after each use. Dry thoroughly. Part of daily dusting and cleaning.	Use 10% Hypochlorite solution
Basins (hand basins)	Clean after each use. Part of daily dusting and cleaning.	Use 10% Hypochlorite solution
Bed frames, furniture, ledges, curtain rails, intravenous poles (stands)	Part of daily dusting and cleaning.	Use 10% Hypochlorite solution
Bedpans and urinals (plastic and metal)	Clean after each use.	Use 10% Hypochlorite solution to clean and put on rack to dry
Bins (wastes bins – metal, plastic)	Put plastic bag indicated. Operate according to waste management prescriptions. Clean regularly with	Must be foot operated

	detergent solution.	
Bowls (surgical bowls)	Autoclave	Return to CSSD for sterilization
Bowls (washing bowls)	Clean with detergent. Store dry, inverted	Bowls must not be stacked
Contaminated linen	See waste management section	
Crutches	Disinfect and let dry	Clean with hypochlorite solution, let dry
CSSD instruments and items	If stained with blood/body fluids wash with disinfectant solution in sluice room	Return to CSSD in appropriate bag (see waste management) for sterilization
Defibrillator electrode (external paddles)	Wipe contact jelly off with disposable paper towel, clean with 70% Alcohol/Spirit swab. Return to CSSD for sterilization	To be sterilized
Disposable nappies	Dispose in red plastic bag.	To be incinerated
Ear syringe	Wash with disinfectant, let dry	Use 10% Hypochlorite solution
Ear piece (of autoscope, stethoscope)	In-between patients - Wash with disinfectant, let dry	Clean with 70%Alcohol Use 10% Hypochlorite solution
ECG apparatus (leads)	Wipe with disinfectant solution and let dry. Switch off at plug (electrical inlet)	Use Hypochlorite solution
ECG apparatus (metal terminals)	Wipe electrode jelly container with spirits and dry.	
Electric fans	Damp dust with disinfectant	Use Hypochlorite solution
Endoscope	Clean according to manufacturer's instructions	
Endotracheal tubes, face masks, re, breathing bags, airways	Wash with disinfectant, rinse, air dry. To be sterilized	Use Hypochlorite solution and send to CSSD for sterilization
Incubators	Clean daily or after use. First clean with detergent solution and then with disinfectant. Filter to be re-	Clean – detergent solution Disinfectant –

	sterilizing after every use, replace every 3 months or when dirty.	Hypochlorite solution CSSD to sterilize
Linen (including pillows, mattresses)	See section on waste management	
Laryngoscope	Remove batteries, bulb and blades. Wipe with disinfectant and replace battery, bulb and blades.	Use Hypochlorite solution
Oxygen humidifiers	Change daily or after use (different patients). Rinse with detergent solution and send to CSSD for sterilization.	Rinsing – detergent solution CSSD to sterilize
Plastic aprons (disposable)	See section on personal protective equipment	
Plastic aprons (for theatre use)	Wipe with disinfectant, let dry	Use Hypochlorite solution and send to CSSD for sterilization
Proctoscopes	Wash with disinfectant, rinse, air dry. To be sterilized	Use Hypochlorite solution and send to CSSD for sterilization
Mattress (ripple)	Wash with disinfectant, rinse, air dry.	Use Hypochlorite solution Use Hypochlorite solution
Mops	Wash in detergent solution, dry in sun. Should not be left overnight in disinfectant.	
Razors (disposable)	Dispose after use	Dispose in sharps container, incinerate
Razors (re-usable)	Remove and dispose blade as a sharp. Wash razor in disinfectant and let dry	Dispose blade in sharps container; incinerate. Use hypochlorite solution to disinfect razor
Rectal washout apparatus (funnel and tube)	Wash with disinfectant, rinse, air dry. To be sterilized	Use Hypochlorite solution and send to CSSD for sterilization
Rectal washout apparatus (catheter)	Disposable	Place in red plastic bag, incinerate
Scissors (nurses own)	Wipe with disinfectant after each, if soiled with body fluids soak in disinfectant	Use hypochlorite solution

Sigmoidoscope	Rinse under running water, clean with disinfectant, let dry	Use solution	Hypochlorite
Splints (plastic)	Remove padding after use, wash in disinfectant, let dry	Use solution	Hypochlorite
Splints (Thomas)	Wash in disinfectant, let dry	Use solution	Hypochlorite
Specimen containers (sputum)	Disposable	Dispose in red plastic bag, incinerate	
Specimen containers (urine)	Wash with disinfectant, rinse, let dry, place upside down	Use solution	Hypochlorite
Stomach washout apparatus (funnel and tubing)	Wash with disinfectant, let dry and return to CSSD for sterilization	Use solution.	Hypochlorite CSSD to sterilize
Suction apparatus - Suction bottle of electrical suction machine (high and low suction units)	When not used wipe with disinfectant solution After use or when fixed for a patient remove, rinse under water and send for sterilization.	Wiping –	Hypochlorite solution After use/when changing – CSSD to sterilize
Suction apparatus (catheter)	Dispose in red plastic bag for incineration	Incinerate	
Suction apparatus (machine)	Do not soak machine regulator, wipe outside of machine daily with disinfectant.	Use solution	Hypochlorite
Telephone	Wipe daily with disinfectant	Use solution	Hypochlorite
Thermometers	Wipe with disinfectant on cotton wool swab before and after every use	Use 70% Alcohol/spirits	
Toilet brushes	Wash with detergent water, rinse well, shake off excess water in toilet pan and store dry	Use detergent solution	
Tooth brushes for cleaning	Wash in detergent water, rinse, dry and store	Use detergent in use	
Tube feeding apparatus (tube)	Discard in red plastic bag for incineration.	Incinerate	
Tracheostomy tubes	Dispose in red plastic bag	Incinerate	

(disposable)	for incineration	
Tracheostomy (re-usable)	Soak in Hydrogen Peroxide to remove secretions, rinse in water and re-sterilize	After cleaning send to CSSD for re-sterilization
Trolley (medicine)	Wash inside and outside daily with disinfectant, let dry	Use Hypochlorite solution
Trolley (patient)	Wash daily and after every use with disinfectant	Use Hypochlorite solution (10% strength)
Trolley (dressing)	Wash daily with disinfectant. In-between use – spray with 70% Alcohol or Hibitane and wipe with clean disposable towel	Use Hypochlorite solution 70% Alcohol or Hibitane
Underwater drainage apparatus (bottles)	Rinse with cold water in sluice room. Return to CSSD for sterilization.	CSSD to sterilize
Vacolitres (glass)	Do not dispose off. When empty wipe with detergent solution return to pharmacy/CSSD.	Use detergent solution
Vacolitres (plastic)	Dispose in red plastic bag for incineration.	Incinerate
Vaginal examination apparatus	Rinse in running water, soak in disinfectant and rinse again. Return to CSSD for sterilization.	Use Hypochlorite solution. CSSD to sterilize
Ventilators	Clean and disinfect according to manufacturer's instructions	

*Adapted from: Infection Control – Policies and Guidelines, Ministry of Health, United Arab Emirates, First Edition, March 2003*

## **Appendix 10: Duties of Housekeeping Staff (CLEANERS)**

Staff should wear the appropriate protective gear when performing cleaning activities.

- Disposable unsterile gloves to protect hands from disinfectant, when in contact with blood and body fluids and handling contaminated items.
- Aprons (plastic) when performing cleaning in isolation areas.

### **Duties**

- Sweep floors before dusting.
- Dust and clean furniture with Hypochlorite solution (1:10) before mopping floors.
- Empty all household refuse holders (buckets) twice a day, wash the holders daily.
- Work from clean to dirty areas, except in cases of protective isolation. (Chapter 6 section 6.4.3 provides more details)
- Start cleaning in non patient areas, offices, treatment and dressing room, nurse station, corridors, and storerooms.
- Clean patient rooms, bathrooms and toilets after breakfast is served.
- Remove all refuse bags to the sluice room at 9h00. The final removal from the unit/ ward to disposal area should be done at 15h00.
- Check bathrooms and toilets every two hours and clean when required.
- Clean sluice rooms last, wash bedpans and urinals with Hypochlorite and place on shelf to dry. Clean basins with scouring powder once a day to prevent build up of dirt. Disinfect walls with Hypochlorite daily. Regularly check on room and clean items throughout the day.
- Disinfect high touch areas twice a week with Hypochlorite solution (1:10) and clean walls once a week.
- Clean windows regularly according to hospital policy.
- Clean cleaning equipment daily after completion of shift. ( Chapter 5 section 5.10 provide more details)

# **PART II**

## **VIRAL HAEMORRHAGIC FEVERS**

# Viral Haemorrhagic Fevers

## Chapter 1

### 1. Introduction

Viral Haemorrhagic Fevers (VHFs) refers to a group of **highly infectious illnesses** caused by a distinct family of viruses; it is a severe multisystem syndrome that affects multiple organs in the body. It generally affects the overall cardiovascular system that impairs the body's ability to regulate itself, causing life-threatening disease and is in most cases fatal (up to 90%) depending on the particular virus.

**The Haemorrhagic Fever viruses are grouped in four distinct families, namely the arenaviruses, filoviruses, bunyaviruses and flaviviruses.**

Each of these share some specific features including:

They are all RNA viruses and they are all covered in a fatty (lipid) coating.

Their survival is dependent on an animal or insect host, called the natural reservoir.

The viruses are geographically restricted to the areas where their host species live.

Humans are not natural reservoirs for any of these viruses, but are infected when they come into contact with infected hosts. However, with some viruses, after the accidental transmission from the host, humans can transmit the virus to one another.

Human cases or outbreaks of hemorrhagic fevers caused by these viruses occur sporadically and irregularly. The occurrence of outbreaks cannot be easily predicted.

- With a few noteworthy exceptions, there is no cure or established drug treatment for VHFs.
- In rare cases, other viral and bacterial infections can cause a hemorrhagic fever of which scrub typhus is a good example.

#### 1.1 General Information about VHFs

- A VHF case can be caused by several different viruses, which is transmitted to humans by animals or arthropods. (Animal without a backbone such as an insect or worm).
- Each virus causes a different disease, but all attack the same blood vessels.
- The virus is usually in all organs and can cause bleeding from the nose, mouth, and intestines as well as under the skin.
- The virus is transmitted through unprotected contact between an infectious patient or their body fluids and a non-infected person.
- VHF is not a common disease and is very dangerous and poses significant risk to the health care setting.
- Common complaints include: fever, body aches, weakness persisting after dehydration, diarrhea, muscle pain and back pain.

- Clinical examination may reveal only conjunctival infection (red eyes). Mild hypotension (low blood pressure), flushing and haemorrhages.
- VHF leads to shock, generalized mucous membrane bleeding, reduced sensitivity to pain and signs involving the nervous system.
- Any suspected case of VHF is strictly isolated and contact with the patient is limited to only a few trained staff and in some cases, a trained family member to prevent and reduce the risk of transmission of the disease.
- All staff members and family members who are in contact of the patient **must at all time** follow the Isolation Precautions and wear personal protective equipment.
- The use of invasive procedures is limited to the minimum and all waste is disposed off safely, including the safe burial of the deceased.
- In cases of ACCIDENTAL EXPOSURE (needle stick injury or exposure to contaminated body fluids) strict procedures must be followed.

### **1.2 Objectives of the guideline are to assist health care workers to:**

- Understand and implement VHF isolation precautions to prevent secondary transmission of VHF in the health care setting;
- Make advanced preparations and apply VHF isolation precautions both in cases of emergencies and in large outbreak situations;
- Identify low-cost solutions when recommended supplies are not available or in short supply; and
- Mobilize community resources and conduct community education.

**Table: 1 Summary of Viral Haemorrhagic Fevers.**

*(Adapted from: WHO/CDC (1998) Infection control for Haemorrhagic Fevers in the African Health Care Setting)*

<b>Common geographical ,epidemiological characteristics and clinical features of VHF</b>				
<b>Disease</b>	<b>Geography</b>	<b>Vector/Reservoir</b>	<b>Incubation period (days) Case fatality (%)</b>	<b>Human Infection and Clinical characteristics</b>
<b>Crimean Congo HF</b>	<ul style="list-style-type: none"> <li>• <b>Africa</b></li> <li>• Balkans</li> <li>• China (western)</li> <li>• Former Soviet Union (Southern)</li> <li>• Middle East</li> </ul>	<b>Ticks.</b> Tick-mammal-tick maintenance.	3-12 days 15 -30%	Tick bites or squashing ticks. Exposure to aerosols or fomites from slaughtered animals. <b>Nosocomial infections have occurred!</b> <b>Clinical:</b> Most severe bleeding and ecchymoses ( blood forming from vessel into skin)
<b>Ebola HF and Marburg HF</b>	<ul style="list-style-type: none"> <li>• <b>Africa</b></li> </ul>	<b>Unknown</b>	2-21 days 25-90%	Virus spread by close contact with infected person, route of infection of first case is unknown, but non-human primates may provide a link to infection. <b>Clinical:</b> Most fatal of all HF, weight loss, exhaustion, macopapular rash is common, post event infections can include hepatitis, uveitis and orchitis.
<b>Lassa Fever</b>	<ul style="list-style-type: none"> <li>• <b>West Africa</b></li> </ul>	<b>Mice.</b> The <i>Mastomys</i> genus of the mouse.	5-16 days approximately 15%	Transmitted by aerosols from rodent to man. Direct contact with infected rodent droppings, saliva or urine. Person-to-person contact. <b>Clinical:</b> Exhaustion and loss of strength,

<b>Common geographical ,epidemiological characteristics and clinical features of VHF</b>				
<b>Disease</b>	<b>Geography</b>	<b>Vector/Reservoir</b>	<b>Incubation period (days) Case fatality (%)</b>	<b>Human Infection and Clinical characteristics</b>
				shock and deafness develops during recovery in 20% of cases.
<b>Rift Valley Fever</b>	<ul style="list-style-type: none"> <li>• <b>Sub-Saharan Africa</b></li> </ul>	<b>Floodwater mosquitoes.</b> Maintained between mosquitoes and domestic animals, particularly sheep and cattle.	2-5 days in uncomplicated disease, but with HF it may differ. 50% of severe cases, (about 1.5% of all infections)	Mosquitoes bite, contact with blood of infected sheep, cattle and goats. Aerosols generated from infected domestic animal blood. No Person –to person contact observed. <b>Clinical:</b> Shock, bleeding, reduced or no urine production, jaundices, inflammation of the brain and blood vessels of the retina.
<b>Yellow Fever</b>	<ul style="list-style-type: none"> <li>• <b>Africa</b></li> <li>• South America</li> </ul>	<b><i>Aedes aegypti</i> mosquitoes</b> Mosquito-monkey-mosquito maintenance. Occasionally human infection occurs when unvaccinated humans enter the forest. In urban outbreaks the virus is maintained in the infected <i>Aedes aegypti</i> mosquitoes and humans	3-6 days 20%	Mosquitoes bite; in outbreaks the mosquitoes amplify transmission between humans. Fully developed cases not viremic. Direct Person-to person transmission is not believed to be a problem, yet the virus is highly infectious (including aerosols) in laboratory settings. <b>Clinical:</b> An acute febrile period, followed by period of remission, followed by a toxic phase with renal failure and jaundice in sever cases.

## **Chapter 2**

### **2. Pathogenesis of Viral Haemorrhagic Fevers**

The virus that causes Haemorrhagic Fevers naturally resides in an animal host or reservoir, namely the rat, cotton rat, deer mouse, house mouse and ticks. It is important to know that the host of the Ebola and Marburg viruses is still unknown.

Transmission to humans by the bite of an infected tick or animal, or when humans have contact with urine, faecal matter, saliva or other body excretions from the infected animal or rodent. Transmission can also occur when humans work with livestock that are infected, especially in the process of slaughtering of animals.

Transmission between humans occurs through direct close contact with infected persons, their body fluids such as blood and organs, especially in the health care setting. Travelers can become infected by a host in the host's natural environment and can infect others when traveling. VHFs are thus becoming a threat in areas where it was never seen before. Burial ceremonies where people have direct contact with the deceased can also play a significant role in transmission.

VHF transmission can also occur indirectly through contact with contaminated objects, such as syringes and needles in the process of neglecting infection control practices and adequate barrier nursing procedures.

## Chapter 3

### 3. Identification, immediate action and referral in suspected cases of VHF

#### 3.1 The identification of suspected case (s) of VHF in a non- outbreak situation

Health care workers should use the available diagnostic tools in the facility to identify or exclude the cause of fever, such as a malaria smear or a stool sample.

