

GOVERNMENT OF THE
REPUBLIC OF SIERRA LEONE

MINISTRY OF HEALTH AND SANITATION



National Infection Prevention and Control Guidelines

SIERRA LEONE

National
Infection Prevention
and Control Guidelines

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FOREWORD



Improving the standard of health care in this nation is a key priority of our current government. The tragic events of this past year which saw many of our respected colleagues die demonstrates the importance of patient safety practices in our Health Care Facilities. Infection Prevention and Control is an essential component of patient safety. A swift introduction of the standards laid out in these guidelines will reduce to a minimum the transmission of infection at all levels of our Health Care System.

To meet the highest standards of good infection prevention and control will be challenging and will not be achieved overnight. It requires co-operation from many departments at National and District level and in each health care facility. Priorities for implementation of these guidelines will have to be agreed and introduced in a stepwise fashion to ensure a cycle of continuous quality improvement.

It is essential that all individuals adopt a positive attitude and play an active role in ensuring Infection Prevention and Control standards and practices become embedded in our Health Care system such that any non-compliance with established standards is automatically identified and rectified.

The National Guidelines on Infection Prevention and Control alongside the National Policy for Infection Prevention and Control usher in a new beginning and a sector-wide approach to the delivery of safe health care services. We welcome the support of our national and international development partners and gratefully acknowledge their contribution in helping to develop the programme for Infection Prevention and Control. These Guidelines bring to the health sector, a new beginning and a new way of doing business, and I ask that all of us support subsequent implementation.

Finally I would like to thank all institutions who have been involved in the preparation of these important guidelines. I would also like to thank all development partners for their valuable contributions and comments during its preparation.

A handwritten signature in blue ink, appearing to read 'Dr. Abu Bakarr Fofanah'. The signature is stylized and written over a horizontal line.

Dr Abu Bakarr Fofanah

Honourable Minister of Health and Sanitation

Freetown, November 2015

ACKNOWLEDGEMENTS



The First National Infection and Control Guidelines marks a landmark in the development of this field within the Health Care System of Sierra Leone. The importance of infection prevention and control in safeguarding staff and patients cannot be overstated. These guidelines are the product of hard work, consultations and collaboration between the Ministry of Health and Sanitation's National Infection Prevention Control Unit, International partners and National representatives who carefully considered and validated the development and writing of these Guidelines.

The Ministry is very grateful to each individual person (and organization) who contributed to the successful development of these guidelines, which set the gold standard for Infection Prevention and Control in the country. Achieving these standards will be challenging and requires sustained commitment but with time and effort they are achievable.

Special thanks go to the representatives at the Validation meeting who ensured that the contents of these guidelines are in keeping with practices that are already in place in Sierra Leone Health Care facilities to ensure a smooth adoption of its contents.

The Government appreciates the financial and technical support provided by the World Health Organisation (WHO) and Centre for Disease Control (CDC) for the development of these guidelines. WHO, CDC and all our health development partners have been very instrumental in encouraging this effort and will continue to support efforts to implement the guidelines throughout Sierra Leone. There will be challenges ahead but the Ministry remains optimistic that teamwork will prevail.

Finally the Ministry expresses its appreciation to all other individuals and institutions who continue to work tirelessly towards improving the safe delivery of health care services to the people of Sierra Leone.



Dr Brima Kargbo

Chief Medical Officer

Ministry of Health and Sanitation

LIST OF CONTRIBUTORS AND REVIEWERS

The National IPC Guidelines were commenced in 2014 under the leadership of the MOHS. From May-July 2015 a team of technical experts from WHO and CDC undertook a short-term project to review and refine the 2014 draft guidelines to ensure consistency with available evidence and international standards. The overall process was led by Julie Storr (WHO HQ) and Amy Kolkwaite (CDC Atlanta) under the direction of the national IPC lead for Sierra Leone.

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ABBREVIATIONS

ABHR	Alcohol based handrub
ACH	Air changes per hour
ACIP	Advisory Committee on Immunization Practices
AD	Autodisable
AII	Airborne infection isolation
AIRR	Airborne infection isolation room
ANTT	Aseptic non-touch technique
ART	Anti retroviral treatment
AZT	Azidothymidine (zidovudine)
BBF	Blood and body fluids
BSC	Biosafety cabinet
BSL	Biosafety Level
BSI	Blood stream infection
CAP	Community acquired pneumonia
CDC	United States Centers for Disease Control and Prevention
ECG	Electrocardiogram
ET	Endotracheal tube
EVD	Ebola virus disease
GoSL	Government of Sierra Leone
GMT	Good Microbiological Technique
HAI	Health care associated infection
HAP	Health care acquired pneumonia
HCF	Healthcare facility
HCW	Health care worker
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HLD	High level disinfection
HIV	Human immune deficiency virus
IPC	Infection prevention and control
IPCC	Infection prevention and control committee
ILD	Intermediate level disinfection
IMEESC	Integrated Management for Emergency and Essential Surgical Care
IPPV	Intermittent positive pressure ventilation
IV	Intravenous
LLD	Low level disinfection
LTBI	Latent TB infection
NGO	Non government organizations
MERS-CoV	Middle East Respiratory Syndrome coronavirus
MoHS	Ministry of Health and Sanitation
MSD	Musculoskeletal disease
MTB	Mycobacterium Tuberculosis
PEP	Post exposure prophylaxis
PPE	Personal Protective Equipment
PQS	Performance quality and safety
RNA	Ribonucleic acid
RUP	Reuse protection
UN	United Nations
SARS	Severe Acute Respiratory Syndrome
SI	Sharps injury
SIP	Sharps injury protection
SOP	Standard Operating Procedure
SSI	Surgical site infection
Tdap	tetanus, diphtheria and pertussis
TLV	Threshold limit value
TB	Tuberculosis
UTI	Urinary tract infection
VAP	Ventilator associated pneumonia
WHO	World Health Organization
WMSD	Workplace musculoskeletal disease
WPV	Workplace violence
XDR TB	Extensively drug resistant TB

INTRODUCTION

1.1 Background

Infection prevention and control (IPC) is universally acknowledged as a vital component of a comprehensive approach to patient and healthcare worker safety, quality improvement, and improved health outcomes. The evolving landscape of emerging infectious diseases necessitates increased awareness and attention to IPC. A strong health system, which includes a culture and infrastructure of IPC, such as improved hygiene conditions, appropriate use and availability of personal protective equipment (PPE), and improved healthcare waste management, will equip governments and communities to respond to and manage outbreaks, and will prevent the spread of infectious diseases including healthcare-associated infections (HAI). The 2014 Ebola virus disease outbreak in West Africa accelerated efforts to strengthen health systems in Sierra Leone, including the establishment of a Ministry of Health and Sanitation (MoHS)-led National IPC Unit¹. The development of national guidelines on IPC has been prioritised as one of the first outputs of the National IPC Unit.

The Sierra Leone MoHS have developed a national IPC policy to provide a framework for the development and implementation of guidelines and standard operating procedures (SOPs) in order to establish a culture of safety in healthcare facilities. With technical support from WHO and CDC, the MoHS has developed National IPC Guidelines to provide comprehensive and standardised recommendations for an improved IPC culture and infrastructure in Sierra Leone.

1.2 Rationale

IPC is concerned with patient and healthcare worker safety and is part of a multidisciplinary approach to strengthening the healthcare system. HAIs, also termed nosocomial infections, are infections occurring in a patient during the process of care in a hospital or other healthcare facility, which was not present at the time of admission, typically more than 48 hours after admission. This includes infections acquired in the healthcare system that appear after discharge, and occupational infections among facility staff. Due to limitations in surveillance and subsequent lack of data, the disease burden and economic impact of HAIs in developing countries are not well understood. However, available data suggests a disproportionate burden of HAI in Africa compared with many other parts of the world - newborns are at highest risk, with HAI responsible for 75% of all neonatal deaths².

Previously, HAIs in Sierra Leone have not been systematically tracked or studied. However, there is a consensus, informed by the 2014 Ebola outbreak that HAIs are a very real threat to patient and healthcare worker safety and need to be the subject of surveillance and investigation. In Sierra Leone, a comprehensive IPC system with national evidence-based IPC guidelines and strategies is critical to ensure IPC practices and procedures are implemented and adhered to with the aim of reducing HAIs, achieving best health outcomes, and preventing future outbreaks.