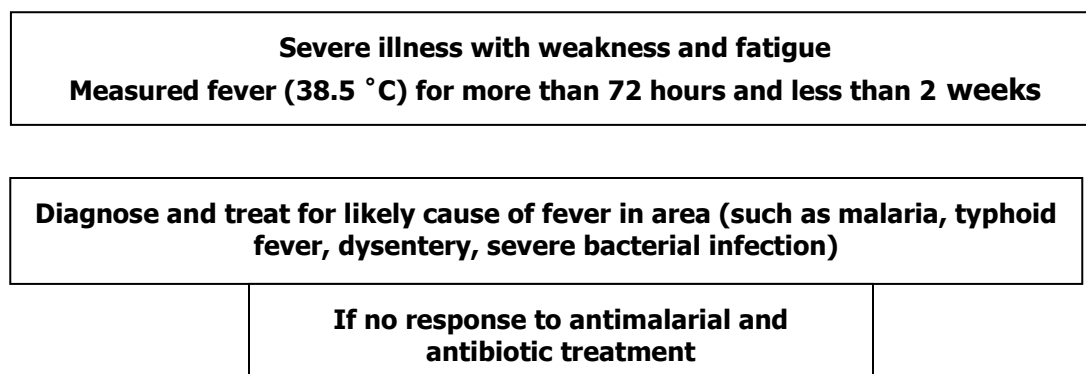
Using the flow chart (Section 3.2) health care workers should be able to identify a suspected case of VHF at any level in the health care system.

Steps to follow:

- Review history of contact with a VHF case, or visit to a tropical area, visit to an endemic VHF area, contact with animals or abattoir, or history of a tick-bite or insect-bite.
- Treat the most likely cause of the fever and if it persists for more than 3 days, and other signs such as bleeding or shock occurs, suspect VHF.
- Review the patient's history for any contact with someone who was ill with fever or bleeding or who died from unexplained fever and bleeding.
- If no cause is found for patient's signs and symptoms, suspect VHF.
- If VHF is suspected, start Isolation Precautions immediately to reduce the number of people exposed to VHF.

#### 3.2 Flow chart to use in the identification of a suspected case of VHF

The flow chart can be used by HCWs when following the above-mentioned steps.



**Does patient have one or more of the following?**

- **Unexplained bleeding from**
  - **Mucous membranes ( gum, nose, vagina)**
  - **Skin (puncture sites, petechiae)**
  - **Conjunctiva ( red eyes due to swollen blood vessels)**
  - **Gastrointestinal system ( vomiting blood, dark or bloody stools)**
- **Shock: blood pressure less than 90mm HG or rapid weak pulse**
- **Contact in the 3 weeks prior to onset of illness with anyone who had an unexplained illness with fever and bleeding or who died after an unexplained severe illness with fever**

**Suspect VHF  
And Begin VHF Isolation Precautions**

*Diagram adopted from: (Infection control for Haemorrhagic Fevers in the African Health Care Setting)*

### **3.3. VHF Transmission in the Health Care Setting**

The diagram gives a concise flow of how VHF can transmit in any health care setting

**The virus enters the health facility in the body fluids of a  
VHF patient.**

**The virus is transmitted during direct, unprotected contact  
with a VHF patient OR with a deceased VHF patient**

**The virus also transmit during unprotected contact with VHF  
infectious body fluids  
OR  
Contaminated medical equipment and supplies  
OR  
As a result of an accidental needle stick or accidental  
exposure to infectious body fluids**

**All health care staff, laboratory staff, housekeeping staff, other patients and visitors to the health facility are at risk of exposure to VHF.**

**The exposed person carries the virus back to the community. Transmission continues if there is direct person-to-person contact**

**OR**

*Diagram adapted from: (Infection control for Haemorrhagic Fevers in the African Health Care Setting)*

### **3.4. Laboratory examinations to identify and confirm VHF:**

- Low white cell count, relative to fewer than 2000 white cell count, leucopenia relative to normal white cell count
- Low platelet count
- Abnormal kidney and liver function
- Anaemia – normochromia, normocytes
- Negative blood cultures
- Positive culture for Congo Fever or other VHF
- Positive anti bodies in the recuperating phase

#### **3.4.1 Obtaining blood specimens**

**Testing in VHF cases should be confined to the minimum and all efforts should be applied to obtain it in the safest way.**

- **The wearing of full personal protective equipment is compulsory.**
- Prepare all the supplies before entering the isolation area.
- Remove labels and complete all the details.
- Prepare vacutainer with tube in position.
- If butterfly is used, connect butterfly and vacutainer tube.
- Move to isolation room with all the supplies (alcohol swabs, 1 linen saver, cut in half, 1 biohazard plastic bag and the syringes and tubes).

**Actual procedure:**

1. Explain the procedure to the patient and encourage cooperation.
2. Place one part of the linen saver under the arm, at the site where blood will be drawn. Place the other part in a safe and clean area to put the specimens after collection.
3. Ensure all supplies and specimen tubes are in reach before the puncture is made.
4. Clean the area with alcohol swab and allow to air dry.
5. Obtain blood by using the relevant supplies. It is highly **NOT** recommended to use **SYRINGES AND NEEDLES TO DRAW BLOOD** because of the risk of contamination of specimens and accidental exposure to staff.
6. Seal the puncture wound with a cotton wool swab and plaster strip. Ensure that bleeding has stopped.
7. Discard the sharps into the sharp container and the other used supplies in the biohazard bag for incineration. Seal and wrap the specimens into a clean linen saver.
8. The specimens is taken to the outside room and received by the laboratory person in an open specimen bag. Care should be taken for the specimens not to fall or be contaminated in the process. Attach the written details of the patient to the specimen (put it into the part of the bag for the purpose of holding documents)
9. The laboratory person places the first plastic bag (air carefully squeezed out) into a second bag which should be labeled as **"highly infectious."**
10. Specimens are taken to the laboratory immediately for processing.

**3.4.2 Specimen handling form peripheral facilities**

1. Pack specimens in clear Biohazard plastic bag, seal bag and clearly mark it as: **"Highly Infectious – Viral Haemorrhagic Fever"**.
2. Put specimens in a second plastic bag and seal the bag, apply the same marker as in step 1.
3. Pack the specimens in a thin plastic container with absorbent material, seal the lid of the container and mark it as: **"Highly Infectious – Viral Haemorrhagic Fever"**
4. Pack the first container in a second larger container or tin securely packed with absorbent material, seal container and mark clearly as: **"Highly Infectious – Viral Haemorrhagic Fever"**.
5. Hand container to an assigned person with clear instructions for transporting the specimens.
6. Inform the medical laboratory of specimens in transit and expected time of arrival.

**Note: If blood spills occur, follow the procedure as detailed in Section 7.2.6. If a vacutainer was used, it should be soaked in 1:10 bleach solution for 30 minutes, rinsed with clean water and air-dried for re-use.**

### **3.5 Immediate action when VHF is suspected at Regional or District Facility level.**

- Inform the Doctor in-charge of the nearest District Hospital and the Infection Control unit in Windhoek.
- Isolate the patient immediately from others and initiate VHF Isolation Precautions. (Chapter 5 section 5.1.1 provides details on procedures to follow).
- Take the necessary steps to confirm the diagnosis:
  - Consult with the Chief Physician in Windhoek before patient is dispatch.
  - Obtain blood specimens for a differential full blood count and platelets. The specimen should be taken under extreme caution and by an experienced health care worker. (Section 3.3.1 provides details on how to obtain blood samples safely). Label specimens as **"Highly Infectious – Viral Haemorrhagic Fever"** with full particulars on the case.
  - Inform the laboratory immediately and ensure specimens are handled with extreme caution. (Section 3.3.2 provides details on how to handle specimens safely).
  - Consider staff members involved in the initial stage/contact with the suspected case as "close contacts" similar to the family of the patient. (Section 12 provides details on how to determine close contacts and the procedures to follow).

### **3.6 Evacuation/ Referral of a suspected VHF case from any health facility (point of preliminary diagnosis) to Isolation Unit in Windhoek**

Referral of the suspected VHF case should be done in consultation with the Chief Physician in Windhoek. Strict VHF Isolation Precautions must be implemented immediately.

Strict Isolation Precautions should be adhered to during the evacuation, namely:

- Remove all items from the ambulance that may not be required during the journey and prepare to receive the patient on a bed covered with plastic sheeting, disposable sheets, one pillow securely covered in plastic and a pillow case.
- Limit the number of staff members attending to the patient before and during transportation to a minimum of two nurses. One of the nurses should be a Registered Nurse, who will continue to care for the patient in the Isolation Unit in

- Windhoek. Ensure the driver of the ambulance is not in direct contact with the patient.
- Ensure that all nursing staff and the accompanying family member, preferably a contact to the patient (if present) are wearing full personal protective equipment, (Section 6 provides details on personal protective equipment).
  - Ensure that staff members are fully conversant with the precautions to follow by providing information before the journey; this will limit the risk of exposure due to uncertainty and misinformation.
  - All essential medical equipment should be designated for the patient and be transported with and used in the Isolation unit until discharge, at which point it will be disinfected according to protocol. (Section 7 provides details).
  - All material and supplies used during the journey should be discarded in a red bag, sealed and dispatched safely for incineration at the end of the journey.
  - Utilized the shortest possible route through the Windhoek Central Hospital to the Isolation Unit, which should be organized in advance by the VHF coordinator.

### **3.6.1 Disinfection of the ambulance (other mode of transport)**

- **The ambulance should be disinfected immediately with 1:10 bleach solution before the return journey is undertaken. This should be done under supervision of the VHF coordinator or person assigned for disinfection procedures and should include:**
  - Wearing full personal protective equipment (double gloves, gown, plastic apron, mask, goggles and boots).
  - Removing the disposable sheets and pillow cases and discard it into red bag, securely sealed for incineration.
  - Discarding the pillow and mattress of bed if soiled with blood or body fluid in a red bag, securely sealed for incineration. If not soiled, wash/wipe covers with 1:10 bleach solution and let air-dry.
  - Disinfecting the interior of the ambulance with 1:10 bleach solution by washing the area and let it soak in for 10 minutes before rinsing it with clean water to prevent corrosion. Let the interior of the ambulance air-dry.

### **3.7 Management of Haemorrhagic Fever**

No cure exists for VHF. No vaccines are available.

Early diagnosis and symptomatic treatment is crucial, with rapid nontraumatic hospitalization in isolation.

Patients receive intensive supportive treatment with electrolyte dehydration. Care is similar as that for patients with multi-system organ failure, with the challenge of preventing transmission of VHF to other patients and HCWs.

## Chapter 4

### 4. Infection Control Measures

#### 4.1 Primary prevention

Since no vaccines are available against Haemorrhagic Fever viruses, prevention measures concentrate on avoiding contact with the host species.

- Many of the hosts that carry Haemorrhagic Fever viruses are rodents, disease prevention should therefore include efforts to control rodent populations and to keep rodents away from homes and workplaces.
- Haemorrhagic Fever viruses spread by vectors, prevention measures should include controlling the population of ticks and mosquitoes, and preventing bites by using screens, wearing and using personal protective equipment and using repellent spray.
- For Haemorrhagic Fever viruses that can be transmitted from person-to-person, great care needs to be taken when nursing patients, including isolation and the wearing of gloves, gowns and masks, in order to prevent the spread of infection.

#### 4.2 Secondary Prevention

**There have been several documented instances when health care workers contracted Ebola and Marburg viruses from infected patients.**

Infection control measures in VHFs include Standard and Additional Precautions. Strict Isolation Precautions is practices that involve:

- Isolation of suspected VHF cases from other patients,
- The wearing of personal protective equipment,
- Appropriate use of disinfection and disposal of instruments and equipment used in treating infected persons.

##### 4.2.1 Standard Precautions

Standard Precautions includes the major features of Universal Precautions that is designed to reduce the risk of transmission of blood borne pathogens from body fluids. Standard precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals.

Standard Precautions apply to blood and all body fluids (i.e. secretions, and excretions, regardless of whether or not they contain visible blood, non-intact skin, and mucous membranes. (It excludes sweat).

In addition to routine standard precautions, Specific Standard Precautions in VHF includes:

- The establishment of a source of clean water.
- Routine hand washing before and after any contact with any patient who has a fever and when having contact between patients.
- Compulsory wearing of personal protective equipment to reduce exposure to blood and other body fluids.
- Safe handling and disposal of sharp instruments and equipment, including needles and syringes.

#### **4.2.2 Additional Precautions**

Additional Precautions also known or referred to as: "**Transmission-Based Precautions**" are those precautions used for patients known (documented) or suspected to be infected or colonized with highly transmissible or epidemiologically important pathogens that can be transmitted by airborne or droplet transmission or by contact with dry skin or contaminated surfaces. For such situations additional precautions beyond standard precautions are required to interrupt transmission in hospitals.

**These additional precautions are specific to VHFs and include:**

- Isolation of the patient (s).
- Wearing of personal protective equipment in the isolation area, in the cleaning, laundry and laboratory areas. Wearing of a scrub suit, gown, apron, two pairs of gloves, a mask, head cover, and eyewear and rubber boots.
- Cleaning and disinfecting spills, waste and re-usable equipment safely.
- Cleaning and disinfecting soiled linen and laundry safely.
- Using safe disposal methods for non-re-usable supplies and infectious waste.
- Providing information about the risk of VHF transmission to health facility staff. Reinforcing VHF Isolation Precautions with all health facility staff.
- Providing information to families and the community about prevention of VHFs and care of patients.

**4.2.3 Other specific measures to implement VHF Isolation Precautions should include:**

- **The appointment of a VHF coordinator to:**
  - Ensure general readiness of the isolation unit and oversee the immediate preparation in case of emergency.
  - Serves as a focal point and coordinate activities when a case is suspected.
  - Alert health care facility staff about the specific risks for VHF transmission; coordinate the referral in the shortest possible time frame.

Ensure that all relevant precautions are in place to prevent transmission during transfer.

- Assign responsibilities to medical, laboratory, housekeeping and laundry staff and ensure the necessary precautions, treatment protocols and disinfection procedures are in place and understood by all involved.
- Ensure that all assigned staff members are briefed/ trained (crash course information) on the precautions and protocols in the emergency situation.
- Identify patient's contact and travel history, identify contacts and provide information on disease and procedures for when and where to seek care.
- Report the suspected case to health authorities by following the national level guidelines in reporting.
- Provides regular in-service training to strengthen skills for using VHF Isolation Precautions.
- Act as a contact and reference between the health providers, families and the community.

- **Restricted access to the unit and patient (s).**
- **Select well trained staff, quarantined in the area for the duration of hospitalization of patient (s). The number of staff should be decided upon by the nature of the case and the number of cases involved in care.**

- Staff working in the isolation unit, should be submitted to blood tests when assuming duty and once more when they complete duty in the unit. (Specifically a full blood count, platelets and antibodies).
- Regular formal and informal meetings amongst staff members should occur to identify problems, seek solutions and build a team spirit.
- Staff should be observed for fatigue, stress, suppressed fear and given the necessary support.

## Chapter 5

### 5. Isolation of the patient

Isolation is intended to restrict patient access to only staff assigned to care for the patient and establish a barrier between the VHF patient and uninfected patients, other health care providers and visitors.

**In the case of Namibia, the Windhoek Central Hospital (WCH) has a designated Isolation Unit for VHF cases. Chapter 3, section 3.6 provides detailed procedures to follow in evacuation/referral of a suspected case from any other health facility to WCH.**

#### 5.1 Steps to follow in facilities where there is no assigned isolation area

The following steps can be implemented at facilities in the periphery while awaiting diagnosis/ decision making from the Chief Physician and the Isolation Unit in Windhoek. It can also be reviewed at regular intervals as part of in-service training.

##### 5.1.1 Select the area for isolation

Set aside a single room with an adjoining toilet.

If no single room, a separate building or ward can be used. Or an area in a ward that is separate from the rest of patients such as an isolation room, private room or semiprivate room.

##### 5.1.2 Plan to arrange isolation

If no toilet next to patient room, select and isolate the toilet to use for patient only. Ensure there is adequate ventilation to prevent airborne and droplet transmission and to vent room from chlorine disinfectants in use. Avoid rooms with air conditioning. Screen windows to avoid and prevent transmission of mosquitoes and other insect-borne diseases. Restrict access with a rope around the room and clear signs of **"ISOLATION - ACCESS RESTRICTED"**

##### 5.1.3 Gather recommended supplies for disinfection procedures

Gather all supplies from the pharmacy or improvise by using local available materials. Ensure enough ordinary household bleach, soap and water to use as disinfectants. Regular hand washing to remove infectious material and disinfecting with bleach are very effective as the viruses are very sensitive to bleach solution. Where sterilization is not available, boiling of items for 20 minutes will effectively kill the viruses.

#### **5.1.4 Gather supplies for patient area**

(Part II Appendix 1 & 4 provides more details on the supplies)

Obtain the required items for use in the patient room:

- Bed and mattress and bedding.
- Plastic sheeting to cover mattress to protect the mattress from contamination and can easily be cleaned.
- Equipment to use in measuring temperature and blood pressure and examine the patient. This is assigned to room for duration of isolation.
- A covered container to keep bleach or alcohol solution to disinfect thermometer and stethoscope after use.
- A puncture-resistant container to collect needles and syringes and other sharp objects.
- Bedside table to place medical instruments and equipment on.
- Large wall clock to measure respiration and pulse rate.
- Bedpan and urinal.
- Disinfection station with buckets, sprayer, bleach solution, soap, water and disposable towels and gloves.
- Container with soapy water to collect discarded outer gloves.
- Boot sprayer for disinfecting boots before leaving patient room.
- Extra supply of gloves and gowns.

#### **5.1.5 Gather supplies for the changing room**

- Hangers to hang reusable personal protective equipment.
- Plastic tape to tape the cuffs of gowns and trousers.
- Disinfection station with bleach solution for disinfecting gloved hands.
- Hand washing station with bucket, soap, soap dish, clean water and a supply of disposable towels.
- Container with soapy water to collect discarded gloves and instruments for sterilization.
- Containers to collect reusable personal protective equipment for the laundry and infectious waste for incineration.

#### **5.1.6 Arrange for storage of supplies outside changing room**

- A shelf or box to store personal protective equipment.
- Adequate supply of clean personal protective equipment.

- Container to collect non-infectious waste.
- Covered shelf to store disinfected boots to keep them dry.

### **5.1.7 Set up changing rooms**

- One room is needed outside the patient room, where staff will put on personal protective equipment before entering the room; and change and remove personal protective equipment when leaving the area.
- Contaminated clothing remains in change room until collected by trained housekeeping staff for laundry and incineration.
- Other health facility staff who may deal with blood samples and contaminated linen must also wear personal protective equipment when in contact with patient or when handling contaminated items.
- The flow of people within this changing area should always be from least to the most contaminated area.

### **5.1.8 Place security barrier around isolation area**

- Clearly mark the area as **"ISOLATION – ACCESS RESTRICTED "**
- Prepare a list of medical, nursing, laboratory staff, housekeeping staff and family members who have access to the patient. These people should only be allowed access if required and all individuals should be trained in VHF Isolation Precautions.
- In cases of more patients, a guard should be stationed at the entrance of the unit limit access to maintain strict isolation and protect the community.

### **5.1.9 Consult family members about patient care**

- Consult with family members and explain the reasons for isolation and restriction. Family members should also be informed about the signs and symptoms of the disease to seek care as soon as possible.
- In the event that family members may want to be involved as part of their custom to care for the sick, they should select a care giver, who has been a close contact, the caregiver should receive full training on VHF Isolation Precautions.
- The training should include all the practical aspects of hand washing, wearing of and handling of personal protective equipment.
- Family members should preferably be given a separate area for the purpose of changing personal protective equipment and disinfection procedures. The changing room should contain:

- A shelf or table to store supply of clean gloves and hooks to hang personal protective equipment.
- A bucket with soapy water for collecting discarded gloves after leaving the isolation area.
- A hand washing station with adequate disposable paper towels.
- A location to stay while assisting with care of the patient.

## Chapter 6

### 6. Personal Protective Equipment

Personal protective equipment replaces the familiar term “protective clothing” and refers to all the items used and worn to protect the HCWs and other persons involved in the care of an infectious patient. Personal protective equipment includes items such as scrub suits, gowns, aprons, gloves, masks, head covers, eyewear and rubber boots.

#### 6.1 Who should wear personal protective equipment?

- All doctors, nurses and health care workers who provide direct care to a suspected case of VHF.
- All support staff who clean the isolation room, handle contaminated supplies and equipment, launder reusable linen and collect and dispose of infectious waste.
- All laboratory staff who handle specimens and body fluids and laboratory equipment in the testing and diagnosing of a suspected VHF case.
- Mortuary staff, burial teams and family members who remove and handle bodies of deceased VHF patients.
- Family members who care for the VHF patient.

#### 6.2 What personal protective equipment should be worn?

- A **scrub suit** or **inner layer of clothing** (such as an old shirt and trouser from home). Avoid wearing a skirt to prevent contact between clothing and infectious spills.
- A pair of **thin gloves**, reaching well above the wrist, preferably 10 – 15 cm long to promote and permit fine motor function when examining and caring for patients. They do need to be sterile and can be vinyl or latex.
- **Rubber boots**, worn over street shoes when floor is soiled). Common rubber boots are recommended and it should at least be 30 cm long and have textured soles. Staff should be assigned their own boots and be responsible for their cleaning and storing during the time of isolation. If boots are not available, overshoes or two layers of plastic bags can be worn.
- A **gown** or **outer layer of clothing** (surgical or disposable gown with long sleeves and cuffs). The gown should open at the back and close with ties at the neck and back. It should be knee length with collar wraps around the neck and elastic bands to close the gown around the wrists. This is worn over the first layer of clothing and if disposable can be used by the same staff member more than once if not visibly dirty, torn or contaminated. If disposable gowns are short supply, cotton gowns can be worn and be washed for re-used.

- A **plastic apron** worn over both layers of clothing. The apron prevents contact with infectious body fluids that may soak through the clothing when patient vomits or bleeds.
- A **second pair of thin or thick gloves**. They can be of thick rubber or neoprene and should reach well above 30 cm up the arm. Wearing a second pair of gloves provides added measure of safety during patient care and when handling contaminated supplies during cleaning of spills, laundering of reusable protective clothing. If gloves are in short supply or not available, either wear kitchen gloves or use plastic bags to cover hands or wear one pair of gloves and disinfect them after each contact with the patient, infectious body fluids or contaminated material.
- A **HEPA –filter** (high –efficiency particulate air respirator) or other **biosafety mask or surgical mask** if HEPA-filter or biosafety mask is not available. The HEPA –filter mask protects HCWs from airborne transmission of microorganisms. Surgical masks or other biosafety masks do not filter out small particles but will protect HCWs from droplet transmission and blood splashing. Cotton masks can be used if surgical masks are not available. Masks can be reused by the same HCW provided it still fits properly and is not contaminated or visibly dirty.
- **Head covering** protects the HCW's hair and head against splashes of vomit, blood or other body fluids. The cover should include ties to prevent the cap from falling off when care is being provided. Disposable head covers can be use and if not available cotton caps can be made from locally available materials. If cotton caps are not available, a scarf, bandanna or cloth can be used to wrap around the head.
- **Clear eye goggles** (non-fogging) are worn to protect the HCW's eyes from splashes of blood or other infectious body fluid. If available, HCWs should wear non fogging goggles, but if not available, clear eye glasses can be used with ties on the ear holders to prevent it from falling off while providing care.

### **6.3 How should personal protective equipment be worn?**

#### **Putting on personal protective equipment**

##### **6.3.1 BEFORE ENTERING the changing room:**

- Remove all jewelry, wallets, watches and other valuables. Store them safely.
- Remove street clothes and hang it on a hook, put on a scrub suit or old clothes from home.

##### **6.3.2 ENTER the CHANGING ROOM**

### **6.3.3 Put on rubber boots**

Put on rubber boots on each foot and tuck the trouser leg inside or if overshoes are used, tape the top of the boot to the leg with plastic tape to prevent spills from running into the boot.

### **6.3.4 Put on the first pair of gloves.**

**Examine your hands for cuts or broken skin** and if present, refrain from direct patient contact. Put on one glove at a time; place the edge of each glove under the cuff of the scrub suit. If only one pair of gloves is worn, place edges of glove under cuff of gown. If plastic bags are used, put one layer on and attach the first layer with tape or elastic band.

### **6.3.5 Put on the outer gown.**

Pick the gown from the inside, especially if it will be reused. Place arms through armholes, tie gown at back or let another HCW to tie the gown.

### **6.3.6 Put on the plastic or rubber apron.**

### **6.3.7 Put on the second pair of gloves.**

Put the edges of the second pair of gloves over the cuff of the gown. If plastic bags are worn, secure the second layer over the first and close ends with plastic tape or elastic bands. Housekeeping staff and staff handling waste disposal should wear thick gloves as second pairs.

### **6.3.8 Put on the mask.**

Tie the mask at the back of the neck and towards the top of the head to secure it properly.

### **6.3.9 Put on the head cover.**

### **6.3.10 Put on the protective eye wear.**

Attach the eye wear at the back of the head to prevent it from falling while attending to the patient.

**Remember** to ensure that the mask, the head cover and eye wear fit properly and are well secured to avoid touching it during attending to the patient. In the event of touching the above-mentioned personal protective equipment with contaminated hands, discard it and put on clean supplies.

Ensure at all times that all required supplies and equipment is in the patient's room.

**Never re-enter** the general health facility to assemble required supplies and equipment. In cases of an emergency, ask a guard or assistant to obtain the needed items.

## 6.4 How should personal protective equipment be removed?

### Taking off personal protective equipment

#### **BEFORE LEAVING the Patient's room:**

1. **Disinfect the outer pair of gloves** by washing it in soap and water and dip the gloved hands in 1:100 bleach solution for 1 minute.
2. **Disinfect the apron** by spraying or wiping it with 1:100 bleach solution.
3. Disinfect **the boots** by spraying them with 1:100 bleach solution or hold it over a pan or basin and ask another HCW to pour 1:100 bleach solution over the boots. Alternatively step into a pan containing 1:100 bleach solution and wipe boots on a bleach-drenched cloth.
4. **Remove the outer pair of gloves.** If two pairs of gloves are worn, pull the edge of the gloved hand so that the glove turns inside out as it is pulled back. Discard it in the container for disposal of contaminated waste.

If only one pair of gloves is worn, **DO NOT REMOVE IT NOW!** Rinse the gloved hands in 1:100 bleach solution for 1 minute before leaving the patient's room.

**After disinfecting the boots and removing the outer gloves, proceed to the changing room.**

1. **Remove the apron and outer gown.** Put the apron in the laundry container or hang it for reuse. Remove the outer gown and hung it inside out for reuse. If the gown needs laundering, place it in the laundry container.
2. **Disinfect the gloved hands.** Rinse the gloved hand in 1:100 bleach solution, then wash it in soap and water. Dry the gloved hands with disposable paper towels. If no bleach is available, wash gloved hands with soap and water.
3. **Remove the eye wear, head cover and mask.** If eyewear is soiled, wash in soapy water, wipe them clean and store it safely. Remove head cover, if soiled, discard in laundry container and if not soiled, store safely. Remove mask and if

not soiled, store it on hook. If soiled, discard in container for contaminated waste.

- 4. Remove the boots.** Place a bleach-soaked towel on the floor to stand on when removing the boots. Avoid touching the boots with bare or gloved hands and store safely in a covered shelf.
- 5. Remove the inner pair of gloves.** Remove the first glove with the other gloved hand. Pull edge of first glove back over to turn it inside out. Place the inside out glove on the palm of the gloved hand. Reach inside the glove to a clean area. Pull the glove over the hand so that the only inside of the glove is exposed. Discard the gloves in a container for disposal of contaminated waste. Wash ungloved hands with soap and water.
- 6. Remove inner layer of clothes.** If clothes are not soiled, store it for reuse. If soiled, place in container for laundry. If shower facilities are available, take a shower and dress in street clothes. If skin had contact with soiled material, follow guidelines for accidental exposure. ( section 12 provide details)
- 7. Wash hands with soap and water before leaving the changing room.**

**Important note:**

**When gloves are limited in supply, use one pair and modify the order of removing clothing as follows:**

- 1. Rinse gloved hands in 1:100 bleach solution upon leaving the patient's room.**
- 2. Remove apron and outer gown.**
- 3. Remove the gloves.**
- 4. Wash ungloved hands in soap and water.**
- 5. Remove the inner gown or scrub suit, mask, head cover and eye wear.**
- 6. Wash hands again with soap and water.**

## Chapter 7

### 7. Disinfection of Reusable Supplies and Equipment

**Disinfection kills almost all bacteria, fungi, viruses and protozoa and it reduces the numbers of microorganisms to make use of equipment safer.**

#### 7.1 What should be disinfected?

##### **After contact with a VHF patient or infectious body fluid:**

- Hands and skin.
- Gloved hands when gloves cannot be changed.
- Thermometers, stethoscopes and other medical instruments.
- Spills on walls or floors.
- Contaminated containers (e.g. bedpans).
- Reusable supplies such as personal protective equipment and patient bedding.

**Note: All staff, including cleaners, waste disposal and laundry staff who handles, clean and disinfect VHF contaminated supplies and equipment should wear personal protective equipment. Additionally important is that the second pair of gloves should be of thick quality to provide added protection while performing these tasks.**

#### 7.2 Specific procedures to follow for disinfection of supplies and equipment

##### 7.2.1 Disinfecting Gloved hands between patient contacts

Gloves (the outer pair) should be changed between each patient in cases where more than one patient is cared for. If gloves are not enough, gloves should be disinfected between patients following the next procedure:

1. Place a bucket of 1:100 bleach solution in the isolation room.
2. If gloved hands are visibly soiled, wash them first in soap and water.
3. Dip the gloved hands into the 1:100 bleach solution for 1 minute.
4. Dry gloved hands with a disposable paper towel or let it air-dry.
5. If bleach solution is not available, wash gloved hands with soap and water.
6. Discard gloves in the container for disposable infectious waste.

**Note: Gloves will become sticky after several rinses in bleach solution, if so, it needs to be changed.**

## **7.2.2 Disinfecting Reusable Medical Instruments**

### **7.2.2.1 To disinfect thermometers and stethoscopes with alcohol**

1. Use rubbing alcohol (70% isopropyl).
2. Place the alcohol in a covered container and keep in patient's room and change the alcohol at least once a week.
3. Use a clean cloth or paper towel and dip it in the alcohol solution. Carefully wipe the thermometer with solution and hold cloth around it for 30 seconds. Discard cloth in laundry container and let thermometer air-dry.
4. Use another cloth and dip into solution and carefully wipe the metal part of the stethoscope, hold it against the surface for 30 seconds and let it air-dry.
5. Discard the cloth in the laundry container and the towel into the bucket for paper waste.

### **7.2.2.2 To disinfect thermometers and stethoscopes with bleach solution**

1. Place a covered container with 1:100 bleach solution in the isolation room and change it daily.
2. Use a clean cloth and dip it into the solution and wipe the thermometer with the soaked cloth OR soak the thermometer for 10 minutes in the bleach solution, let it air-dry. Discard the cloth in the laundry container.
3. Use a clean cloth and dip it into the solution, wipe the metal part of the stethoscope with 1:100 bleach solution and let it air-dry.
4. Discard the cloth in the laundry container and the towel into the bucket for paper waste.

**Note: Never re-dip a soaked cloth again, rather pour the solution on the cloth.**

## **7.2.3 Disinfecting bedpans**

1. Cover the contents of the pan with 1:10 bleach solution and empty the contents directly into the isolated toilet or latrine.
2. Clean the bedpan with soap and water to remove solid waste. Pour into toilet or latrine. Rinse the bedpan in 1:100 bleach solution and return it to the patient's room.
3. The toilet or latrine used in isolation for disposal of solid waste should be decontaminated every 12 hours with 1:10 bleach solution and flushed down.

**Note: If the task is performed by anyone other than a health care worker, make sure the person wears personal protective equipment.**

#### **7.2.4 Disinfecting patient's utensils**

**The use of disposable utensils is highly recommended and should be disposed off in the container for infectious waste for incineration.**

If disposable utensils cannot be used:

1. Wash utensils with soap and water.
2. Rinse utensils with 1:100 bleach solution and let it air-dry.

**Note: If the task is performed by anyone other than a health care worker, make sure the person wears personal protective equipment.**

#### **7.2.5 Disinfecting spills of infectious body fluids**

**Place a bucket containing 1:100 bleach solution in the isolation area and change it daily.**

1. Use a cup or dipper to pour solution on spills, cover the spill completely with 1:100 bleach solution and if spill is heavy or dense cover it with 1:10 bleach solution.
2. Let the spill soak for at least 15 minutes.
3. Remove the disinfected blood or spilled material with a cloth soaked with 1:100 bleach solution.
4. Discard all waste in container for infectious waste for incineration.
5. Wash area as usual with soap and water.

#### **7.2.6 Cleaning walls or other surfaces**

**Generally surfaces may not become dirty during the period of provision of care, but any visibly soiled surfaces other than the floor should be cleaned, using the following procedure:**

1. Use a sprayer or mop to wash walls with 1:100 bleach solution. Rinse the mop in fresh 1:100 bleach solution. If a sprayer is used, apply it close to the surface to avoid splashing and aerosols.
2. Wash the walls as usual with soap and water to clean visible soil.
3. Discard any waste into the container for infectious waste for incineration.