1.3 Situation Analysis

Multiple assessments conducted by the MoHS and partner organizations e.g. World Health Organization [WHO], Centers for Disease Control and Prevention [CDC] during 2014-2015 have highlighted health system vulnerabilities, with IPC singled out as a key area for improvement and action.

1 Taken from Sierra Leone National Infection Prevention and Control (IPC) Policy Ministry of Health and Sanitation.

2 BagheriNejad S, Allegranzi B, Syed SB, et al. Health-care-associated infection in Africa: a systematic review. WHO 2011;89:757–65.



► 1.4 Purpose

The key purpose of the National IPC Guidelines is to protect patients and healthcare workers from HAIs. The National IPC Guidelines are written as a reference document for IPC best practices in Sierra Leone and are intended to be used by all healthcare providers³ as part of an overall policy to assure effective and safe practices and promote a culture of continuous IPC improvement at all healthcare facilities. In addition to the National IPC Guidelines, the MoHS has previously produced disease-specific guidelines (e.g. Interim IPC guidance during the context of the Ebola outbreak in Sierra Leone).

1.5 Use of these Guidelines

Under the direction of the National IPC Coordinator, who is tasked with overseeing the development of IPC infrastructure and culture in Sierra Leone, the National IPC Unit will be responsible for the development and dissemination of guidelines and Standard Operating Procedures (SOPs) for IPC practices in Sierra Leone. The National IPC Coordinator will be responsible for managing the review process for National IPC Guidelines and associated SOPs. The National IPC Unit will review and update the National IPC Guidelines regularly, no more than every three years, to reflect changes in epidemiology, evidence, risks, best practices, and available resources.

To aid translation of the guidelines into practice, a number of conditions are important for healthcare facility leaders and managers as well as policy-level actors:

1. **Infrastructure/system change:** access to the right equipment and supplies, and an environment that is designed and planned to facilitate the guideline recommendations.
2. **Training and education:** a program of routine training, education, and periodic retraining for all personnel involved in the recommendations presented in the guidelines.
3. **Monitoring, evaluation and feedback:** a program of regular supervision and feedback is in place in relation to the guideline recommendations including a surveillance program.
4. **Awareness raising/promotion:** the practices described in the guidelines are reinforced through awareness raising (e.g., use of posters displayed in clinical areas).
5. **Safety culture:** managers and leaders at every level of the healthcare facility show their visible support for the National IPC Guidelines' recommendations to help foster, develop and reinforce a culture of patient safety and IPC.

1.6 General Policy Statements

Summary of the problem:

HAIs are a significant threat to patient and healthcare worker safety in Sierra Leone, and there is a need to improve health outcomes, prevent future outbreaks, and establish a culture of safety in healthcare facilities.

Available evidence:

Situational analyses, evidence, and lessons gathered from the 2014-2015 Ebola outbreak highlight vulnerabilities at every level of the healthcare system, which relate to IPC infrastructures and practices that contribute to the ongoing threat to the health and safety of patients and healthcare workers, including the threat of HAIs.

Policy direction:

- The MoHS of Sierra Leone have prioritized a series of actions to address the deficits in IPC across the entire health system with the aim of improving the safety of patients and healthcare workers
- Patient and healthcare worker safety can be greatly enhanced through the implementation of simple measures such as improved hygiene conditions, appropriate management of potentially infectious patients including use and availability of personal protective equipment (PPE), improved healthcare waste management and the safe use of injections, invasive devices, and blood transfusions
- The National IPC Guidelines, containing recommended instructions and practices for patient and healthcare worker safety, are an important component of a comprehensive national IPC strategy to enhance patient and healthcare worker safety. The WHO Core Components for Infection Prevention and Control (2009) describe eight features of such programmes that are considered essential and these are presented in annex 1

3 Community Health Workers, Peripheral health Units and hospitals.

- The National IPC Guidelines have been co-developed and updated by the National IPC Coordinator in collaboration with WHO and CDC, with review and approval by the Ministry of Health and Sanitation
- The Guidelines will be made readily available for healthcare workers, patients, and communities and will be updated regularly and supported by summary and other documents
- Emphasis will be placed on maximizing the dissemination and implementation of the Guidelines across all levels of the healthcare system

Annex 1: WHO Core Components of Infection Prevention and Control Programmes

Category	Component
Organization of IPC programmes	A structure responsible for policies, goals, strategies, legal, technical framework and monitoring. Existence of qualified dedicated technical staff with defined responsibilities, scope and functions. A budget adequate to meet programmed activities.
Technical guidelines	Development, dissemination and implementation of technical evidence-based guidelines for prevention of the relevant risks and/or infections, adapted to local conditions.
Human resources	Training for all health-care personnel in IPC and specialized training of infection-control professionals. Adequate staff responsible for IPC activities. Address biological risks and implement preventive measures.
Surveillance of infections and assessment of compliance with IPC practices	Established priorities for surveillance of infections and pathogens, standardized case definitions and active methods of surveillance. Systematic assessment of compliance with IPC practices. Detection of outbreaks and prompt response. Documentation of the situation of HAI and IPC practices.
Microbiology laboratory	Standardization of microbiology laboratory techniques. Promotion of the interaction between IPC activities and the microbiology laboratory. Use microbiology data for surveillance and IPC activities. Establish laboratory biosafety standards.
Environment	Minimum requirements for IPC: clean water, ventilation, handwashing facilities, patient placement and isolation facilities, storage of sterile supply, conditions for building and/or renovation.
Monitor and evaluation of programmes	Regular monitoring, evaluation and reporting of IPC outcomes, processes and strategies at national level and in health-care facilities. Promotion of evaluation in a non-punitive culture.
Links with public health or other services	Links between public health services and the facilities for events of mandatory reporting. Permanent coordination with activities related to waste management and sanitation, biosafety, antimicrobial pharmacy, occupational health, patients and consumers and quality of health care.

STRUCTURE AND MANAGEMENT OF THE IPC PROGRAMME: IPC POLICY

2.1 Responsibility and Authority

The MoHS has the responsibility for ensuring that the healthcare workforce, patients, and the community are protected from HAIs. In recognition of the need for IPC strengthening in all levels of governmental health facilities (e.g. district hospitals, peripheral health units), private, faith-based, and military facilities, the MoHS is committed to:

- Developing national IPC guidelines, policies, and standard operating procedures (SOPs)
- Establishing and supporting MoHS IPC units and IPC focal persons at the national, district, and healthcare facility level
- Establishing a system for monitoring, evaluating, and reporting key IPC indicators
- Instituting the governance structure within which these units and personnel will operate, as defined in the National IPC Policy document

The policy document provides guidance on the institution of IPC programmes at all Government of Sierra Leone (GoSL) healthcare facilities by outlining roles, responsibilities, reporting, and accountability processes at each level of the health care system. In addition, the IPC Policy document lays out the MoHS vision for the core components required to establish effective IPC programmes.