#### **7.2.7 Cleaning and disinfecting personal protective equipment**

1. A special area should be set aside for laundry and cleaning of contaminated laundry and staff working with these items should wear personal protective equipment and thick gloves as the second pair.
2. Transfer laundry to special area as soon as possible.

3. Carefully move laundry to a container with 1:100 bleach solution.
4. Soak laundry in 1:100 bleach solution for 30 minutes.
5. Remove items from bleach solution and place in soapy water.
6. Soak laundry overnight in soapy water.
7. Rinse thoroughly to remove all visible stains, rinse and lie-dry.
8. Repair torn linen and discard items that are worn out.
9. Iron if necessary.

**Note: Disinfected and clean linen pose no threat and therefore no need exist to wear personal protective equipment when ironing.**

### **7.2.8 Cleaning and disinfecting boots**

1. Place a sprayer or pan with 1:100 bleach solution at the exit of patient's room. (Section 6.4.3 provides details on how to disinfect boots).

### **7.2.9 Clean and disinfect patient's bedding**

#### **7.2.9.1 Plastic Sheeting**

1. If soiled, remove liquid or solid waste with a paper towel soaked in 1:100 bleach solution.
2. Discard paper towels in container for infectious waste for incineration. Wash sheeting with 1:100 bleach solution.

#### **7.2.9.2 Patient's Sheets**

1. Remove sheets from bed; put it in a container in patient's room.
2. Take the container directly to the laundry area.
3. Soak linen in 1:100 bleach solution for 30 minutes and be sure that all items are soaked.
4. Remove items from bleach solution and place them in soapy water. Soak overnight.
5. Rinse thoroughly to remove stains. Rinse and line-dry.

**Note: If linen is heavily soiled, discard as biohazard material for incineration.**

#### **7.2.9.3 Mattresses**

**If mattresses must be reused:**

1. Pour 1:10 bleach solution directly on mattress, let it soak through to other side.
2. Flood the soiled area with soapy water and rinse and clean with clean water.
3. Let mattress dry in sun for several days, ensure to turn it often.

**Note: If heavily soiled, remove from isolation and incinerate it. Ensure staff wears personal protective equipment.**

## Chapter 8

### 8. Waste Disposal

#### 8.1 What should be disposed?

**In the event of treatment of a suspected case of VHF, all materials and supplies that are non-reusable should be disposed off in a safe manner. Safety includes that all staff members involved in the process should wear personal protective equipment during the process.**

#### **These materials and supplies include:**

- Infectious blood and other body fluids such as urine, faeces and vomit.
- Disposable needles and syringes and disposable or non-reusable protective clothing.
- Treatment materials and dressings.
- Non-reusable gloves.
- Laboratory supplies and biological samples.
- Used disinfectants.

#### **Recommended waste disposal methods include:**

Incineration is the recommended method in cases of VHF. It can either be in an incinerator or by burning in a pit.

Liquid waste that is already disinfected can be flushed down the toilet used in the isolation unit. (Chapter 7 section 7.3.4 provides details)

#### **Incineration is recommended to dispose of:**

- Needles and syringes
- Used treatment materials and dressings
- Non-reusable personal protective equipment and
- Laboratory supplies.

**Note: When an incinerator is not available in rural areas and in home situations; waste should be burned in a pit, using fuel to accelerate the burning process and ensuring that all waste is completely destroyed.**

#### **Burning in a pit is recommended to dispose of:**

- Disinfected body fluids such as urine, feces and vomit when no designated toilet or latrine is available.

- Used disinfectants, burn it together with flammable items such as disposable gowns or masks. These flammable items will ensure the fire remains hot enough to boil off the liquids.

## **8.2 Supervision for Waste Disposal**

### **8.2.1 Selection of a person with authority to:**

- Ensure that procedures are followed according to protocol.
- Train all staff members involved in waste disposal.
- Prepare a schedule for waste collection and burning of waste.
- Actively supervise each burning/incineration process to ensure it is carried out correctly and safely.

### **8.2.2 Training of waste disposal staff.**

**Select staff members who will be responsible for waste collection and disposal.**

**Train staff on:**

- The risks of VHF contamination, the importance of wearing personal protective equipment, including a plastic apron and thick gloves as the second pair.
- The procedures to follow and processes of collecting waste from the isolation unit and how and when to discard it into the incinerator or pit.
- Careful watch over the burning process, by moving waste around to ensure all is completely burned. To clean the incinerator from all ashes and bury it in a pit, OR to close a full pit and dig a new one.

**Show staff how to:**

- Wear personal protective equipment.
- Collect and carry container of infectious waste from the isolation area to the disposal area.
- Dispose of liquid waste in an isolated toilet and how to burn it if no toilet exists.
- Place the infectious waste in the incinerator or pit.
- Pour fuel (diesel) on waste to accelerate the fire to ensure all waste items are burned before leaving the area.

**(Part II Appendix 8** provides details on how to make an incinerator or dig a pit and steps to follow for incineration and burning of infectious waste)

## **Chapter 9**

### **9. Burial Safety**

**The transmission of VHF remains a risk, even after death as the body fluids of the deceased is contagious for up to several days after death. Family and community members are also at risk as burial practices involve the washing, cleaning and touching of the deceased body.**

#### **9.1. Safe preparation of the deceased body**

**Burial should take place as soon as possible and the family should be informed about the risks involved in a culturally acceptable manner.**

**The health facility staff should:**

- 1.** Wear protective clothing and use thick gloves for the second pair.
- 2.** Spray the body and the area around it with 1:10 bleach solution.
- 3.** Place the body in a "body bag" or mortuary sack and close it securely. Spray the body bag with 1:10 bleach solution.
- 4.** If no body bags are available, cover the body in two thickness cloth that is soaked in 1:10 bleach solution, and then wrap it in plastic sheeting. Seal the wrapping with plastic tape. Spray the body bag again and place the body in a coffin.
- 5.** Arrange transport to the burial site as soon as possible and ensure that a health officer accompany family to observe safety precautions.

#### **9.2. Safe transportation of the deceased body**

**VHF Isolation Precautions remains in force during the journey**

- 1.** Take the shortest route possible to limit accidental exposure to body fluids.
- 2.** Individuals involved in handling the body should be the minimum and all should wear personal protective equipment. The driver of the vehicle should not be involved in the process, other than driving.
- 3.** Take along a container with 1:10 bleach to use in case of accidental exposure or to clean up spills from the vehicle.

#### **9.3 Preparation of the burial site.**

**Explain to the family that viewing of the body is not possible and why the funeral should be limited to family members only. The grave should be at least 2 meters deep.**

#### **9.4 Disinfecting the vehicle after transporting the deceased body.**

- 1.** Individuals who disinfect the vehicle must wear personal protective equipment.
- 2.** Rinse the interior of the vehicle where the body was carried with 1:10 bleach solution.
- 3.** Let it soak for 10 minutes.
- 4.** Rinse well with water and let the vehicle air-dry. Make sure to rinse well as the bleach can cause corrosion to the vehicle.

## Chapter 10

### 10. Community Education

**In the event of an outbreak of VHF, the community needs mobilization and information about prevention and control of the disease. This should include key messages and communication channels that the community should know and follow during this period. Depending on the magnitude of the outbreak, it should also consider involvement of other relevant organizations.**

**The VHF Coordinator, in close cooperation with the VHF committee members and on behalf of the Ministry of Health and Social Services should:**

- Ensure that the community knows about VHF and how it is transmitted.
- Involve the family/ families and the community to identify the source of the outbreak to control it more effectively.
- Identify key organizations to liaise with in terms of support.
- Develop key educational messages on prevention and control to reduce fears and rumors in the community.
- Organize activities to communicate educational messages.
- Meet regularly with VHF committee to give feedback and determine additional strategies.

## **Chapter 11**

### **11. Advance Preparation for VHF Isolation Precautions**

**When a VHF case is suspected, the Isolation Unit should be ready because Isolation Precautions should start immediately. The Infection Control Unit in Windhoek should ensure that all health facilities are conversant with the protocol.**

#### **11.1 Assess readiness for VHF Isolation Precautions**

##### **Preparation for VHF Cases**

- Reinforce the use of standard precautions, especially hand washing, ensure reliable supply of soap and clean water.
- Ensure adequate supply of personal protective equipment is available.
- Set up the area for isolation to accommodate the case as well as other cases that may come later.
- Ensure that the area where cases are initially sorted out before admission contains all the required supplies.
- Identify a family liaison person to spend time with the family in the initial stage to answer questions and comfort them.
- Restrict access to the Isolation Unit.
- Prepare a checklist of hospital staff that will be working in the unit during the period of isolation.
- Provide the guard/security person with a sign-in sheet for recording who goes into the Isolation area, the time of entry and departure. (Appendix 5 provides an example of a sign-in sheet)
- Prepare a large quantity of disinfectant solutions, store in large containers, change it according to protocol.
- Ensure additional patient supplies (already targeted as per recommendation) can be obtained easily from the local stores in case supplies ran out. Ensure dedicated medical equipment is assigned for the Isolation unit, if more than one patient, be sure that disinfection occurs according to protocol.
- Ensure schedules are carried out according to protocol.
- Initiate community education activities.

#### **11.2 Assess readiness to identify suspected cases of VHF**

**The need for training health care workers should be assessed in terms of their knowledge of:**

- The case definition for VHF.
- The administrative procedures to follow in case of a suspected case.
- The level of standard precautions and Isolation Precautions to follow to prevent transmission during assessment of the suspected case and during the transportation of the case to the Isolation Unit in Windhoek.

### **11.3 Assess readiness of staff members (medical, laboratory, cleaning and laundry) for VHF.**

**These key staff members should be identified and informed about their roles and responsibilities with respect to the treatment of a suspected case of VHF.**

#### **Important aspects to review should include:**

- Knowledge on standard precautions and VHF Isolation Precautions and its importance for each individual and the patient (s).
- The critical importance of maintaining Isolation Precautions at all times to prevent and reduce the risk of transmission of disease at any given time.
- The necessity to assign only one laboratory staff member to attend to samples and the importance of wearing protective clothing at all times.
- The importance that liaison with the family, community and press will be handled by the VHF Coordinator and that all aspects related to the case be referred accordingly.
- Practical demonstrations of actual tasks to be performed in order to build staff member's confidence for readiness and address any possible misunderstandings and uncertainties before a case presents. (These can be done on a regular basis if feasible and should be done while waiting for the case to be transferred.)

## Chapter 12

### 12. Handling of Contacts

**Identification of contacts is important to prevent transmission of disease and promptly initiate appropriate treatment to reduce death from contracting VHF.**

#### 12.1 Contacts

Only close contacts with patient or body fluids are at risk of contracting the virus. Those individuals incubating the infection are not infectious before the onset of symptoms.

For surveillance purposes, those who are defined as close contacts are the persons who at the time of onset of the illness:

- Had direct contact with patient's blood and excretions (excluding saliva), contaminated bedding and clothing;
- Attended to the patient or handled specimens from the patient;
- Had direct contact with the body of a patient who died of VHF before the coffin was sealed; and
- Had contact with an animal infected with VHF, its blood, body fluids or corpse.

#### 12.2 Surveillance of Close contacts

- The VHF Coordinator should ensure that all close contacts are identified and that surveillance is undertaken.
- Contacts should be under daily surveillance for a period of 21 days from the last possible date of exposure to infection. Surveillance activities should include:
  - Twice daily measured temperature recording
  - Enquiry about the presence of symptoms
  - Any rise in temperature above 38 °C and persists for 24 hours, the person should be kept under close observation and isolation.( Isolation Precautions apply according to protocol)

**Note: People that were merely in the presence of the suspected case, (i.e. in passing or in the same area, but had no close contact) should be advised and given information on signs and symptoms to monitor themselves and seek medical services immediately.**

## **Chapter 13**

### **13. Management of Accidental Exposure**

#### **13.1 Accidental NEEDLE STICK INJURY**

**Accidental NEEDLE STICK INJURY should be considered in a very serious light, and be treated as an exposure to VHF even if no break in the skin can be observed.**

##### **Steps to follow:**

- 1.** Immerse the exposed site in 70% alcohol for 20 -30 seconds, and wash with soap and water.
- 2.** Flush the site with running water for 20 -30 seconds.
- 3.** If needed cover with a dressing.
- 4.** Report the incident to the supervisor or doctor in charge, who should:
  - Identify what caused the problem.
  - Take corrective action to solve the problem and prevent future accidental exposure and
  - Provide appropriate care for the case.

#### **13.2 Accidental Exposure/Contact**

**ACCIDENTAL EXPOSURE/ CONTACT with INFECTIOUS Body Fluids should be treated as a suspected contact with VHF.**

##### **Steps to follow:**

- 1.** Flush the area in the most appropriate way with soap and water. If splash occurred in the eye, flush it with clean water.
- 2.** Leave the isolation area and remove personal protective equipment as recommended.
- 3.** Take a shower and dress in street clothes.
- 4.** Report the exposure to the supervisor or the doctor in charge.

#### **13.3 Follow up of ACCIDENTAL EXPOSURES.**

- 1.** Monitor the condition of the staff member by taking a measured temperature twice a day.

- 2.** If a fever occurs, temperature is 38.5°C or higher, the staff member should not perform patient care duties.
- 3.** Treat as a suspected case of VHF if the staff member's signs and symptoms meet the case definition.

**PART II**  
**APPENDICES**

## **Appendix 1: Checklist: Supplies for a Changing Room**

### **Storage outside the Changing Room:**

1. Shelf or cabinet with lock.
2. Supply of clean scrub suits, gowns, aprons, gloves, masks, head covering, and eyewear.
3. Covered shelf for storing disinfected boots.
4. Bucket for collecting non-infectious waste.

### **Inside the Changing Room:**

1. Hooks, nails, or hangers for hanging reusable gowns and scrub suits.
2. Roll of plastic tape to fasten arm cuffs and trousers.
3. Hand washing supplies: bucket or pan, clean water, soap, and disposable paper towels.
4. Bucket or pan, 1:100 bleach solution for disinfecting gloved hands.
5. Container with soapy water for collecting used instruments.
6. Container with soapy water for collecting reusable gowns, masks, and linen for laundry.\*

**\*Place outside the changing room if the changing room is too small**

### **If large amounts of waste on floor:**

Sprayer, a bucket or a shallow pan with 1:100 bleach solution for disinfecting boots.

## **Appendix 2: Checklist: Supplies for Patient Area**

1. A bed with clean mattress or sleeping mat and at least a bottom sheet and blanket.
2. Plastic sheeting to cover the mattress or sleeping mat.
3. 1 thermometer, 1 stethoscope, and 1 blood pressure cuff for exclusive use by patient or for each patient area.
4. 1 puncture-resistant container for collecting non-reusable needles, syringes, and discarded sharp instruments.
5. 1 bedside table or shelf to use for placing instruments and equipment.
6. 1 large wall clock with a second hand to monitor pulse and respiration rate.
7. Pan with 1:100 bleach solution or alcohol and disposable paper towels for disinfecting the thermometer and stethoscope between use with patient.
8. Bucket or pan, 1:100 bleach solution, disposable paper towels for disinfecting gloved hands between patients.
9. Supplies for disinfecting bedpan and urinal (1:10 bleach solution).
10. Sprayers with 1:100 bleach solution, clear water, and mop for disinfecting spills on floor and walls.
11. Screens (or sheets hung from ropes or lines) placed between the beds of VHF patients if more than one.
12. Extra supply of gowns and gloves.
13. Container for collecting infectious waste for incineration.

### Appendix 3: Preparing Disinfectants and Bleach solution

Bleach solutions must be prepared daily as they lose their strength after 24 hours, if no odour of chlorine is present, discard the solution.

It is important to remember that 1:10 bleach solution is caustic, thus direct contact with the skin should be avoided and solutions should be prepared in well ventilated areas.