The core components include:

- Organization of IPC programme structures at national, district, and facility levels
- Technical IPC guidelines and SOPs
- Human resources needed to implement IPC practices
- HAI surveillance
- Microbiological laboratory support
- Environmental and healthcare facility infrastructure needed for IPC practices
- Appropriate use of antibiotics
- Occupational health and safety
- Financing and sustainability of IPC activities
- Monitoring and evaluation of the IPC programme
- Coordination with other directorates within the MoHS and other Ministries (e.g. Education)



For more information on the IPC policy, including IPC organization, structure, roles and responsibilities refer to the Sierra Leone MoHS IPC Policy Document

► **Annex 2: Checklist for IPC work Programme which will inform the IPC committee of progress. Not everything can be implemented at once**

Identify key priorities for the period (3 month, 6 month, 9month,12month) of the programme – **consider:**

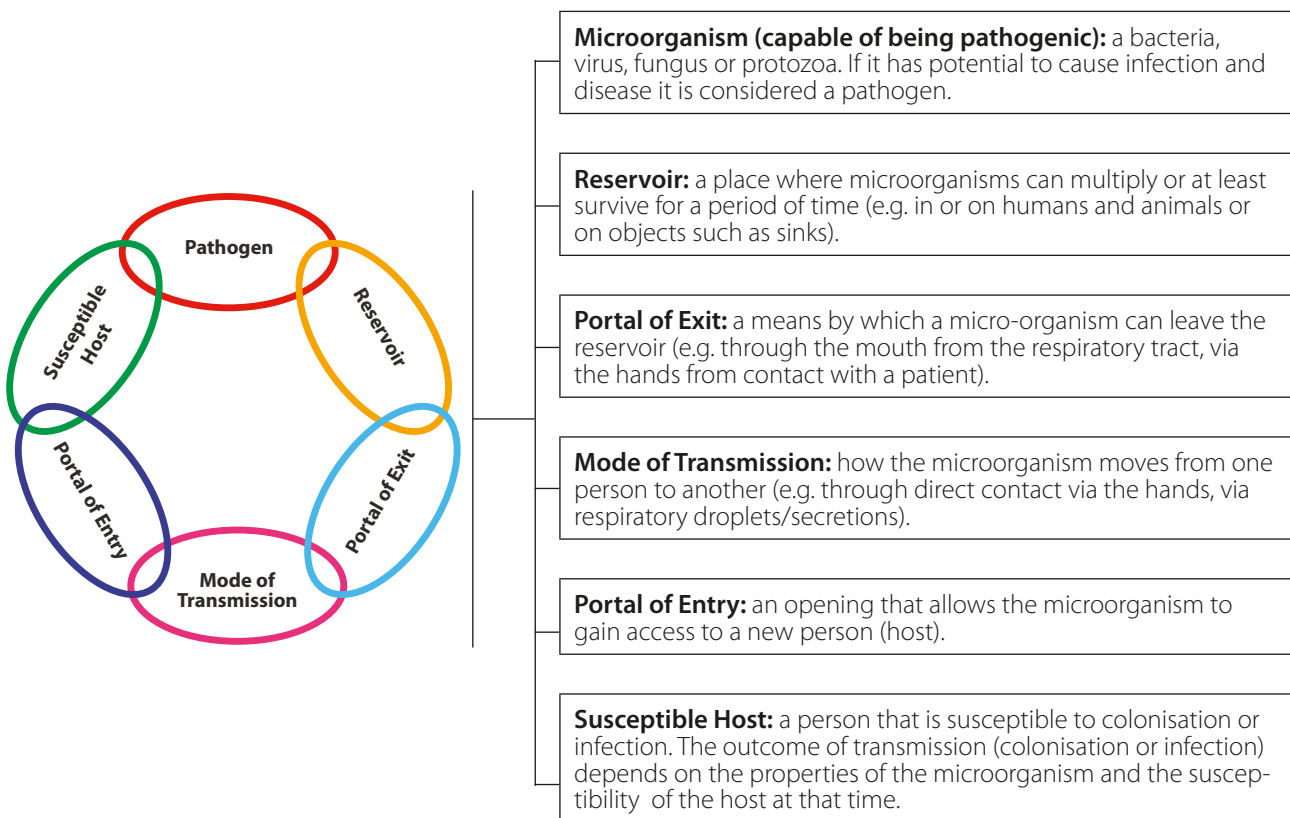
- Priorities for Policy development
 - Priorities for SOP development
 - Priorities for training
 - Priorities for surveillance
 - Systems for documenting and recording
 - Systems for monitoring implementation of agreed priorities
 - Systems for identifying and addressing blocks to implementation with clear action plan for resolution
 - Individuals responsible for delivering each aspect of the work programme
-

INTRODUCTION TO HAI AND IPC

3.1 The Chain of Infection

Understanding how infections spread and the contributory factors that facilitate spread is important in developing robust prevention approaches. The “chain of infection” is an easy way of visualising this and provides a focus for health care associated infection (HAI) prevention activities. The chain of infection illustrates the six conditions that need to be in place in order for microbes to be transmitted (figure 1). Each condition or link in the transmission chain must be present and in the sequential order shown for a microorganism to spread and cause infection. Breaking any link in the chain will prevent infection, though control measures are most often directed at interrupting the ‘Mode of Transmission’ link.

Figure 1: The Chain of Infection



3.2 IPC Principles

Infection prevention and control (IPC) strategies within healthcare are designed to break the chain of infection. IPC interventions are often targeted at specific links of the transmission chain – for example, a healthcare worker (HCW) performing hand hygiene at the correct moment will reduce the number of microorganisms on a his or her hands (reservoir), making it less likely that he or she will transfer a microorganism (mode of transmission) to others via direct contact. Hand hygiene blocks the **mode of transmission**, breaks the chain and therefore **prevents** cross infection.



The basic set of IPC strategies that should be implemented in healthcare facilities (HCFs) at all times are known as “**standard precautions**.” These evidence-based practices are designed to protect HCWs and also prevent transmission of infections among patients. Standard precautions include hand hygiene, use of personal protective equipment, practising appropriate respiratory hygiene, safe use and disposal of sharps, appropriate decontamination of medical equipment, laundry and environment and waste management.

For certain infectious diseases e.g. those considered highly transmissible and/or caused by epidemiologically important pathogens, an additional set of IPC interventions known as “**transmission based precautions**” are implemented to prevent the spread of the disease. These interventions are specific to the mode of transmission of the disease. Contact precautions are implemented to prevent transmission of diseases that are spread via contact with infectious material. Droplet precautions are used to prevent transmission of diseases that are spread via contaminated respiratory droplets. Airborne precautions are implemented to prevent transmission of diseases that can spread through aerosolized particles.



For more information on hand hygiene, standard precautions and transmission-based precautions refer to chapter 4

3.3 Common and Important HAIs

HAIs, also termed nosocomial infections, are infections occurring in a patient during the process of care in a hospital or other health-care facility, which was not present or incubating at the time of admission. HCWs are also at risk for developing HAIs. IPC programs are implemented to prevent HAIs from occurring and spreading within health facilities.

HAIs can be classified as either endogenous (also known as self infection) or exogenous (also known as cross infection) infections. IPC interventions differ between the two categories.

Endogenous infection. Many microorganisms that cause HAIs come from the patient’s own body (the term normal flora/endogenous flora is used to describe this). For example, bacteria normally present in the colon can gain entry to the urinary tract and cause urinary tract infections. Endogenous infections are difficult to prevent by conventional measures since the microorganism causing the infection comes directly from the patient. However, they can be controlled by helping to protect the resistance of the person to infection (e.g. mobilising the patient, providing adequate nutrition, or avoiding the use of urinary catheters and intravenous catheters if possible, promoting patient hand hygiene after defecation and before eating and before touching wounds/skin breaks).

Exogenous infection. Result from the transfer of microorganisms to the patient or HCW from an external reservoir. For example, microorganisms can be transferred through direct contact with contaminated hands of HCWs and other patients (cross-contamination), contaminated instruments and needles, or the environment (exogenous flora). Practicing hand hygiene at the right moment and other elements of standard precautions can greatly reduce the frequency of cross contamination between patients and HCWs and thus reduce the incidence of infection. As with endogenous infection, measures to protect a persons natural resistance to infection can also help to reduce the likelihood of infection if cross transmission does occur.

IPC is important in HCF’s because on-going cross transmission can result in certain types of microorganisms becoming established (resident) in the HCF with the potential for antimicrobial resistance to occur. In Sierra Leone it is also essential to prevent the cross transmission of infectious diseases within the Health Care Facility such as Viral Haemorrhagic Fevers, Cholera and other transmissible diseases which may not present with all the classic symptoms.

There are four major types of HAI, all related to invasive or surgical procedures: urinary tract infection (UTI), surgical-site infection (SSI), pneumonia, and blood stream infection (BSI). This chapter provides background information and prevention advice on these four and in addition a number of other significant or common infections that may be transmitted in a HCF.



For all of the HAIs addressed in this chapter the following preconditions for prevention should be addressed by HCF leaders and managers, informed by the evidence based information provided:

1. **Infrastructure/system change:** access to the right equipment, supplies and an environment that facilitates the right actions for patient and health worker safety
2. **Training and education:** a program of routine training and education for all relevant HCWs that is in line with the recommendations presented in this chapter
3. **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place
4. **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising e.g. use of posters referenced in the chapter, displayed at the point of care
5. **Safety culture:** managers and leaders at every level of the HCF show their visible support for IPC to help develop and reinforce a culture of patient safety

A. Urinary Tract Infection (UTI)

Urinary tract infection is one of the most common HAIs. Preventing UTI is a major factor in decreasing the overall incidence of HAIs in HCFs. Healthcare-associated UTIs are frequently related to urinary catheterization. Many patients with a urinary catheter develop bacteriuria (bacteria in the urine) because the catheter creates a pathway for bacteria to enter the bladder. However, it is important to make the distinction between bacteriuria and an actual urinary tract infection. Patients should not be considered to have a catheter related urinary tract infection and should not receive antimicrobial treatment solely because the urine is discoloured, has an odour, or because the laboratory has cultured bacteria from the urine. Unless the patient has clinical features of infection (e.g. fever, rigors, other systemic features) they should not be considered to have catheter related UTI.

Factors that can lead to bacteriuria and may lead to UTIs include:

- Urinary catheterization which creates a pathway that allows for endogenous transfer of microorganisms (e.g. bacteria from the patient's GI tract can be transmitted to the urinary tract)
- Passage of organisms from the urine bag to the bladder (retrograde contamination) can occur in patients with indwelling catheters
- Some microorganisms that can grow on the outside or inside of the catheter's tubing and in the urine itself
- Handling of the urinary catheter and urine bag by HCWs

Reducing Hospital-Acquired Urinary Tract Infections:

- Introducing an indwelling urinary catheter should be done only when necessary and no other options are effective. It is particularly important to limit the duration of catheterization as much as possible
- Following appropriate procedures for inserting and removing urinary catheters will also reduce the risk of UTI

Insertion Procedure for Urinary Catheter:

- Explain the procedure to the patient and get his / her consent
- It is recommended that during the procedure an assistant is available
- Before inserting a urinary catheter, all of the following materials should be available at the point of care: a sterile indwelling urinary catheter, a sterile drape, a sterile syringe filled with sterile water for blowing up the balloon, clean examination gloves, sterile gloves, antiseptic solution (2 % aqueous chlorhexidine gluconate or 10 % povidone-iodine), a sterile gauze or sponge-holding forceps, and a single use lubricant
- Lubricant is not really necessary, in case you decide to use be sure is single use
- Practice aseptic non touch technique (ANTT)
- Perform hand hygiene and put on clean examination gloves
- Clean with soap and water and rinse the urethral area and external genitals carefully and thoroughly
- Separate and hold the labia apart or hold the head of penis with the non-dominant hand and prepare the urethral area with the antiseptic solution using a sterile gauze or a sponge forceps with sterile gauze
- Perform hand hygiene and put on a pair of sterile gloves
- Grasp the catheter about 5 centimetres from the catheter tip with the dominant hand and place the other end in the urine collection bag
- Gently insert the catheter until urine flows then for a further 5 cm. Inflate the balloon. Record the volume required to inflate the balloon, the same volume should be removed when the balloon is deflated for removal



- ▶ – Do not use undue force. In the event of pain, blood or resistance during insertion stop the procedure
- If the catheter is indwelling, pull it out gently to feel resistance, and secure the indwelling catheter properly to the thigh
- For in and out catheterization, allow the urine to slowly drain into the collection bag, then gently remove the catheter
- Dispose of waste appropriately
- Remove gloves and practice hand hygiene
- **Removal Procedure for Urinary Catheter:**
 - Indwelling urinary catheters should be removed as soon as possible to reduce the risk of UTI
 - Before removing the catheter, ensure that a new pair of clean examination gloves, a syringe are in the point of care
 - Practice hand hygiene
 - Put on clean examination gloves
 - Empty the catheter balloon using a syringe, compare the volume removed to that inserted, it should be the same
 - Swab the urethra two times with an antiseptic solution using sponge forceps with sterile gauze
 - Gently remove the catheter
 - Dispose of all waste appropriately
 - Remove gloves and practice hand hygiene
- **Catheter maintenance**
 - Daily cleaning of the periurethral area
 - Do not rest the bag on the floor
 - Urine flow through the catheter should be checked several times a day to ensure that the catheter is not blocked (no dependent loops or kinking of the catheter tubing)
 - Avoid raising the collection bag above the level of the bladder. If it becomes necessary to raise the bag above the level of the patient's bladder during transfer of the patient to a bed or stretcher, clamp the tubing
 - Before the patient stands up, drain all urine from the tubing into the bag
 - Remove the urine after performing hand hygiene and while wearing clean examination gloves
 - To avoid contamination, the collection bag should be emptied in a clean fresh vessel, do not permit the tip touch the urine vessel
 - For samples collection aspirate the urine from the needleless sampling port with a sterile needle
 - Unless obstruction is anticipate bladder irrigation is not recommended
 - The catheter collection closed system should remain always closed. Unless absolutely necessary open systems can be open
 - In open system replace bags when needed
 - Clamping catheters prior to removal is not necessary
 - Daily review of urinary catheter necessity and remove as soon as indicated preferably within 24 hours
- **Consider alternatives to indwelling urinary catheter:**
 - Other methods for managing urinary tract problems that do not require the use of an indwelling catheter include intermittent catheterization using a sterile straight catheter, condom catheters for male patients, adult diaper pads, bladder retraining, or stimulating urination using running water from a nearby tap.
- **Summary tips for Preventing Infections in Catheterized Patients**
 - Ensure that only properly trained persons insert and maintain catheters
 - Minimise the duration of catheterisation. A urinary catheter should not be left in place on the basis that it is more convenient for that patient or staff than assisting the patient to walk to the toilet



For more information refer to the WHO poster: My 5 Moments for Hand Hygiene - Focus on caring for a patient with a Urinary Catheter http://www.who.int/gpsc/5may/hh-urinary-catheter_poster.pdf?ua=1

B. Surgical-Site Infections (SSI)

Surgical site infections is often the result of contamination during the surgical procedure or contamination of the surgical wound after the procedure. SSIs are very common HAIs and often require additional surgical procedures to treat the infection.

The following factors predispose a patient to development of a SSI:

- Obesity
- Infection at another body site at the time of surgery
- Immunosuppression
- Malnutrition and anaemia
- Old age and chronic diseases such as diabetes and malignancy

Reducing SSIs in patients:

- Avoid prolonged preoperative hospitalization and recommend ambulatory surgery as often as possible
- Avoid preoperative hair removal. If hair must be removed, clip it with scissors or electric clippers just before the surgery. Do not shave using a razor blade (shaving has been attributed to microscopic cuts in the skin that later serve as foci for bacterial multiplication)
- In the surgical room prepare a wide area around the proposed incision site with antiseptic solution (2% alcohol chlorhexidine is generally appropriate)
- Practice good surgical techniques that minimize tissue trauma, control bleeding, eliminate dead space, use minimal sutures, and maintain adequate blood supply and oxygenation
- Keep the duration of surgical procedures as short as possible. The rate of infection doubles with each hour of surgery
- Discharge patients promptly after surgery
- It is important to note that applying topical antibiotic ointments on closed skin incisions does not decrease the risk of SSI. Additionally, healthy tissue growth is damaged when dry gauze is removed from surgical wounds. Moisten the dry gauze with sterile normal saline solution before removing it
- **Antimicrobial Prophylaxis to Reduce the Risk of SSI:**
 - The administration of systemic antimicrobial agents immediately before surgery can reduce the incidence of SSI after certain operations. The benefits, however, must be weighed against the risks of toxic and allergic reactions, the emergence of resistant bacteria, drug interactions, super infection, and cost. In general, antimicrobial prophylaxis is recommended for procedures with significant risk of infection (for example, surgery that involves entering the colon). The prophylactic antimicrobial drug(s) should be directed against the most likely infecting organisms.
 - To help reduce the development of antimicrobial resistance to drugs used for surgical prophylaxis, it is recommended that:
 - *Antimicrobial agents with a moderately long half-life should be used*
 - *Antimicrobial agents with an appropriate spectrum of activity should be used*
 - *The antimicrobial agent(s) used prophylactically differ from any agents used for a period of time just before surgery, as antimicrobial-resistant bacteria may have developed*
 - *Selection of antimicrobial agent(s) for surgical prophylaxis should take account of local/national data on antimicrobial resistance where this is available*
 - Each HCF should have a clear written policy of antimicrobial prophylaxis in surgery that specifies for which types of surgery and which patient categories antimicrobial prophylaxis is required, the agent(s) to be used, the dose, the route of administration, the interval before surgery and an alternative regimen for patients with a history of adverse reaction to the primary regimen
 - Agents commonly used for abdominal surgery are co-amoxiclav (amoxicillin/clavulanic acid), the combination of cefotaxime and metronidazole, or for those with a history of immediate hypersensitivity to beta-lactam antimicrobial agents, the combination of ciprofloxacin and metronidazole. All of these agents are included in the WHO Model List of Essential Medicines 17th List (2011) available at http://whqlibdoc.who.int/hq/2011/a95053_eng.pdf
 - In most instances, a single IV dose of an antimicrobial administered 60 minutes or less before the skin incision provides adequate levels of antimicrobial within the tissues throughout the operation. If surgery is prolonged (more than four hours), if major blood loss occurs, or if an antimicrobial with a short half-life is used, one or more additional doses should