<b><u>Chlorine Product to use</u></b>	<b>1:10 solution for disinfecting:</b>	<b>1:100 solution for disinfecting:</b>
	<ul style="list-style-type: none"> <li>• Excreta</li> <li>• Cadavers</li> <li>• Spills</li> </ul>	<ul style="list-style-type: none"> <li>• Gloved hands</li> <li>• Bare hands and skin</li> <li>• Floors</li> <li>• Clothing</li> <li>• Equipment</li> <li>• Bedding</li> </ul>
<b>Household Bleach 5% active chlorine</b>	1 Liter bleach per 9 Liters of water	100ml per 10 Liters of water OR 1 Liter 1:10 bleach solution per 9 Liters of water
<b>Calcium hypochlorite powder or granules 70% (HTH)</b>	7 Grams or half a tablespoon per Liter of water	7 Grams or half a tablespoon per 10 Liters of water
<b>Household Bleach 30 % active chlorine</b>	16 Grams or 1 tablespoon per 1 Liter water	16 Grams or 1 tablespoon per 10 Liters of water

#### How to prepare Bleach solutions

##### Gather the required supplies:

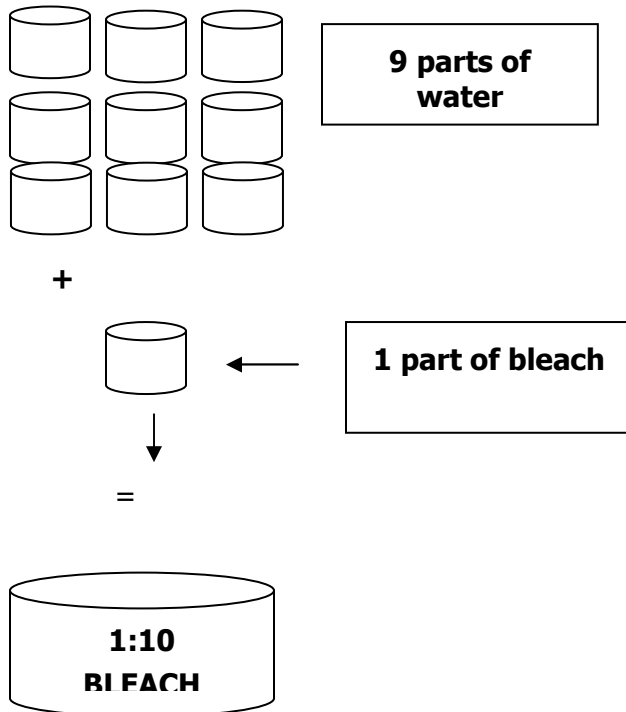
- 1 container that holds 10 liters to make 1:10 bleach solution
- 1 large or several small containers for each disinfection station that can hold 1:100 bleach solution.
- Chlorine bleach (1 liter)
- Clean water
- A measuring cup or other container such as a bottle that can hold 1 liter

##### Prepare the solution

Determine the markings on the containers and mark it clearly with a permanent marker.

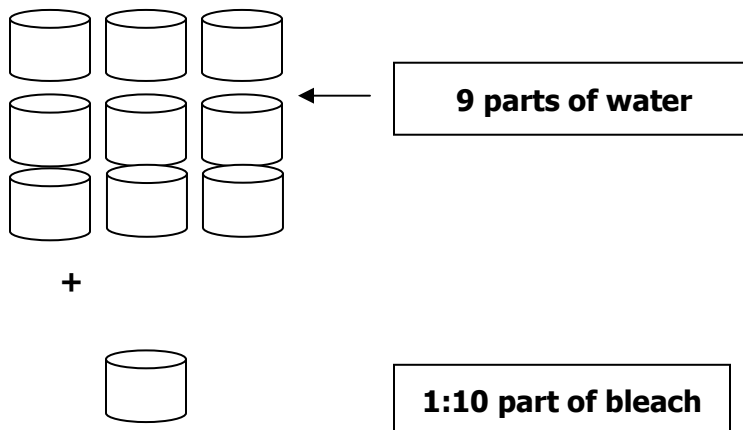
- **To prepare 1:10 bleach solution**

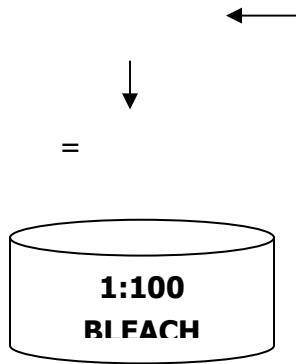
- Fill the marked container with water up to the mark for 9 parts.
- Now pour the ordinary household bleach into the container to the top of the container which represents the 1 part according to the markings.



- **To prepare 1:100 bleach solution**

- Measure and pour 9 parts of water into the large container.
- Now measure and pour 1 part of 1:10 bleach solution into the water to make 1:100 bleach solution.





**Note:**

- Clearly mark the different bleach solutions with a permanent marker or use different colour bottles or containers.
- Distribute a container to each station.
- Fill the container at each station with 1:100 bleach solution.
- Place the remaining 1:10 bleach solution in the isolation area to clean up spills and excreta.
- In outbreak situations, prepare larger quantities daily and discard after 24 hours or when no odour is present.
- Prepare a schedule for housekeeping staff to replenish bleach solution regularly.

#### **Appendix 4: Preparing supply of soapy water**

- Gather the necessary supplies
    - Large bucket
    - Supply of clean water
    - Ordinary cake soap or powder laundry detergent
    - Container to measure 1 liter
  - Cut small pieces of cake soap
  - Mix one piece of standard cake soap with 4 liters of water
  - Make sure the soap is well mixed with the water
  - Pour into a bucket or pan to use for cleaning
- OR**
- Mix laundry detergent as per the instructions on the packet

## **Appendix 5: Disinfecting water for drinking, cooking and cleaning.**

In emergency situations (such as power cuts or broken pipes) where clean water may not be available, household bleach can be used to disinfect water. Adding a small amount of full strength household bleach to water will disinfect it enough to make it safe for drinking, cooking and cleaning. Get several empty containers for storing the disinfected water. The containers should have a narrow mouth to prevent hands to contact water, a screw top and spigot if possible.

- Clean and disinfect the containers with soap and water and rinse it with 1:100 bleach solution
- Collect water from available sources such as a river, stream or well
- Place the water into the disinfected containers and add 3 drops of full strength household bleach per liter of water
- Mix the water and bleach drops
- Let the water stand for 30 minutes, the water will now be safe to drink
- Label the containers clearly: **"DRINKING WATER"**
- Provide clean water for hand washing
- Assign the duty to a designated person to collect water and disinfected it according to a schedule

### **To disinfect large quantities of water:**

- Determine the liters the container can hold. (Example 25 liters)
- Calculate the amount of bleach to disinfect the quantity of water. (3 drops of bleach per liter of clear water) –  $3 \text{ drops} \times 25 \text{ liters} = 75 \text{ drops}$
- Find a spoon, cup or bleach bottle cap to measure the required amount of bleach. Count the drops that the measuring spoon, cup or bottle cap will hold
- Use the measuring spoon, cup to measure the amount of bleach needed to disinfect large quantities of water

**Appendix 6: VHF Isolation Precautions Supplies: Standard Precautions**

**These are recommended Standard Precautions in all health facilities, regardless of the patient's infection status.**

*Table adopted and adapted from: WHO (1998) Infection Control for Haemorrhagic Fevers in the African Health Care Setting*

<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b><u>Tick if ready for use</u></b>
Source of clean water	Prepared as needed/ ensure no water supply problems exists				
Container for daily supply of water <b>(if running water is not available)</b>	1 or 2 large containers				
Bucket or pan for use with hand washing <b>(if no wash basins exist)</b>	1 for each location in the facility where hand washing is required				
Pieces of soap	Several bars of cut soap				
Soap dishes	1 for each hand washing station				
Paper towels	1 roll per health worker per week				
Sharps containers	1 for each location where sharp instruments are used				
Pans with full strength bleach	1 for each cleaning area				
<b><u>VHF Isolation Precautions: Patient Isolation</u></b>					
<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b><u>Tick if ready for use</u></b>

Bed	1 per patient				
Mattress or sleeping mat	1 per patient				
Plastic sheet covers	1 per bed				
Bedding: bottom sheet and blanket	1 per patient				
Thermometer	1 per patient isolation area				
Stethoscope	1 per patient isolation area				
Blood pressure cuff	1 per patient isolation area				
Covered container with alcohol or bleach solution to disinfect thermometer and stethoscope after each use with patient	1 per patient isolation area				
Bedside table or shelf	1 per patient isolation room				
Large wall clock with a second hand	1 per patient isolation room				
One-use towels	1 per patient per week of stay				
Bed pan	1 per patient				
Screens(or sheets hung from the ceiling) to place between patient's beds if required	Long enough to provide adequate privacy				
Signs: <b>ISOLATION: ACCESS RESTRICTED</b>	10				
Poster describing Isolation	1				

Procedures					
<b><u>VHF Isolation Precautions: Personal Protective Equipment</u></b>					
<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b><u>Tick if ready for use</u></b>
Covered shelf for storing disinfected boots	1 outside the changing room				
Hooks, nails or hangers for hangers, gowns and scrub suits	1 for each staff member				
Boot remover	1 per changing room				
Rolls of plastic tape	1 per changing room				
Extra supply of clean ppe(for the changing room)	1 -3 sets (depending on staff numbers)				
Extra supply of clean ppe(for the isolation area)	1 -3 sets (depending on staff numbers)				
<b><u>VHF Isolation Precautions: Disinfection</u></b>					
<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b><u>Tick if ready for use</u></b>
<b>Supplies for preparing disinfectants</b>					
Plastic container with lid or cover for preparing 1:10 bleach solution	1				

Containers for preparing 1:100 bleach solution	1 large container or several small ones				
Measuring tape	1 with measurement marked on it				
Bleach	1 liter bleach yields 100 liters of 1:100 bleach solution				
<b>Supplies for disinfection station ( changing room and patient room)</b>					
Container with 1:10 bleach solution	1 per each disinfection station				
Container with 1:100 bleach solution	1 per each disinfection station				
Bag for collecting contaminated, reusable ppe	1 per changing room				
Bucket or bag for collecting patient's contaminated laundry	1 per isolation area				
Sprayer, or container with 1:100 bleach solution for disinfecting boots	1 per disinfection station in patient room				
Sprayer with 1:100 bleach solution, clean water for disinfecting spills on floor or wall	1 per disinfection station				
Mop	1 per disinfection station				

<b>Supplies for Laundry</b>					
Container with 1:10 bleach solution					
Container with 1:100 bleach solution	2-3 (10 -30 liters of bleach solution is needed daily)				
Container with soapy water	2-3 (10 -30 liters of soapy water is needed daily)				
Source of clean water for rinsing laundry	10 -30 liters per day				
Talcum powder to put in washed gloves	1 tin				
Line to air- dry clothes (only if applicable)					
<b><u>VHF Isolation Precautions: Waste Disposal</u></b>					
<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b>Recommended Item</b>
Containers with 1:100 bleach solution for collecting infectious waste	1 per isolation area				
Pit or incinerator for burning of waste (only applicable in remote areas)	1 per facility, 2 meters deep				
Kerosene or petrol (only applicable in remote areas)	1 liter per week				

Wood for burning (only applicable in remote areas)					
Rope to place around waste disposal site (only applicable in remote areas)	Long enough				

**VHF Isolation Precautions: Safe Burial Practices**

<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b>Recommended Item</b>
Supply of 1:10 bleach solution	Prepared as needed				
Sprayer	1				
Body bags (cotton cloth, plastic sheeting, plastic tape)	As needed				

**VHF Isolation Precautions: Other Infection Control Supplies**

<b>Recommended Item</b>	<b>Recommended amount</b>	<b>Amount available</b>	<b>Amount to obtain</b>	<b>Local Adaptation</b>	<b>Recommended Item</b>
Supply check list	As needed				
Patient record forms	As needed				
Accidental exposure record forms	As needed				
Training material for staff training in VHF Isolation	As needed				

Precautions.					
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**Appendix 7: An example of a sign-in sheet**

<b>Date</b>	<b>Name</b>	<b>Service</b>	<b>Time In</b>	<b>Time Out</b>
14/05/07	Dr Doctor	Intensive Care	10h30	11h30
14/05/07	Nurse Friday	Nursing Care	12h00	13h30

## **Appendix 8: Incineration of VHF-Contaminated Waste**

VHF contaminated waste should be incinerated at all times, but in the absence of an incinerator at remote facilities, HCWs can make their own incinerator or use a pit to burn waste. Diesel fuel should be used during incineration to make sure all the waste is completely destroyed.

If no incinerator is available, one can be made by using an empty 220-litre oil or fuel drum.

### **Supplies required for making an incinerator:**

- 220-litre (55-gallon) drum
- Chisel or other sharp instrument (an awl, for example) to cut metal
- Hammer
- 0.5 mm or 1.0 mm metal wire
- The piece cut out from the top of the drum or a wire screen or grill about 1 cm thick
- Metal rods or bars 4 cm or 5 cm x 2 cm

### **How to make an incinerator?**

- Cut open the drum. Remove and save the top cutaway piece.
- Hammer the edges of the drum so they are not sharp.
- Cut 3 half-moon openings just below the open end of the drum.
- Turn the drum upside down. The bottom of the drum is now the top.
- Cut 4 holes on the sides of the drum. These holes are for threading the two metal rods through the drum so they will form an "X" inside the drum. These will support the platform that will be used for holding the infectious waste material for burning.
- Use the top piece that was cut away in step 1 and put holes in it to allow for air to flow through during the burning process.
- Pierce a series of holes on the side of the drum and above the crossed rods to improve the draw of the fire.
- Cut away half of the bottom of the drum (which is now the top of the incinerator and is facing up). Attach the wire loops to the cutaway half to make a trap door. Attach another loop for a handle to open the trap door.
- Place the platform that was made in step 7 inside the drum on top of the rods.

### **How to burn waste in the incinerator?**

- Wearing and using personal protective equipment, place the waste inside the top of the drum. Soak it with one liter of fuel.
- Light the fire carefully.
- Watch the fire and frequently mix the waste with the metal bars to ensure all waste is burned.

- Empty the ashes into a pit when all material has burned out completely.

### **Burning of VHF-Contaminated Waste in a pit.**

If an incinerator is not available, a pit should be made to burn infectious waste.

#### **How to dig a pit?**

- Identify a safe area to dig a pit, far away from the normal traffic flow of the health facility.
- Dig a pit that is 2 meters deep. It should be wide enough to hold all contaminated waste material, including discarded liquids.

#### **How to burn waste in the pit?**

- Wearing and using personal protective equipment, place the disinfected waste in the pit, including disinfected liquid waste that was not discarded in an isolated latrine or toilet.
- Soak the waste with one liter of fuel.
- Carefully start the fire.
- Watch the burning to make sure all the waste is completely destroyed.
- When the fire has gone out, if any waste remains, repeat the steps for burning.
- When no waste remains and the fire goes out, cover the ashes with soil.
- Before the pit becomes completely full, cover it with soil so that no pieces of waste are visible or are too close to the surface. The pit should be closed when it can be covered by one-half meter of soil.
- Dig a new pit.

### **Safety and security precautions during incineration and burning of infectious waste**

- Apply caution when lighting the fire.
- Maintain the security of the burning site to limit access to contaminated items. This is important since children could be tempted to pick up the interesting waste materials and use those for toys. Dogs, cats, and other animals may carry items beyond the health facility boundaries.
- Tie a rope around the disposal area. Hang warning signs from the rope that tell people this is a dangerous area.
- Never leave unburned waste in the incinerator or the pit.
- Never leave the disposal area while the fire is still burning.
- Always ensure that there is no unauthorized access to the disposal area.

## **Appendix 9: Community Information**

The Community needs information on VHF to empower them with knowledge and ease the fears and uncertainty that may exist due to an outbreak.

Information leaflets can include:

- The signs and symptoms of VHF,
- How the disease is spread?,
- Personal precautions to prevent contact with infectious body fluids,
- Importance of hand washing, careful laundry of clothes, bedding and other household items,
- Isolation of the infected person,
- The importance of limited contact with the infected person,
- The need to follow up with health services if in contact,
- How to care for person at home before diagnosis?,
- What is expected of family when patient is in hospital?

# **PART III**

## **MULTI-DRUG RESISTANT TUBERCULOSIS**

## Multi-Drug Resistant Tuberculosis

### 1. Introduction

Tuberculosis is a leading cause of mortality and morbidity worldwide. There are approximately 8 million TB cases and 2 million deaths annually. Namibia is one of the African countries with a high prevalence of Pulmonary Tuberculosis, ranking fourth in the world and with HIV co-infection rates of up to 65%.

The targets of World Health Organization (WHO) for TB control are 70% case detection and 85% cure rates. The strategies embraces the 5 fundamentals of TB control, including Directly Observed Treatment, Short Course Chemotherapy (DOTS) which is the single most effective strategy in the fight against Tuberculosis in its approach to detect cases early and initiate treatment early to prevent the onset and spread of drug resistance.