- ▶ be given during the procedure
- Detailed guidelines on Antimicrobial Prophylaxis in Surgery are freely available from a number of sources including the following e.g. The Infectious Diseases Society of America ([http://www.idsociety.org/antimicrobial_agents/#Antimicrobial Prophylaxis for Surgery](http://www.idsociety.org/antimicrobial_agents/#Antimicrobial_Prophylaxis_for_Surgery)).



For more information refer to the WHO Surgical Safety Checklist <http://www.who.int/patientsafety/safesurgery/checklist/en/> and the Integrated Management For Emergency and Essential Surgical Care (IMEESC) toolkit <http://www.who.int/surgery/publications/imeesc/en/>

C. Health Care-Associated Pneumonia

Healthcare associated pneumonia (HAP) is a common HAI with a significant risk of a fatal outcome. Most of these infections occur by aspiration of bacteria growing in the back of the throat or in the stomach. Pneumonia associated with mechanical ventilation may be referred to as ventilator associated pneumonia (VAP). The range of microorganisms associated with HAP/VAP is much wider than is the case for community acquired pneumonia (CAP) and many of these microorganisms are much more likely to be resistant to antimicrobials. Therefore HAP/VAP may be much harder to treat effectively with antimicrobial agents than CAP.

Intubation and mechanical ventilation greatly increase the risk of pneumonia in the following ways:

- They block the normal body defence mechanisms—coughing, sneezing, and the gag reflex
- They prevent the washing action of the cilia and mucus-secreting cells that line the upper respiratory system
- They provide a direct pathway for microorganisms to get into the lungs

Other procedures that could increase the risk of pneumonia include oxygen therapy, intermittent positive pressure ventilation (IPPV) treatment, and endotracheal suctioning. The combination of severe illness, the presence of multiple invasive devices (intravenous catheters, urinary catheters, and mechanical ventilators), and frequent contact with the hands of HCWs often leads to cross-contamination and patient infection.

Risk Factors:

The following risk factors are associated with healthcare-associated pneumonia:

- Old age (over 70)
- Chronic lung disease
- Severe head injuries with loss of consciousness
- Severe medical conditions, such as end-stage renal disease and liver cirrhosis
- Cigarette smoking
- Alcoholism
- Obesity
- Major cardiovascular or pulmonary surgery
- Endotracheal intubation and mechanical ventilation
- Prolonged confinement to bed
- Immune deficiency states eg HIV
- Diabetes

Reducing health care associated pneumonia - Preoperative Pulmonary Care:

- Antimicrobial Prophylaxis to Reduce the Risk of SSI:
 - Limit the use of narcotics although not to a degree that will compromise appropriate pain relief
 - Adhere to standard precautions to maximize prevention of cross-transmission of microorganisms
 - Additionally, patients should be educated about the following postoperative practices that can prevent development of healthcare-associated pneumonia:
 - Deep breathing
 - Moving in bed



- ▶ – *Frequent coughing*
- Early ambulation i.e. getting up and walking about (note if urinary catheter is inserted for surgery, early removal can help to prevent catheter associated UTI and encourage early ambulation)

Reducing health care associated pneumonia - Prevention of complications from equipment/devices:

- **To reduce the risk of contamination and possible infection from mechanical respirators and other equipment follow these guidelines:**
 - Use mechanical ventilation only when necessary
 - Implement a comprehensive oropharyngeal cleaning this includes suctioning to avoid draining past the tube and consider decontamination program for all patients at high risk for VAP
 - If reusable breathing circuits are used they must be cleaned and appropriately sterilized between patients according to the manufacturers guidance. Disposable (single patient use) breathing circuits eliminate this risk of cross-transmission but are expensive. Breathing circuits intended for single patient use are not suitable for cleaning, decontamination and reuse
 - Disinfect or sterilize resuscitation devices, such as Ambu bags, promptly according to the manufacturers guidelines
- **To minimize cross-contamination when suctioning patients on ventilators, follow these guidelines:**
 - Practice hand hygiene
 - Wear sterile examination gloves, a mask, and protective eyewear
 - Use only sterile fluid to clear a catheter that you're using to suction secretions from the patient's lower respiratory tract if you are planning to reinsert it into the ET tube*
 - Discard waste appropriately
 - Decontaminate and clean suction catheters and then disinfect them with high-level steam
 - Remove gloves immediately after therapy and practice hand hygiene

Reducing health care associated pneumonia - Preventing Gastric Reflux

- **Follow these practices to reduce the risk of gastric reflux, which can lead to healthcare-associated pneumonia:**
 - Avoid prolonged use of nasal gastric tubes for feeding
 - Feed small, frequent amounts rather than large amounts at one time
 - Elevate the head (30-45 degrees), if not contraindicated so that the patient is in a semi sitting position
 - Ensure patients stop taking solid foods 4-6 hours prior to general anaesthetic

Reducing health care associated pneumonia - Postoperative Management

- **Surgical units should have effective plans for postoperative management that include the following guidelines:**
 - Provide adequate pain control for patient comfort and to facilitate movement and encourage deep breathing/coughing
 - Move and exercise patients daily to prevent skin breakdown and pressure sores
 - Encourage deep breathing/coughing in the immediate postoperative period and for the next few days
 - Encourage early mobilization of patients
 - Ensure adequate nutrition



For information on My Five moments - Focus on caring for a patient with an endotracheal tube
http://www.who.int/gpsc/5may/HH15_Endotracheal_WEB_EN.pdf?ua=1

D. Infections Related to Use of Intravascular Devices

Intravascular devices inserted into the venous or arterial bloodstream penetrate the normal skin defence mechanism and provide a route for microorganisms to enter the bloodstream from one or more of the following:

- Any contamination of the device at the time of insertion
- Subsequent contamination of the device or attachments



- ▶ • Pathogens on the skin surrounding the insertion site

Intravascular device related infection may be localised skin and soft tissue infection at the site of the intravascular device (exit site infection, phlebitis). Localised infection is typically associated with *Staphylococcus aureus*. The infection may extend to cause extensive skin and soft tissue infection of the limb and can progress to bloodstream infection. Intravascular devices may also be associated with bloodstream infection with little or no evidence of infection at the catheter site. *Staphylococcus aureus* is again the most common associated organism. For these reasons intravascular catheter related infection should be considered in any patient who develops a new onset blood stream infection with an intravascular device in situ, particularly if there is no other obvious site of infection (e.g. pneumonia). Where available a sample for blood culture should be taken using appropriate precautions to aid in diagnosis of patients with suspected severe intravascular catheter related infection. One of the most important principles of safe management of intravascular catheter related infection is early removal of the catheter. Antimicrobial treatment is unlikely to be effective if the catheter remains in place.