**WHO has been conducting studies on the incidence and prevalence of Tuberculosis worldwide and have found the emergence of MDR-TB to be present in five continents and increasingly is becoming a significant public health problem. This emergence has prompted a review of The Stop TB Strategy to now extend to activities in other key areas such as MDR and HIV.**

A formal WHO working group was established in 1999 to develop guidelines for the management of MDR-TB and assist countries in obtaining second line drugs for the treatment of MDR-TB. These developments resulted in the realization that the recommended drug regimens were not affordable in most countries.

The Green Light Committee (GLC) comprising of a coalition of five categories of partners (namely governments of resource limited countries, academic institutions, civil society organizations, bilateral donors and WHO) was thus established in 2000. The GLC mandate was to successfully negotiate for affordable drugs and become the model of good practice to provide access to affordable drugs that is safe and can rationally be used rational to prevent the emergence of super resistant strains of *Mycobacterium tuberculosis*.

**The guidelines also integrate the context of the new Stop TB Strategy to build on and enhance the DOTS Strategy and integrate the management of MDR-TB into the comprehensive National TB Control Programme.**

#### **The magnitude and trends of anti-TB drug resistance**

The first drug treatment was introduced in 1943 and since then, the incidence of drug resistance has increased steadily over the years. The WHO Global Project on Anti-Tuberculosis Drug Resistance Surveillance gathers data on drug resistance using standard methodology to determine the global magnitude of resistance to the first four first-line anti-TB drugs that is isoniazid (INH), rifampicin (RMP), ethambutol (EMB), pyrazinamide and streptomycin (SM).

Many MDR-TB cases are resistant to drugs other than INH and RMP. To analyze the burden of MDR TB in a specific setting, the prevalence in new and re-treatment cases should be appropriately linked with relevant programme information (such as proportion and categories of re-treatment among all cases as well as absolute case numbers).

Rifampicin resistance was evaluated as a predictor of MDR-TB. The PPV (positive predictive value) of the sensitivity and specificity of RMP resistance testing and the presence of MDR and non-MDR rifampicin resistance was highest amongst previously

treated cases in settings with high MDR prevalence. Globally, more isolates were resistant to INH (0-42%) than to any other drug.

Generally INH and SM resistance were more prevalent than RMP and EMB. Thus mono resistance to either INH or SM is the gateway to acquisition of additional resistance.

## **2. Pathogenesis of Tuberculosis**

Tuberculosis is an airborne disease, carried by droplet nuclei when sneezing, coughing and talking. Droplets can be suspended in the air for extended periods of time. Droplets are inhaled and once in the lungs are taken up by the macrophage and can cause infection which may develop into disease or may remain dormant and viable for many years, called latent TB infection.

Pulmonary Tuberculosis (PTB) is tuberculosis within the lungs. Signs and symptoms are;

- Persistent cough for more than 3 weeks
- Haemoptysis
- Chest pain
- Night sweats
- Shortness of breath
- Loss of appetite
- Loss of weight

Extra-Pulmonary Tuberculosis (EPTB) is when the TB bacilli spread via the blood stream and lymph nodes to various parts of the body/other organs. EPTB is usually non-infectious except for Laryngeal TB. Signs and symptoms depend on the organ affected. EPTB can occur (but not limited to) as TB of the spine, TB meningitis, renal TB or abdominal TB.

## **3. The risk of infection**

Infection, which is usually asymptomatic, occurs when a susceptible person inhales droplet nuclei. Other important characteristics include disease in the lungs, the presence of a cough and acid-fast bacilli in the sputum.

Susceptible host characteristics are not well defined, but may include: the effect of HIV infection on the risk of TB infection, changes in the immune response in mucosa of the bronchi and alveoli as a result of inhalation of smoke or other industrial exposure.

TB can remain highly infectious when treatment is delayed, or incorrectly administered or during cough inducing activities.

## **4. Hospital Acquired Infection (HAI) – Health care associated transmission of *M. tuberculosis***

Health care associated transmission of *M. tuberculosis* is linked with close contact with persons with TB disease during aerosol generating procedures such as bronchoscopy, sputum induction procedures etc. Reported outbreaks of TB in health-care settings have involved the transmission of Multi-Drug Resistant TB (MDR TB) to both health care workers and patients. Factors that contributed to these outbreaks included;

- delayed diagnosis of TB disease,
- delayed initiation and inadequate airborne precautions,
- lapses in infection control procedures and precautions during cough-inducing and aerosol-generating procedures, and
- lack of adequate respiratory protection.

## **5. Drug Susceptible Tuberculosis**

Drug-susceptible TB can be described as Tuberculosis that can be cured within six months using the standard First Line Drugs recommended by National Guidelines and implementing DOTS.

Most patients diagnosed with TB harbor drug-susceptible strains of *M.tuberculosis* and respond well to a 6-8 month short course of multi-drug chemotherapy.

In areas of minimal or no MDR-TB, DOTS can achieve cure rates of up to 95%; high enough to dramatically reduce the TB burden while preventing the emergence of drug-resistant TB. Patients with TB are usually non-infectious within 5-7 days after initiation of treatment.

## **6. How does drug-susceptible TB become drug-resistant TB?**

Drug resistance arises due to the improper use of antibiotics in chemotherapy of drug-susceptible TB patients. From a microbiology perspective, resistance is caused by a genetic mutation that makes a drug ineffective against mutant bacilli. Inadequate or poorly administered treatment regimens allow a drug resistant strain to become dominant in a patient infected with TB. Thus drug resistant TB is resistance of the bacilli to one or more anti-TB drugs.

The development of MDR TB depends on the number of bacilli in the person's body, treating active TB disease only with one drug (mono-therapy) which almost always leads to resistance against this one drug, close contact with a known MDR TB patient or with patients who relapse or fails after been treated with Category II regimen.

### **6.1 Common causes of drug resistance include:**

#### **6.1.1 Health care providers: Inadequate Regimens**

- Inappropriate guidelines or the absence of guidelines,
- Non compliance with guidelines,
- Poor training of health care providers,
- No monitoring of treatment,
- Poorly organized or funded TB control programmes.

#### **6.1.2 Drugs: Inadequate supply and quality**

- Poor quality or non availability of drugs,
- Stock outs and delivery disruptions,
- Poor storage conditions,
- Wrong dose combinations.

#### **6.1.3 Patients: Inadequate drug intake**

- Poor adherence or poor DOT,

- Lack of information,
- Lack of money and transport,
- Drug side effects,
- Social barriers,
- Mal-absorption,
- Substance dependency issues.

## **6.2 Drug resistance and its association with re-treatment**

This has been repeatedly demonstrated, and surveillance of previously treated patient's was found to be very complex and included the following aspects:

- Most were chronic TB patients, (i.e. patients who failed the course of treatment, patients who have relapsed, and those who return after defaulting.
- Chronic TB cases and failures of the first line treatment are at a higher risk of Multidrug Resistant Tuberculosis (MDR-TB).
- Patients who relapsed or defaulted are also more drug resistant than new cases, but less than chronic cases and failures.

**Drug Resistant Surveillance should thus focus on all subgroups to allow for better definition and appropriate treatment strategies.**

## **7. Drug Resistant Tuberculosis**

### **7.1 Primary drug resistance**

Primary drug resistance is when someone infected with a bacillus which is resistant to TB drugs but this person has never been treated with anti-TB drugs. This is the principal reason why some patients fail the standard category I regimen although it is properly administered.

### **7.2 Acquired drug resistance**

Acquired drug resistance when a patient has developed drug-resistant TB and has a history of previous treatment with anti-TB drugs. This often develops when the patient is treated incorrectly or fails to adhere to the treatment regimen.

### **7.3 Mono-drug resistant tuberculosis**

Mono-drug resistant tuberculosis refers to resistance to a single first-line drug.

### **7.4 Poly-drug resistant tuberculosis**

Poly-drug resistant tuberculosis refers to resistance to two or more of the first-line drugs.

No specific diagnostic procedures are recommended to determine such, but it can be identified during the case finding of MDR-TB. Treatment of patients infected with mono or poly-resistant strains using the standardized short course have been associated with increased risk of treatment failure and further acquired resistance including the development of MDR-TB; however, the majority of patients will be cured with short course therapy.

## 7.5 Multi-Drug Resistant Tuberculosis (MDR-TB)

**MDR-TB is a specific form of drug-resistant TB due to a bacillus resistant to at least isoniazid (INH) and rifampicin (RMP), the two most powerful anti-TB drugs.** MDR requires second-line drugs (SLDs) that are less effective, more toxic and much more costly.

### 7.5.1 Causes of MDR TB

- Mono-therapy,
- Inadequate drug combinations,
- Short treatment duration,
- Irregular and selective drug intake by the patient,
- Low drug dose.

### 7.5.2 Second-line TB drugs currently used in Namibia:

Initial Phase		Continuation Phase	
Drugs	Duration in months	Drugs	Duration in months
Pyrazinamide	A minimum of four months <b>and</b> Until two sputum smears and two successive cultures are negative	Ethambutol	Eighteen months
Ethambutol		Ethionamide	
Amikacin		Ciprofloxacin	
Ethionamide			
Ciprofloxacin			

**(Adopted from Namibian National Guidelines, MOHSS)**

The stop TB Partnership in 2000 through the Green Light Committee ensured availability of Second line Drugs (SLDs) to ensure proper treatment and prevent increase in resistance. While ensuring drug availability the committee encountered numerous reports of drug resistance to SLDs.

## 7.6 Extensive Drug-Resistant TB (XDR TB)

**This is TB which has been defined in October 2006 by the WHO Emergency Global Task force as tuberculosis which is:**

- Resistant to at least isoniazid and rifampicin amongst the first-line anti-TB drugs,
- Resistant to any fluoroquinolone,
- Resistant to at least one second-line injectable drug (amikacin, capreomycin or kanamycin).

**The Stop TB Partnership has adopted a seven-point Action Plan for XDR-TB and included;**

- Conducting rapid surveys of XDR-TB,
- Enhance laboratory capacity,
- Improve technical capacity of clinical and public health managers to effectively respond to XDR-TB outbreaks,
- Implement infection control precautions,

- Increase research support for anti-Tb drug development,
- Increase research support for rapid diagnostic test development, and
- Promote universal access to ARV's under joint TB/HIV activities.

## **8. Management of Multi-Drug Resistant Tuberculosis**

### **8.1 The expanded new Stop TB Strategy**

The original package of DOTS for TB control has been expanded, but retains the five essential components and includes the following components to address the additional challenges:

- Pursue high-quality DOTS expansion through political commitment and sustained financing, case detection through quality bacteriology, standardized treatment with patient supervision and support, effective supply and management of drugs and monitoring, evaluation and impact assessments.
- Address TB/HIV, MDR-TB and other challenges by implementing collaborative TB/HIV activities, preventing and controlling MDR-TB and addressing prisoners, refugees and other high risk groups.
- Contribute to health system strengthening by collaborating with other health care programmes, mobilizing human and financial resources and sharing and applying achievements of TB control.
- Engage all care providers, including the public, nongovernmental and private providers by scaling up the public-private mix (PPM) and approaches to adhere to international standards of TB care, focusing on the vulnerable and poorest groups.
- Empowering people with TB and communities by scaling up community TB care and creating demand through specific mobilization communication and advocacy.
- Enabling and promoting research to improve programme performance and to develop new drugs, diagnostics and vaccines.

### **8.2 The DOTS framework applied to the Management of MDR-TB**

- Sustained political commitment that will focus on addressing the factors causing the emergence of multi-drug resistance, investing in staffing, training of staff and acquiring resources. Developing regulatory documents and coordinating activities between communities, local governments and international agencies and ensuring a well functioning DOTS programme.
- A rational case finding strategy including accurate, timely diagnosis through quality-assured culture and drug susceptibility testing (DST) through rational triaging of patients into DST and the DR-TB programme and the establishment of an effective relationship with a supranational reference laboratory.
- Appropriate treatment strategies that use second-line drugs under proper case management conditions by designing rational evidence based treatment regimens, ensuring adequately trained staff to implement DOT and monitor and manage adverse events
- Ensure the uninterrupted supply of quality-assured second-line anti-tuberculosis drugs.

- Standardized recording and reporting system designed for MDR-TB programme that enable performance monitoring and evaluation of treatment outcomes.

## **9. Fundamentals of TB Infection Control Strategies**

One of the most critical risks for health-care-associated transmission of *M. tuberculosis* in health-care settings is from patients with unrecognized TB disease who are not promptly handled with appropriate airborne precautions.

**In addition to the general infection control guidelines as per National TB Guidelines and the Infection Control procedures:**

### **9.1 Reducing the spread of PTB or MDR in health care settings:**

**The spread of PTB or MDR in health care settings can substantially be reduced by the use of:**

- high index of suspicion,
- early diagnosis and isolation of suspected cases,
- standardized anti-tuberculosis treatment regimens in the initial phase of therapy,
- rapid drug susceptibility testing,
- improved infection-control practices, and
- directly observed therapy (DOT) which is an adherence enhancing strategy in which a health care worker or any other specially trained person watches a patient swallow each dose of medication and recording the dates the administration was observed. DOT is the standard of care for all patients with TB disease and should be used for all doses during the course of therapy for TB disease.

It is of utmost importance that all health care facilities receive and implement the TB infection control program guideline. This will ensure prompt detection, airborne precautions, and treatment of persons who have suspected or confirmed TB disease.

## **10. TB Infection Control Levels**

**TB Infection Control is designed to focus on three aspects or levels which are;**

- **Work Practices and Administrative Controls - First Priority**
- **Environmental Controls - Second Priority , and**
- **Respiratory Protection - Third Priority**

**Administrative controls** are the most important since environmental controls and personal respiratory protection will not work in the absence of solid administrative control measures.

Since the exposure to infectious droplet nuclei usually cannot be eliminated, various **environmental control** methods can be used in high-risk areas to **reduce the concentration of droplet nuclei in the air**.

The third recommended control measure is the protection of the HCW and other exposed individuals from inhaling infectious droplets through the use of **personal respiratory protective devices** which are designed to fit over the mouth and nose and filter out infectious TB particles. The type of surgical masks (cloth, paper) commonly used by HCWs do not filter out infectious droplet nuclei, although they may be of some use if placed on patients to prevent the generation of such nuclei. Personal respiratory protective devices for HCWs that are capable of adequately filtering out infectious particles are more expensive than surgical masks.

### **10.1 Work Practices and Administrative Controls - Managerial Controls**

The first and most important level of control is the use of administrative controls to prevent droplet nuclei from being generated and thus **reducing the exposure of HCWs and other patients to *M. tuberculosis***. It would be ideal if the risk of exposure can be eliminated as no further controls will be needed. Unfortunately, the risk usually cannot be eliminated, but it can be significantly reduced with proper administrative measures.

#### **The goals of Work Practices and Administrative Controls are to;**

- to prevent TB exposure to staff and other patients;
- To reduce the spread of infection by ensuring rapid and recommended diagnostic investigation and treatment for patients and staff suspected or known to have TB. Best achieved through prompt recognition, separation, isolation, provision of services, and referral of persons with potentially infectious TB disease.

#### **10.1.1 Important Administrative Measures include;**

- Early diagnosis of potentially infectious TB patients, prompt separation or isolation of infectious TB patients.
- Identification of possible MDR and XDR patients.
- Prompt initiation of appropriate anti-tuberculosis treatment for all Categories.
- Other measures including an assessment of the risk of transmission in the facility.
- The development and implementation of an TB Infection Control (IC) plan that details in writing the measures that should be taken in a given facility.
- Adequate training of Health Care Workers to implement the plan. It is very important that at facilities offering integrated services that one individual be

assigned responsibility and accorded authority to monitor the implementation of the IC plan.

- Patient education complemented by increasing community awareness.
- Coordination and communication with the National TB Control Program.

### **10.1.2 Work Practices and Administrative Controls: Specific Strategies**

#### **a) Assessment of settings at risk for *M. tuberculosis* transmission**

- Regardless of the size of the health care facility and type of facility, an assessment of HCW's risk of *M. tuberculosis* infection should be conducted as the first step in improving TB infection control. This includes assessment of transmission of all types of TB (PTB, EPTB {laryngeal}, MDR and XDR).
- The risk of *M. tuberculosis* transmission should be evaluated for the facility and for areas within the facility (adjacent wards of in-patient TB wards) where TB patients might receive care (e.g., examination rooms, laboratory, pharmacy, waiting areas, etc.).
- This risk assessment should consider:
  - the number of infectious TB patients seen per year
  - in the entire facility
  - in each specific area
  - the amount of time that infectious TB patients spend in the area
  - Whether special procedures (e.g., sputum collection) that increase the number of infectious particles are performed in the area. The results of this risk assessment will guide the development and implementation of the IC plan, since interventions should focus initially on those areas that pose the highest risk.

#### **b) Infection Control Plan**

The next step is the development an IC plan which will be supported by all levels of the health care system.

TB Infection Control Plan will outline the protocol for the prompt recognition, separation, provision of services, investigation for TB culture and drug sensitivity of suspected MDR patients and referral of patients with suspected or confirmed TB disease.

Implementation and adherence to the IC plan should be monitored.

**It is imperative that each health facility catering for MDR TB patients develop a facility based and facility specific infection control plan. This plan should be consistent with all the recommendations under administrative, environmental and personal protection.**

**The IC plan will cover areas like:**

- Early **recognition** of patients with suspected or confirmed TB disease is the first step in the Infection Control Plan and should be supported by identification of risk areas
- assessment of TB among HCWs (where feasible)
- assessment of HIV prevalence in the patient population (where feasible)
- assessment of HCW training needs
- area-specific infection control recommendations
- time-line and budget (e.g., material and personnel costs)

### **c) Training of Staff**

Infection control is effective only if all staff working in a facility understands the importance of the infection control policies and their role in implementing them.

As part of training, each health care worker and staff member, including any lay workers, should receive job category-specific instruction.

Training should be conducted before initial assignment and continuing education should be provided to all employees and volunteers.

#### **Training should include the following issues:**

- Basic concepts of *M. tuberculosis* transmission and pathogenesis;
- Risk of TB transmission to health care workers and staff;
- Symptoms and signs of TB;
- Impact of HIV infection on increasing risk of developing TB disease and the importance of TB as a major cause of disease and death in People Living With HIV/AIDS;
- Importance of the infection control plan and the responsibility that each staff member has to implement and maintain infection control practices;
- Specific infection control measures and work practices that reduce the likelihood of transmitting TB; and
- Measures staff can take to protect themselves from TB.

### **d) Education of Patients, Contacts and Community Awareness**

Educating TB contacts to recognize symptoms of TB and to seek health care and further investigations should be routine in all health facilities.

#### **Aspects to be covered as part of infection control when educating patients are:**

- **Respiratory hygiene/cough etiquette.** This includes instructing them to turn their heads away from other persons when coughing, cover their nose and mouth when coughing or sneezing, and when possible providing face masks or tissues to assist them in covering their mouths.

- **Information, education and communication material such as pamphlets and posters** emphasizing cough etiquette should be placed at visible areas.

#### **e) In-Patient Management: Separation and Isolation Policies**

Ideally, infectious TB patients should be isolated from other patients so that others are not exposed to the infectious droplet nuclei that they generate. Separation of TB patients from others is far less costly than isolation and can potentially contribute to reduction of hospital acquired infection. At the referral level, an attempt should be made to:

Establish separate wards, areas, or rooms for confirmed infectious TB patients. These wards/areas should be located away from wards with non-TB patients, especially wards with high-risk patients (e.g., pediatric, immuno-suppressed patients). Ideally, these wards should be in separate buildings.

The optimal arrangement in a larger health facility would include two wards, housed in separate buildings if at all possible:

- **award for PTB & EPTB patients (there should also be separation of infectious and non-infectious patients amongst this category)**
- **an isolation ward MDR TB patients**

#### **f) Isolation and MDR TB**

Because of the prolonged period that such patients are infectious and the consequent increased risk of hospital acquired infection, whenever possible, patients suspected of having MDR-TB should be placed in a separate area or building in the facility, preferably in well-ventilated individual patient rooms where the possibility of contact with other patients who do not have TB or do not have Administrative Control Measures.

#### **g) MDR-TB and HIV**

**It is critical that patients with TB, especially MDR-TB, be separated from other patients who have HIV infection. Furthermore patients who are confirmed MDR cases should also be separated from other TB diagnosed patients as MDR TB patients can infect TB patients on first line chemotherapy even though they are on treatment with category I and II drugs.**

#### **h) Other Considerations**

- The Infection Control guidelines should strictly be adhered to when sterilization or disinfecting potentially contaminated equipment (usually

endoscopes) (see infection control guidelines for specific procedure guidance);

- There should be screening and evaluating of HCWs who are at risk for TB disease or who might be exposed to *M. tuberculosis* (i.e., TB screening program). These health care workers should not be placed in areas where they are exposed to TB;
- In addition, health care workers with TB disease should be allowed to return to work when a physician knowledgeable and experienced in managing TB disease determines that HCWs are non-infectious. Consideration should also be given to the type of setting and the potential risk to patients.
- Coordinating efforts with the Management to allow health care workers with TB disease to return to work when they have had three negative smear sputum results.

## 10.2 Environmental Control Measures

The second aspect to be considered is the use of **Environmental Controls** to prevent the spread and reduce the concentration of infectious droplet nuclei in ambient air.

**The probability of the risk for transmission of *M. tuberculosis* is increased as a result of various environmental factors such as;**

- Exposure to TB in small, enclosed spaces.
- Inadequate local or general ventilation that results in insufficient dilution or removal of infectious droplet nuclei.
- Recirculation of air containing infectious droplet nuclei.
- Inadequate cleaning and disinfection of medical equipment.
- Improper procedures for handling specimens.

**A variety of simple to complex environmental controls can be used to reduce the number of aerosolized infectious droplet nuclei in the work environment:**

- the simplest and least expensive technique is to remove and dilute the air from TB patient areas away from patients without TB by maximizing **natural ventilation** through open windows
- more complex and costly methods involve the use of **mechanical ventilation** (e.g., **window fans, exhaust ventilation systems**) in isolation rooms or wards to produce negative pressure and prevent contaminated air from escaping into hallways and other surrounding areas
- additional complex and costly methods include **air filtration** to remove infectious particles and **ultraviolet germicidal irradiation (UVGI)** to kill *M.tuberculosis* organisms

### 10.2.1 Ventilation: Ventilation Patterns

Ventilation is the movement of air to achieve dilution and air exchange in a specific area. **This reduces the concentration of aerosolized droplet nuclei.** To reduce nosocomial risk, the most ideal situation would be one in which fresh air is constantly pulled into a room and the contaminated air is exhausted to the outside, such that the air in the room is changed several times every hour.

The most common way in such ventilation can be established is through the use of **negative pressure ventilation**, in which a room is kept at negative pressure relative to the surrounding area and air is drawn into the room from the corridor and exhausted directly outside. However, establishing such rooms can be highly costly, and the equipment needed requires ongoing maintenance.

More feasible in most settings is the use of **natural ventilation or of mechanical ventilation** in which the movement of air is facilitated by the use of fans.

#### a) Natural Ventilation - Methods to maximize natural ventilation

Natural ventilation can be achieved by leaving windows open and is the simplest way to get better ventilation. Natural ventilation can occur when a room or ward is of open construction with free flow of ambient air in and out through open windows.

- Waiting areas, sputum collection areas, examination rooms, patient rooms should be "opened" to the environment (e.g., established in covered open areas or in areas with open windows). Additionally, windows or other openings may be installed that would allow for more ventilation.
- Windows and openings should be placed on outer walls such that air moves to the outdoors, not into other wards or waiting areas.
- When ceiling fans are used, windows should also be left open since diluting **and** exchanging rather than just mixing the air is the objective.
- A room with an open window at one end provides air exchange near the window; however, little air is exchanged a short distance from the window. Thus, the minimum acceptable condition is openings on opposite ends of a room (windows, window-door, etc.).

#### b) Mechanical Ventilation

In situations where natural ventilation is not feasible or is inadequate, mechanical ventilation can be used to reduce the concentration of infectious droplet nuclei in selected areas or rooms in the health care facility (e.g., patient rooms, waiting rooms, or examination rooms).

It is important to use equipment with sufficient power to facilitate air entry into, and exhaust from the room or area. In other words, if no air is allowed to enter the area, then it will be impossible to exhaust air. It is also important to attempt to direct air

movement so that infectious droplet nuclei produced by coughing patients are exhausted away from others.

Directional air flow should be maintained from a “clean” area, across the HCW, across the patient, and to the outside. The area where air is entering should be located away from the exhaust area to avoid re-entry of contaminated air (“short-circuiting”).

**Window fans** are the least expensive and most feasible method of providing mechanical ventilation to direct air flow in most low-resource settings. Ensure though that air flows across the room (i.e., under a door and out a window, not in and out the same window or vent). Additional methods of mechanical ventilation, which require more resources, include mechanical exhaust system that pump clean outside air into the building and then exhaust the contaminated room air back outside.

**Closed recirculation filtration systems**, which take room air, filter it to remove infectious droplet nuclei, and then exhausts it back into the room, are effective but expensive and require considerable maintenance.

### 10.2.2 Ultraviolet Germicidal Irradiation

Ultraviolet germicidal irradiation (UVGI) or portable HEPA filter units may provide a less expensive alternative to more expensive environmental measures that require structural alterations of a facility. These measures may be particularly useful in wards with high patient numbers, waiting areas or inpatient areas such as television or recreation rooms where TB patients congregate.

*M. tuberculosis* is killed if the organisms are exposed sufficiently to UVGI. The major concerns about UVGI have been adverse reactions (e.g., acute and chronic cutaneous and ocular changes) in HCWs and patients from overexposure if the UVGI is not installed and maintained properly. If UVGI is to be used, guidelines provided regarding installation, cleaning, maintenance and ongoing monitoring should be carefully consulted.

#### **UVGI may be applied in several forms:**

- in sputum collection booths, bare bulbs can be used to irradiate the entire booth when it is **not** occupied
- if HCWs and patients are in the room, continuous upper air irradiation can be used in which shielding placed below the UVGI sources prevents injury to occupants
- portable UVGI floor units also may be used
- an additional more expensive option involves the use of UVGI in combination with a closed mechanical system

The advantage of continuous upper air irradiation is that the upper air is continuously being irradiated; thus, it provides some protection to the HCW while the infectious patient is in the room. This requires good air mixing to be effective.

Furthermore, structural features such as ceiling height may limit the feasibility and usefulness of UVGI. If portable UVGI floor units are used, attention should be paid to lamp placement, since corners may receive inadequate radiation. The quality of UVGI lamps should also be considered.

Responsibility should be assigned to ensure the lamps are cleaned and monitored properly to avoid adverse HCW's and patient's exposure, that air flow patterns maximize *M. tuberculosis* UVGI killing, and that UVGI output is adequate.

### **10.2.3 High Efficiency Particulate Air Filtration**

In small rooms with a limited number of patients or in other small, enclosed areas, HEPA filter units may be a useful alternative to mechanical ventilation requiring structural changes or to UVGI.

HEPA filtration units may be free-standing or may be permanently attached to floors or ceilings to minimize tampering. If possible, the units can be exhausted outdoors, thereby creating a negative pressure isolation room.

If portable units are used, unrestricted airflow is essential; placing the unit close to furniture or putting items on top of the units may compromise their function.

## **10.3 Personal Respiratory Protection**

Personal respiratory protection (respirators) is the last line of defense for HCWs against nosocomial *M. tuberculosis* infection. Without appropriate administrative and environmental controls, respirators will **NOT** adequately protect the HCW from infection. However, respirators may serve as a valuable complement to administrative and environmental IC measures. Since personal respiratory protection may not be always affordable, it is most appropriate for use in high risk areas in the referral hospital setting.

Widespread **and** constant use of respirators is impractical; therefore they should be used on a limited basis in specified high risk areas in conjunction with other administrative and environmental control measures:

- isolation rooms for patients with TB or MDR-TB
- during sputum induction or other cough-inducing procedures
- bronchoscopy suites
- autopsy areas
- spirometry rooms
- during emergency surgery on potentially infectious TB patients (consider postponing elective surgery for infectious patients)

### **10.3.1 Issues for Consideration**

## **Surgical masks**

There are important differences between a face mask and a respirator. Face masks, such as surgical masks (cloth or paper):

- do prevent the spread of micro-organisms from the wearer (e.g., surgeon, TB patient) to others by capturing the large wet particles near the nose and mouth
- **do not** provide protection to the wearer (e.g., HCW, patient, family member) from inhaling infectious droplet nuclei in the air

## **Use of surgical masks for patients**

Disposable/cloth surgical masks for potentially infectious TB patients are not available. Although not the highest priority intervention, disposable/cloth masks can be used to reduce aerosols generated from potentially infectious TB patients:

- disposable/surgical masks should be considered for suspect and known infectious TB patients leaving isolation rooms for medically-essential procedures

Because surgical masks may also serve to identify TB patients, the risk of stigma also needs to be considered. Patient and HCW education regarding the importance and appropriate use of wearing masks should accompany their distribution.

It is important to remember that a **mask does not** protect HCWs or other wearers from inhalation of air contaminated with *M. tuberculosis* and should not be used for that purpose. Masks usually have limited filtration capacity and are loosely fitted over the nose and mouth, allowing free entrance of aerosolized *M. tuberculosis*. Other devices, such as respirators **do** provide protection. Cloth surgical masks can be sterilized and reused.

## **11. Additional Infection Control Measures for Consideration**

### **11.1 Protection of Health Care Workers and Staff: Increasing awareness of TB amongst Health Care Workers and Staff**

It is a proven fact that there is an increased risk of TB disease or infection in health care workers compared with the general population. Pertaining to the health care delivery system this does not include just health care providers, but any staff, including volunteers, who have contact with persons with TB who have not yet been diagnosed and started on treatment.

This could include porters and cleaners, as well as peer educators, adherence supporters, and volunteers working as counselors or in support groups.

**People Living With HIV/AIDS amongst these staff are at particular risk of rapid progression to TB disease if they become infected or re-infected due to exposure to *M. tuberculosis* in the facility. Therefore they should be included in all training programs.**

Nevertheless, the risk to staff will never be zero, and an additional aspect of protecting staff is promoting early recognition of TB disease and standard treatment.

- Annual screening programs for TB disease.
- Reminding health care workers and other staff that they can develop TB, regardless of previous infection status or BCG vaccination. This should occur with continuous re-training on infection control.
- It should be reinforced that all TB investigations services be confidential.
- Increasing access to Voluntary HIV Counseling and Testing. Health care workers should be encouraged to know their HIV status. This will be by providing accessible, acceptable and confidential VCT.

**Health care workers are a valuable resource, and they must receive adequate care and treatment to remain healthy and in the workforce. Furthermore, HIV-infected health care workers and other staff are at increased risk of developing TB disease if exposed in the workplace, and additional precautions should be taken to protect them. Immuno-compromised health care workers should be given opportunities to work in areas with a lower risk of exposure to TB.**

***There is no role for mandatory HIV testing of health care workers.***

Health care workers have the same rights as all individuals to confidential HIV testing with counseling and conducted only with an informed consent. Education directed to health care workers concerning HIV testing can also be linked to their role in educating patients and communities about the benefits of testing and knowing one's HIV status and may further reduce stigma.

## **12. Treatment Regimens**

All MDR-TB cases require second-line drugs which fall under the WHO diagnostic category of Category IV regimens. The strategies for treatment include standardized, empirical and individualized approaches to treat MDR-TB. It is of absolute importance to treat MDR-TB early and successfully as it can have cure rates of up to 85% and greatly aids in the prevention of drug resistant TB and death as a result of untreated TB in the community.

It is essential that drug regimens are designed based on drug resistant survey (DRS) data and the availability of second-line drugs. It should also consider the prevalence of drug resistance in new as well as in re-treatment cases (including treatment failure, relapses and return after defaulting). This is necessary to determine the frequency of the use of second-line drugs in the area of MDR-TB as some drugs may have been used rarely and would thus be more effective than those drugs used extensively, which may be less effective in patients with resistant strains.

### **12.1 Treatment regimens include:**

#### ➤ Standardized treatment

These regimens are designed on the basis of representative drug resistant survey data; however suspected cases of MDR-TB should always be confirmed by DST results (if possible). All patients in a cohort receive the same regimen.

Standardized category IV regimens offer several advantages as it increase access to more patients and maintaining comparable cure rates as it is simpler to implement, ordering of drugs are simplified, training is easier, there is less room for mismanagement and countries are less dependent on high technical laboratories.

#### ➤ Empirical treatment

These regimens are individually designed on the basis of previous history of anti-tuberculosis treatment and with representative drug resistant survey data. The treatment is adjusted for each patient based on their DST results. DST is done of both first and second-line drugs.

#### ➤ **Individualized treatment**

These regimens are individually designed on the basis of previous history of anti-tuberculosis treatment and with representative drug resistant survey data and individual DST results. DST is only done for a limited number of drugs.

These regimens require a high degree of laboratory capacity to perform second-line DST, but it can be advantageous to patients as they can be placed on less toxic and expensive drugs.

In settings where second-line drugs have not been widely used, a combination strategy is often applied and only patients on documented resistance are put on different standardized regimens.