Risk Factors:

The following risk factors are associated with infections related to the use of intravascular catheters:

- Inadequate adherence to hand hygiene during insertion and care of the device
- Immunosuppression
- Cracks in infusion bottles and punctures in plastic containers, allowing for contamination of substance being infused
- Contaminated infusion fluid or additives
- Leaky intravenous administration sets with multiple connections
- Non sterile preparation of intravenous infusion fluid
- Non sterile preparation of skin before inserting the device
- Multiple changes of intravenous fluid containers while using the same IV administration set
- Multiple injections and irrigations of the system
- Central venous pressure measurement apparatus

Reducing the Risk of HAIs with Intravascular Catheters:

The following practices should help reduce the risk of infection:

- Avoid intravascular catheterisation when possible
- Practice hand hygiene and put on clean sterile gloves when inserting and handling intravenous catheters
- If the site for inserting the catheter is dirty, wash it with soap and clean water and dry it before applying the skin antiseptic
- Allow the skin antiseptic solution to dry after applying before inserting the intravascular catheter
- Follow Aseptic Non Touch Technique (ANTT) in insertion and care of intravascular lines
- Fix the device in place by attachment to the skin. Ideally use transparent, adherent dressings to allow easy inspection of the site later
- Dressings can be left in place for up to 72 hours if they are kept dry. Change the dressing immediately if it becomes wet, soiled, or loose
- If dressings are removed to inspect the site discard the removed dressing appropriately and use a new dressing
- If there is resistance to withdrawal of blood or injection of drugs through an intravascular catheter do not use force. The catheter is likely to need replacement
- Check at least daily if the patient has pain or discomfort at the site of the intravenous line. If palpating the cannula site daily for tenderness be careful to practice hand hygiene, wear sterile gloves and avoid touching the puncture site. Inspect the insertion site if the patient develops tenderness or fever
- For peripheral IV lines avoid using the lower limbs if possible as these are more likely to become infected
- Routine change of intravascular catheters after 72 hours is not necessary provided that there is no evidence of infection and there is no resistance to injection or fluid administration
- Because straight and butterfly needles frequently infiltrate, do not use them with solutions that could cause tissue necrosis



► For inserting central venous catheters:

- Avoid use of central venous catheter unless it is essential
- Avoid using the femoral or jugular sites for adults (if possible)
- Central venous catheters should only be inserted by those with substantial experience in the procedure or by those in training under direct supervision of a person with substantial experience. Infection is more likely if inexperienced HCWs insert the catheter
- Wash the catheter insertion site with soap and clean water and dry it before applying the skin antiseptic
- Prepare the skin using alcoholic 2 % chlorhexidine gluconate or 60 % to 90 % alcohol and allow to dry
- Perform hand hygiene and use ANTT/maximal sterile barrier precautions (i.e., surgical mask, cap, gown, sterile gloves) and sterile full body drape on the patient
- Put on sterile gloves, face shield and gown before inserting central venous catheter
- Handle and maintain central lines appropriately
- Comply with hand hygiene requirements
- Scrub the access port or hub immediately prior to each use with an appropriate antiseptic (e.g., alcoholic chlorhexidine, povidone iodine, an iodophor, or 70% alcohol)
- Access catheters only with sterile devices
- Replace dressings that are wet, soiled, or dislodged
- Perform dressing changes under aseptic technique using clean or sterile gloves

Changing Fluids and Infusion Sets

Follow these guidelines for changing fluids and infusion sets in patients:

- Change infusion bottles or plastic bags with parenteral solutions every 24 hours (or follow facility guidelines)
- Change infusion bottles or plastic bags with lipid emulsion given alone within 12 hours
- Change infusion sets whenever they are damaged/contaminated and after 96 hours routinely
- If the tubing becomes disconnected, wipe the hub of the cannula with 60 % to 90 % alcohol and connect a new infusion set
- Replace tubing that is used to administer blood products or lipid emulsions within 24 hours

Inserting and Maintaining Peripheral IV Lines

Follow these practices to reduce the risk of infection when inserting and maintaining peripheral intravascular catheters:

- Avoid use of intravascular catheters unless essential
- Practice hand hygiene and wear sterile single-use examination gloves
- Cleanse the insertion site with antiseptic solution using a circular motion outward from the insertion site (or follow manufacture's recommendation for cleansing site) and allow the antiseptic solution to dry
- Avoid use of intravascular catheters unless essential
- Practice hand hygiene and wear clean single-use examination gloves
- Cleanse the insertion site with antiseptic solution using a circular motion outward from the insertion site (or follow manufacture's recommendation for cleansing site) and allow the antiseptic solution to dry

Removal Procedure:

Follow these practices to reduce the risk of infection when removing peripheral IV lines:

- Practice hand hygiene
- Put on sterile examination gloves
- Check the patient's hand or wrist for phlebitis or evidence of infection. If phlebitis is associated with other signs of infection, such as fever or pus coming from the exit site, this is classified as a clinical exit-site infection
- Carefully remove the needle or the plastic catheter with one hand and with the other hand cover the insertion ►►

- ▶ site with sterile gauze
- Press the insertion site firmly for about a minute and cover it with a sterile bandage
- Dispose of waste appropriately, remove gloves, and practice hand hygiene
- If clinical exit site infection is present, assess whether or not it requires antimicrobial treatment
- Document clinical observations of IV site (ex. Intact without signs/symptoms of infection, warm, erythema, pus etc) in patient record



For information see *My Five Moments - Focus on caring for a patient with a central venous catheter* | http://www.who.int/gpsc/5may/HH15_CentralCatheter_WEB_EN.pdf?ua=1 and
My Five Moments - Focus on caring for a patient with a peripheral venous catheter | http://www.who.int/gpsc/5may/HH15_PeripheralCatheter_WEB_EN.pdf?ua=1

Common pathogens responsible for HAI

E. Healthcare-Associated Diarrhoea

What:

Diarrhoea is generally defined as passage of 3 or more liquid stools in 24 hours. In some cases however the abrupt onset of illness with passage of a single liquid stool leaves little doubt that the patient will meet the definition of diarrhoea soon afterwards and it is sensible to consider that the patient has diarrhoea. New onset passage of loose stool in patients admitted to HCF is common. It is not always caused by infection although this should be considered as likely in most cases.

Risk Factors:

Factors that put patients at particular risk for healthcare-associated diarrhoea include the following:

- Antimicrobial administration (especially for *C. difficile* associated diarrhoea)
- Sharing space with a patient who has infectious diarrhoea
- Occupying space previously occupied by a patient with infectious diarrhoea
- Immunosuppression
- Decreased gastric acidity (for example in patients taking drugs to suppress gastric acid)
- Unhygienic shared toilet facilities
- Inadequate hand hygiene by patients and staff at the correct moments

How it spreads:

Causes of food and water borne infectious diarrhoea which are important in the community (rotavirus, campylobacter, salmonella, cholera) can also be introduced into a HCF by patients and staff if the water supply is not safe; if food is not properly prepared, stored and served; if infected staff come to work while they have diarrhoea; or if infected people visit relatives. Once introduced to the hospital, diarrhoeal infection may be spread through person-to-person transmission.

Prevention:

- Ensure 5 Moments for Hand Hygiene
- Single room isolation, cohorting in a separate space or keeping distance between patients should be practiced for all patients with diarrhoea even if the diarrhoea is considered to be non-infectious. This is because patients with diarrhoea are highly likely to contaminate their environment with their colonic bacteria. These bacteria may include antimicrobial resistant bacteria that could cause infection in other vulnerable patients
- Ensure that all patients admitted with diarrhoea or who develop diarrhoea in the HCF are kept in separate space and use separate washing and toilet facilities if at all possible (i.e. isolation)
- If a separate space is not possible consider how to help the patients with diarrhoea keep some distance from other patients
- Immediately clean and then disinfect all soiled articles and environment
- Ensure that bedpans and bathroom equipment that are regularly handled by patients and staff are clean at all

- ▶ times and are disinfected when appropriate
- Wear utility or heavy-duty gloves before sorting out linen, and bundle soiled linen to prevent leakage
- Ensure that staff with diarrhoea are not engaged in patient care or food preparation and serving until at least 24 hours after diarrhoea has resolved



Refer to chapter 4 for further information on standard and transmission based precautions and isolation

F. Blood Borne Pathogens

Blood-borne transmission of viral infection is a recognised risk to both healthcare workers and the patients in their care. In health care, transmission of blood-borne viruses may occur by injection, infusion, transplantation, unsterile equipment, or other accidental injury/penetration. The risk of transmission of infections can be reduced by eliminating hazards, providing and using engineering controls, avoiding unsafe practices, using personal protective equipment, immunisation, and post-exposure prophylaxis.

Hepatitis B virus (HBV), Hepatitis C virus (HCV) and HIV virus are important blood-borne pathogens that can be transmitted in the health care setting through administration of blood and blood products, use of contaminated needles or sharps injuries.



Refer to chapter 4 for further information on standard precautions, injection safety and prevention of sharps injuries and chapter 6 occupational safety and employee health

G. Ebola Virus Disease and other Viral Haemorrhagic Fever

Ebola Virus Disease (EVD) and other Viral Haemorrhagic Fevers (VHF) are uncommon in HCF in general, but given recent experience in Sierra Leone it is vital that all HCWs have a basic knowledge of these conditions and how to prevent transmission in HCFs.

The key to reducing the risk of transmission of EVD in HCFs is twofold – maintenance of a very high level of adherence to standard precautions at all times and strictly adhering to EVD IPC precautions in patients with EVD-like symptoms. In particular great care should be taken with undiagnosed seriously ill febrile patients with diarrhoea and undiagnosed fever in women in childbirth. It is possible to care for such patients safely and appropriately by following standard precautions and additional transmission based precautions. All health care workers should be vigilant for such cases and alert their supervisor immediately of cases that may suggest EVD. Remember that EVD has an incubation period of up to 3 weeks so that even if the patient had no features of EVD on admission a febrile illness that develops some days later could still be EVD. Triage screening, isolation, assessment and testing on admission and each shift needs to be maintained. This is part of good clinical practise in monitoring the condition of any patient. Testing for EVD and other infectious diseases should be carried out promptly.



For more information on EVD refer to MOHS EVD SOP

► H. Tuberculosis

What:

Tuberculosis (TB) is a bacterial infection caused mainly by the species *Mycobacterium tuberculosis*.

How it spreads:

Transmission of TB is through the airborne route when someone with active disease (untreated smear-positive) coughs, talks, sneezes, or spits. The bacteria can then be inhaled into the lung by people nearby.

Only patients who develop lung disease generate the aerosols that allow for airborne spread of TB. Patients with TB at sites other than the lung (e.g. bone or kidney) generally do not transmit infection.

Diagnosis:

Tuberculosis is usually identified by laboratory examination of a sputum sample. Follow these procedures for patients who are suspected of having TB:

- Initial evaluation and testing is best done on an outpatient basis if possible
- Collect a sample of sputum for smear examination as a matter of urgency. Where available rapid molecular testing may be preferred
- Disposable, non-transparent sputum cups with lids should be used for sample collection
- Perform a chest X ray to aid diagnosis when available

Prevention:

IPC measures include engineering controls, administrative controls, and personal protective equipment.

- Initiation of effective treatment rapidly reduces the risk of infection from infected patients
- All HCFs should be assessed to identify areas where TB transmission can occur
- Adequacy of airflow and natural light should be determined
- In areas where airflow by cross-ventilation is inadequate, extractor fans should be installed
- Natural light should be increased where necessary
- Patients who are coughing in the outpatient clinic or emergency department should wait outside if possible, or in a well-ventilated area. Signs reminding patients about respiratory hygiene precautions, such as the use of tissues when coughing should be displayed prominently
- Patients suspected of having TB should be examined in a well-ventilated area
- The patient should wear a surgical mask if possible
- HCWs treating patients with TB should wear a mask, ideally a fitted respiratory protection mask. Work in the patient area should be planned so as to be performed as efficiently as possible to limit time spent there
- If a patient who is suspected of having TB is admitted to an inpatient ward, they should be placed in either a separate, well-lit, and well-ventilated room or with additional patients suspected of having TB in a cohort area of the ward
- Patients with MDR or XDR TB should be nursed in isolation
- The sputum smear result/molecular test result should be returned to HCWs on the inpatient ward within 24 hours so that the patient can be treated as soon as possible
- Supplies of respiratory protection (N95 or equivalent) masks may be limited. If so, they should be conserved for high-risk situations such as when performing or assisting with bronchoscopy, endotracheal intubation, suctioning, or autopsy of TB cases
- When the patient needs to move within the hospital, he or she should wear a mask. Inform staff in the area or ward to which the patient is taken or transferred so that they can implement effective IPC measures
- For patients on TB treatment, delay any operative procedures until the patient is no longer infectious if it is safe to do so [TB-infected patients who have received adequate treatment for 2 to 3 weeks, have responded to the treatment, and have had three consecutive negative smear examinations from sputum taken on 3 separate days are no longer infectious]. It will take about 2 months for most infectious TB patients to become noninfectious. This is more complex however in situations where MDR* and XDR** TB are common, as standard initial therapy is generally ineffective for these patients



- ▶ • If emergency surgery is required it should be planned to minimise risk of occupational exposure. Numbers of HCWs in the operating room should be minimised and respiratory protection masks should be worn as appropriate
- Every patient that is confirmed to have TB via laboratory smear should be informed of their positive result
- It is a public health requirement under the National Public Health Act that diagnosed cases of every form of TB should be reported to the Ministry of Health using the relevant TB notification form(s)
- Contact tracing for screening should be performed and the patient should be monitored to ensure full compliance with treatment

*MDR - Multidrug resistant

**XDR Extensively drug resistant

Annex 1: Additional information on important pathogens

<p>Tuberculosis</p>	<p>Tuberculosis (TB) is a bacterial infection caused mainly by the species <i>Mycobacterium tuberculosis</i>. Transmission of TB is through the airborne route when someone with active disease (untreated smear-positive) coughs, talks, sneezes, or spits. The bacteria can then be inhaled into the lung by people nearby. In most otherwise healthy adults and older children there is no disease or very mild disease in the short term. In infants and others with impaired immune function, other clinical presentations of TB, including meningitis, may develop in weeks or months. Once <i>Mycobacterium tuberculosis</i> has become established in the body it can remain there for extended periods of time. In some infected people, <i>Mycobacterium tuberculosis</i> may start to grow again many years after first infection and cause disease. This is more likely to happen if the person's immune function has declined. The most common site for development of secondary disease is the lung, accounting for about 2/3 of all cases. Only patients who develop lung disease generate the aerosols that allow for airborne spread of TB. Patients with TB at sites other than the lung (e.g. bone or kidney) generally do not transmit infection. Tuberculosis is usually identified by laboratory examination of a sputum sample. Initiation of effective treatment rapidly reduces the risk of infection from infected patients.</p> <p>The BCG vaccine offers protection against <i>Mycobacterium tuberculosis</i>. If given at birth, the vaccine can help protect infants from severe primary disease. BCG vaccine does not offer strong protection to adults from developing lung infection. Since BCG is not particularly effective in preventing lung disease in adults, HCWs must know that precautions.</p>
<p>Blood-Borne viruses</p>	<p>HBV* is associated with severe acute hepatitis in a high proportion of adults who become infected and some progress to develop chronic infection with long-term risk of liver cirrhosis and liver cancer. If blood or body fluids contaminated with HBV are passed through the skin through an injection or sharps injury, or if contaminated blood and body fluids come into contact with a cut, area of broken skin, or mucous membranes of a non-immune patient or HCW, there is a high risk of infection. HBV transmission is a risk for patients and staff. All HCW students and workers should be vaccinated against HBV before commencing clinical work.</p> <p>HCV** is associated with acute hepatitis in some adults who become infected, but many adults with HCV have asymptomatic infections. A high proportion of infected people develop chronic infection with some long term risk of liver cirrhosis. HCV is transmitted in the health care setting in similar ways to HBV. However, the risk of infection from a single exposure incident is substantially less in most cases. There is no vaccine to protect against HCV virus infection. Hepatitis C virus transmission in a HCF is a risk for patients and staff.</p> <p>HIV virus infection is sometimes associated with an acute illness some weeks after infection but this is not present in all patients or may pass unnoticed. Infection is life long and if untreated will progress to AIDS and associated complications. Treatment is highly effective in preventing progression from HIV infection to AIDS. HIV is transmitted in similar ways as HBV and HCV. HIV transmission in HCF is a risk to patients and staff. There is no vaccine against HIV.</p> <p>The fact that HBV, HCV and HIV cause chronic, long term infections, mean that many patients admitted with other acute illness may be infected with these blood borne pathogens. They may not know they are infected, and it not possible to tell if they are infected without laboratory testing. It is therefore essential to treat all patients as if they are infected with one or more of these viruses to avoid putting HCWs at risk for infection. HCWs infected with one or more of these viruses can work safely at most tasks but should not be involved in procedures that put patients at risk of exposure to the HCW's blood (unless carefully evaluated and declared safe to do so).</p>
<p>Diarrhoeal illness</p>	<p>There is not much information about the causes of healthcare associated diarrhoea in Sierra Leone but in many countries common causes include Norovirus infection (usually self-limiting) and <i>Clostridium difficile</i>. <i>Clostridium difficile</i> associated diarrhoea (CDAD) may be associated with progression to life threatening infection. CDAD is more likely to occur in patients who are receiving antimicrobial agents.</p>