### **12.2 Treatment Duration**

The duration of treatment is guided by smear and culture conversion. The minimal recommendation is for treatment to last at least for 18 months after culture conversion. Extension of treatment is only indicated in cases that are defined as "chronic cases" with extensive pulmonary damage.

Since treatment is of a much longer duration and involves much more adverse events, patients will require more sustained support to continue treatment and maintain adherence. The management of adverse events should also be monitored more vigorously and attended to timely and appropriately.

## **Acronyms, Terms and Definitions**

### **A**

**Airborne transmission** – transmission of an infectious agent by air from respiratory secretions.

**Agent** - something such as a chemical substance, organism, or natural force that causes an effect.

**Anti-septic** – a substance recommended by the manufacturer for dermal application to kill microorganisms or to prevent the growth of microorganisms.

**Aseptic technique** – is when the instruments and drapes used and gloved hands of the health care worker are sterile.

**Agitation of linen** - vigorous or violent shaking of linen.

**Asymptomatic** – having infection, but without any signs and symptoms of disease, though infection can be transmitted.

**Anti-microbial** – a chemical agent that by application to living tissue or by systematic administration will selectively kill or prevent growth of susceptible organisms. It includes antibacterials, antiprotozoals, antifungal, antiseptics and disinfectants.

**Asepsis** – the prevention of microbial contamination of living tissue or sterile materials by removal, exclusion or destruction of microorganisms.

**Anti -sepsis** – the prevention of infection by topical application of bacteriostatic agents to tissues.

**Antibiotics** – a subset of antimicrobial agents that include antibacterial agents.

**Additional precautions** – precautions used for patients known or suspected to be infected or colonized with highly transmissible organisms that can be transmitted by airborne, droplet or contact transmission. They are designed to interrupt transmission by these routes of infection and are additional to standard precautions.

**Antiseptic hand rub** – fast acting hand rub that do not require the use of water to remove transient and resident flora. Most contain alcohol, glycerin (an emollient) and an additional antiseptic (chlorhexidine) that has a residual action.

**Antiseptic / Antimicrobial agent** – chemicals that are applied to the skin to inhibit or kill microorganisms (both transient and resident) to reduce bacterial counts.

**Arthropods** - an invertebrate animal that has no backbone, but has jointed limbs, a segmented body, and an exoskeleton made of chitin, e.g. an insect, arachnid, centipede, or crustacean.

**Audit** - a systematic check or assessment, especially of the efficiency or effectiveness of an organization or a process.

## B

**Barrier protection** – Personal Protective Equipment used in the health care setting to separate patients from the potential of infection from hands of HCWs or equipment used during care.

**Biocide D-** an Example of a Hypochlorite.

**Body Substance** – includes all human bodily secretions, or substance other than blood. (Excluding sweat).

## C

**CDC** – Centers for Disease Control and Prevention in Atlanta, USA

**Colonization** – the ability of microorganisms to reside on, or in a host without causing disease.

**Contact transmission** – transmission of an infectious agent through person-to-person contact.

**Cohorting / Cohort Nursing** – management of a group of patients infected with the same infectious agent in the same place. Placing patients with the same infection together in an area or ward and using the same nursing staff to reduce the risk of spreading infection to other patients.

**Commensally** – describes a relationship between organisms of two different species in which one derives food or other benefits from the association while the other remains unharmed and unaffected.

**Compliance** - the state or act of conforming with or agreeing to do something.

**Contamination** – presence of infectious agent in blood and other body fluids, on body surfaces and medical equipment, clothing and supplies.

**Cleaning** – the physical removal of foreign material, for example, dust, soil, organic material such as blood, secretions, excretions and microorganisms. Cleaning physically removes rather than inactivate microorganisms. Cleaning is accomplished with water, detergents and mechanical actions. Cleaning must precedes disinfection and sterilization.

**Clean Water** – natural or chemical treated and filtered water that is safe to drink and use for other purposes (hand washing and cleaning of instruments) as it meets public health standards.

**Changing room** - area next to isolation ward where health workers dress in personal protective equipment, disinfect hands and gloves, and dispose of soiled and contaminated personal protective equipment.

## D

**Decontamination** – the removal of microorganisms or foreign matter or both from contaminated materials or living tissues.

**Decontaminate** - to remove unwanted chemical, radioactive, or biological impurities or toxins from a person, object, or place.

**Disinfectant** – a chemical, which destroys or removes microorganisms but not bacterial spores. It is used to clean surgical instruments, equipment, surfaces or furniture.

**Disinfection** – the inactivation of nonsporing microorganisms using either thermal (heat) or heat and water or chemicals means - to clean something so as to destroy disease-carrying microorganisms and prevent infection and making it safe to use

**Detergent** - a cleansing substance, especially a synthetic liquid that dissolves dirt and oil.

**Droplet transmission** – transmission of an infectious agent in droplets from respiratory secretions.

**Droplet** – a small drop of liquid. **Nuclei** - central part of living cell and other genetic information necessary to control cell growth and reproduction.

**DOTS** – Directly Observed Therapy Short Course

**DOTS Strategy** – Strategy to manage and control TB, including direct observe treatment.

**DOTS-Plus** - Strategy including all the elements of DOT and extending to include aspects of HIV and MDR-TB

**DST**- Drug Sensitivity Testing

**DRS** – Drug Resistant Survey

## E

**Exudates** - substance such as sweat or a cellular waste product that is exuded from a cell or organ.

**Emollient** – is an organic liquid, such as glycerin that helps prevent skin damage due to frequent hand washing.

**EMB-** Ethambutol

**EPTB** – Extra Pulmonary Tuberculosis

## F

**Fungus** – a simple plant, which lacks the green pigment of chlorophyll. It causes local infections such as rash, but can cause serious illness in immunocompromized patients.

**Fibroblasts** - cell producing connective tissue: a large flat cell in connective tissue that secretes collagen and elastic fibers.

**Fibreoptic** - device for viewing inaccessible places: an instrument that uses fiber optics to transmit images from inaccessible places such as the interior of the body. Use for microsurgery and diagnosis.

**Fomites** - inanimate objects capable of carrying germs from an infected person to another person, e.g. clothes or bedding.

## G

**GLC-** Green Light Committee – a coalition of five categories of partners (namely governments of resource limited countries, academic institutions, civil society organizations, bilateral donors and WHO). Their mandate is to successfully negotiate for affordable drugs that are safe for use in the prevention of MDR-TB.

## H

**HAV** – Hepatitis A Virus

**HBV** – Hepatitis B Virus

**HCV** – Hepatitis C Virus

**Hand washing** – the process of mechanically removing soil and debris from skin or hands using plain soap and water.

**Hand Antisepsis** – similar to plain hand washing to reduce both transient and resident flora. It consists of washing hands with water and soap that contains an antiseptic agent instead of plain soap.

**Healthcare –associated infection (HAI)** refers to infections associated with healthcare delivery in any setting (e.g. hospitals, ambulatory settings and home care). The term (HAI) considers the inability to determine for certain where the

pathogen is acquired since patients may be colonized with or exposed to potential pathogens outside the healthcare setting.

**Hospital infection** – see Nosocomial infection

**Host** - a human, animal, plant, or other organism in or on which another organism, especially a parasite, lives.

**Hazard** – an agent (biological, chemical or physical) that has the potential to cause harm.

**High-risk areas** - areas in hospital where seriously ill patients, immunocompromized patients are cared for and the risk of infection increases.

**HCWs** – Health Care Workers

**Health care worker** - any person trained to provide patient care (medical, nursing, paramedical, emergency room nurses, community health workers).

**Health facility** - any hospital, health centre or clinic with inpatient facilities. Also any facility providing emergency or primary health care services.

**Health facility staff** - all patient care, laboratory, cleaning, disposal, reception, and administrative staff who are likely to have contact with suspected VHF cases, VHF infectious body fluids, and infectious waste.

**High- efficiency particulate air filter (HEPA)** – an air filter that removes more than 99% of particles at a specified rate of air. HEPA filters may be integrated into the central air systems, installed at the point of use above the ceiling of a room or as portable units.

## I

**Inanimate** - belonging to the category of nouns that refer to things and concepts considered to be without life.

**Increased length of stay** – the extended stay of a patient in hospital, usually more than the average of 2 -3 days due to medical or other reasons.

**Immune** – protected from getting a disease because of natural resistance, resistance acquired after catching the disease, or resistance conferred by inoculation. (E.g. immune to smallpox)

**Immunosuppression** – the inhibition of the immune response, usually deliberately by administering drugs to prevent rejection of transplanted organs, but sometimes resulting from disease, as in the case of AIDS.

**Immunocompromized** – lacking an adequate immune response as a result of disease, exposure to radiation, or treatment with immunosuppressive drugs.

**Incubation / incubation of disease** – the development of an infection inside the body to the point at which the first signs of disease become apparent.

**Infection** – invasion or multiplication of harmful microorganisms in body tissue.

**Isolation** – to keep somebody who is infected away from other people in order to prevent the spread of a contagious disease.

**Isolation area/ward** - The area in the health facility used for housing suspected VHF patients. It includes the patient's room or area, isolated latrine or toilet, family entrance, and changing room.

**Invasive procedure** – any procedure that pierces skin or mucous membrane or enters a body cavity or organ. This includes surgical entry into tissue, cavities or organs or repair of traumatic injuries.

**Indwelling devices** – medical devices that remain inside in the body, such as catheters.

**Isolation precautions** - Precautions taken to protect patients, clients, health care workers and visitors from potential infection due to infectious disease.

**Impermeable** - not permitting the passage of liquid, gas, or other fluid.

**Invert** - to reverse the order, position, or arrangement of something.

**INH-** Isoniazid

## **M**

**Micro organism** – an organism too small to be seen by the naked eye. It includes bacteria, fungi, protozoa, viruses and some algae.

**Microbial growth** – the growth of organisms in the environment or on body tissue.

**Mortality** – Death

**Morbidity** – disease or in a reduced state of health.

**MOHSS** – Ministry of Health and Social Services (Namibia)

**MDR-TB-** Multidrug – Resistant Tuberculosis

## **N**

**Nosocomial infection** – infection acquired in a health care establishment, especially hospitals as a result of care and treatment, but can also refer to infection acquired in any other health care facility.

**Notifiable disease** – disease or condition which is Notifiable to State as per regulation.

**Non-compliance** – not acting as agreed, not honoring agreement.

### **NTBCP- National Tuberculosis Control Programme**

## **O**

**Organic matter** - relating to the organs of the body, specifically to basic changes in them brought about by physical disorders.

## **P**

**Pathogens** - something that can cause disease, e.g. a bacterium or a virus.

**Parenteral** - injected, infused, or implanted: describes drug administration other than by the mouth or the rectum. (E.g. by injection, infusion, or implantation)

**Perpendicular** - perfectly vertical

**Perineal** - the region of the abdomen surrounding the urogenital and anal openings.

**Personal Protective equipment** - Masks, gloves, gowns, eyeglasses, caps, aprons, and boots. Provides protection against splashes or spills of infectious material when examining suspected VHF cases or handling infectious waste and laundry.

**Patient's own flora** – microorganisms that live on or in the body, also called commensally organisms. They do not cause disease and they help to protect against disease. Anti –microbial treatment may disrupt the ability of normal flora to protect against disease.

**Prophylaxis** – the means to prevent disease, example to vaccinate against disease, administer treatment after a needle stick injury or give antibiotics before surgery.

**PTB – Pulmonary Tuberculosis**

**PPV – Positive Predictive Value**

## **R**

**Radiation** - the treatment of disease using radiation X-rays or beta rays directed at the body from an external source or emitted by radioactive materials placed within the body.

**Rubella** - a highly contagious viral disease, especially affecting children, that causes swelling of the lymph glands and a reddish pink rash on the skin. It can be harmful to the unborn baby of a pregnant woman who contracts it.

**Resident Flora** - term refer to bacteria located in the layers of skin, they live in deeper layers of skin and in hair follicles and are not completely removed, even by vigorous hand washing. Fortunately they are less likely to cause infection.

**Respirator** – a personal protective device worn by HCWs to protect them from inhalation exposure to airborne infectious droplets from Mycobacterium TB, variola virus, SARS and other dust particles.

**Respiratory Hygiene/ Cough Etiquette** – a combination of measures designed to minimize the transmission of respiratory pathogens via droplet or airborne routes in health care settings. These include covering the mouth and nose during coughing and sneezing, using tissues to contain respiratory secretions with immediate disposal, offering a surgical mask to persons who are coughing to decrease transmission in surrounding areas, turning head away when coughing.

**Retrograde** - moving backward in space or time. (E.g. urine moving backward/upward in catheter)

**RMP-** Rifampicin

## S

**Sanitizing** - to clean something thoroughly by disinfecting or sterilizing.

**Source** - the place, person, or thing through which something has come into being or from which it has been obtained.

### **SARS – Severe Acute Respiratory Syndrome**

**Standard precautions** – work practices required for the basic level of infection control. They are recommended for the care and treatment of all patients and apply to all body fluids, secretions, excretions (excluding sweat), regardless whether they contain visible blood (including dry body substances such as dried blood or saliva), non intact skin and mucous membranes.

Standard precautions include good hygiene practices, particularly washing and drying hands before and after contact with patients, use of protective barriers which include gloves, aprons, gowns, masks, goggles and appropriate handling and disposal of sharps and other contaminated and infectious waste and the use of aseptic techniques.

**Skin disinfectant** – an antiseptic that is intended for application on intact, healthy skin to prevent the transmission of transient or resident skin bacteria from person to person or from a surgical operation site to underlying tissue. They include antimicrobial and antiseptic soaps, hygienic hand washes, hygienic hand rubs, surgical hand rubs and surgical hand ashes.

**Single rooms** – accommodation for one patient only; it may or may not have adjacent bathroom facilities.

**Surgical hand scrub** – the purpose is to mechanically remove soil, debris and transient organisms and to reduce resident flora for the duration of surgery. It is done to prevent wound contamination by organisms from the hands and arms of HCWs.

**Soaps/detergent** – (term is used interchangeably) - cleaning products that lower surface tension to remove dirt, debris and transient organisms. Plain soap requires friction to mechanically remove organisms while antiseptic soap also inhibits or kills growth of organisms.

**Susceptible/ susceptible host** - likely to be affected: liable to being affected by something.

**Surveillance** - continual observation of activities with a specific purpose in mind.

**Sharps container** - puncture-resistant container for collecting used needles and syringes.

**Sterilization** - elimination of all microorganisms (viral, bacteria, and fungal) through heat, using an autoclave or steam sterilizer, or other appropriate methods.

**SAMRC- South African Medical Research Council**

**SM- Streptomycin**

**SLDs- Second Line Drugs**

## T

**Transient Flora** – term refers to bacteria located in the layers of skin. Transient flora are acquired through contact with patients, other HCWs or contaminated surfaces (floors, tables ) during a normal workday. These organisms live in the upper layers of skin and are most likely to cause Nosocomial infections. They are removed by hand washing.

**Transmission based precautions** – see additional precautions

**Thermal disinfection** – disinfection achieved by action of moist or dry heat.

**Toxic** - relating to or containing a poison or toxin that is deadly and that can cause serious harm or death.

**Tourniquet** - a tight encircling band applied around an arm or leg in an emergency to stop severe arterial bleeding that cannot be controlled in any other way. Used in health care setting to obtain blood specimens.

**TB-** Tuberculosis

## U

**Universal precautions** – precautions applied to the work environment, which require everyone to assume that all blood and body substances are potential sources of infection, independent of perceived risks. These precautions can be divided into standard and additional precautions.

## V

**Virus** - submicroscopic parasite: a submicroscopic parasitic particle of a nucleic acid surrounded by protein that can only replicate within a host cell. Viruses are not considered to be independent living organisms.

**Vulva** - the external female genitals. These include the clitoris and the two pairs of fleshy folds, the labia majora and labia minora, which surround the opening of the vagina.

**VHFs** – Viral Haemorrhagic Fevers (including, but not limited to Ebola, Lassa, Crimean-Congo and Marburg virus infections).

**Viral titre** - way of determining concentration of solution: a method of calculating the concentration of a dissolved substance in a known volume of test solution by adding measured quantities of a reagent of known concentration until a reaction occurs.

**VZV** – Varicella Zoster Virus

**VHF Coordinator** - Designated health officer who coordinates infection control and outbreak response, and provides liaison with the community and other agencies involved in outbreak control.

**VHF Isolation Precautions** - Barrier nursing and other infection control practices for preventing contact between VHF infectious body fluids and non-infected persons.

## X

**XDR** - Extensive Drug Resistant

**XDR-TB** - Extensive Drug Resistant Tuberculosis

**W**

**WHO** – World Health Organization

**WCH** – Windhoek Central Hospital (National Referral Hospital in the capital city with a designated unit for VHF Cases).

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