**HBV - Hepatitis B Virus

**HCV - Hepatitis C Virus

STANDARD PRECAUTIONS AND TRANSMISSION BASED PRECAUTIONS

4.1 Standard Precautions General

Standard Precautions represent the minimum infection prevention measures that **apply at all times to all patient care, regardless of suspected or confirmed infection status of the patient**, in any setting where healthcare is delivered. These evidence-based practices are designed to protect HCWs and prevent the spread of infections among patients. Standard Precautions are based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents. In addition to the consistent use of Standard Precautions, additional precautions may be warranted in certain situation. These additional (Transmission based) precautions may be needed when the route of transmission is not completely interrupted using Standard Precautions alone.

Standard precautions include:

- Hand Hygiene
- Personal Protective Equipment (PPE) appropriate for the level of care being given or the potential infection risk associated with an activity, even when there is no known risk of infection
- Respiratory hygiene and cough etiquette
- Injection and phlebotomy safety and sharps injury prevention
- Safe decontamination and sterilization of medical equipment
- safe handling of Linen and laundry
- Environmental decontamination
- Healthcare waste management

Policies and Standard operating procedures covering all these areas need to be implemented at all times to minimize the risk of transmission of infection from an unrecognized source be it an individual, contaminated equipment, linen or waste. **Every person working within a healthcare facility should familiarize themselves with all standard precautions and ensure they are compliant at all times.**

► 4.2 Hand Hygiene

Hand hygiene is the single most important infection prevention and control (IPC) precaution and one of the most effective means to prevent transmission of pathogens within health care services. Hand hygiene is a general term that includes handwashing, antiseptic hand rub, and surgical hand antisepsis.

Handwashing - action of performing hand hygiene for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms.

Alcohol hand rub – applying an antiseptic handrub to reduce or inhibit the growth of microorganisms without the need for a water source and requiring no rinsing or drying with towels or other devices.

Surgical hand antisepsis - antiseptic handwash or antiseptic handrub performed preoperatively by the surgical team to eliminate transient flora and reduce resident skin flora. Such antiseptics often have persistent antimicrobial activity.



WHO Guidelines on Hand Hygiene in Health Care. 2009
<http://www.who.int/gpsc/5may/tools/9789241597906/en/>

4.2.1 Methods Used for Hand Hygiene

Hand hygiene refers to any action of hand washing or disinfection using any of the following 3 methods:

1. Alcohol hand rub (minimum 60% alcohol)
2. Soap and water
3. Surgical hand hygiene (either alcohol rub or antimicrobial detergent)

Although chlorine solution rub (0.05%; 500 ppm) has been widely used in Sierra Leone during the Ebola emergency where standard hand hygiene products were unavailable it is not a standard hand hygiene method. It is no longer recommended.

1. Alcohol hand rub

Alcohol hand rub is the first choice for hand hygiene if hands not visibly soiled as it is:

- More effective in killing microorganisms than antimicrobial hand-washing agents or plain soap and water
- Faster to perform than hand washing
- Can be placed directly at point of care
- Can be used without sink, water, or towelling
- Kinder to hands than other methods

2. Soap and Water

When the hands are visibly soiled or contaminated with blood or body fluids, or feel soiled, do not use a hand rub — they must be washed with soap and running water. Water should be visibly clean. Liquid or bar soap is acceptable, however when bar soap is repeatedly exposed to water, the surface may begin to liquefy, increasing the risk of bacterial contamination. For this reason, liquid soap is preferred when it is available. If bar soap is used it should be stored between use in a manner that allows water to drain away from the soap (e.g. on a rack).



- ▶ Soap and water can still be used even where there is no piped water. If piped water is not available, you can use one of the following methods:

1. A bucket with a tap (veronica bucket),
2. A pitcher or a jug to pour water over hands with the help of an assistant,
3. A foot-operated device or “tippy tap”.



3. Surgical Hand Hygiene

Prior to performing any surgical procedure, hand washing with antiseptics must be performed to remove transient organisms, reduce resident organisms and prevent growth of microorganisms. Surgical hand hygiene also reduces the risk of transmitting organisms to the patient if the surgeon's gloves develop holes, tears, or nicks during the procedure.

4. Chlorine solution for hand disinfection

It is MoHS policy that alcohol rub and soap and water be readily available and the standard materials for hand hygiene. Chlorine solutions have limitations and can be an irritant to eyes, skin and mucous membranes and as such should be no longer recommended.

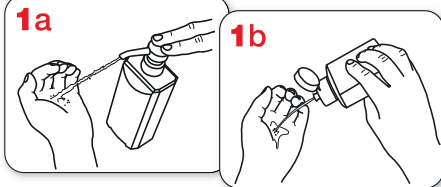
4.2.2 How to Perform Hand Hygiene

Proper hand washing or hand rubbing steps and techniques are important to follow to ensure all parts of the hands are cleansed. Below is a summary and a figure describing the steps:

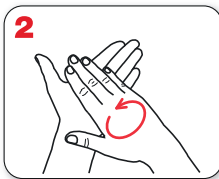
- Hand antiseptics with an alcohol-based handrub (20-30 sec): apply enough product to cover all areas of hands; rub hands until dry
- Hand washing (40–60 sec): Wet hands and apply soap; rub all surfaces; rinse hands and dry thoroughly with a paper-towel; use towel to turn off faucet. Always dry hands after washing with soap and water as described below

Steps on How to Properly Cleanse Hands with Soap and Water or Alcohol Hand Rub

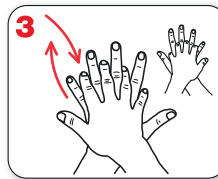
How to handrub? WITH ALCOHOL-BASED FORMULATION



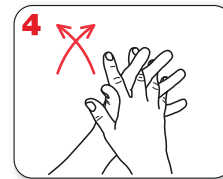
Apply a palmful of the product in a cupped hand and cover all surfaces.



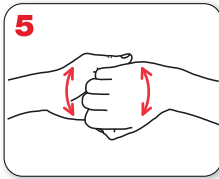
2 Rub hands palm to palm



3 right palm over left dorsum with interlaced fingers and vice versa



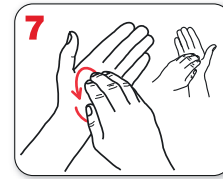
4 palm to palm with fingers interlaced



5 backs of fingers to opposing palms with fingers interlocked



6 rotational rubbing of left thumb clasped in right palm and vice versa



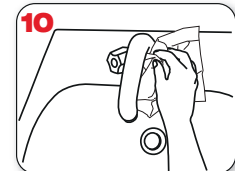
7 rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa



8 rinse hands with water



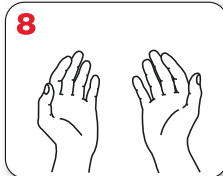
9 dry thoroughly with a single use towel



10 use towel to turn off faucet



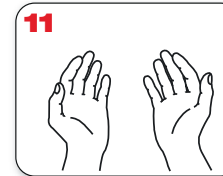
20-30 sec



...once dry, your hands are safe.



40-60 sec



...and your hands are safe.

Design: monofragilis network

► Drying Hands

Hands must always be dried after using Soap and water . Do not use common or shared towels. These might harbour microorganisms and contaminate hands even after proper hand washing or hand rubbing. Use disposable paper or tissue , or single-use hand towels. If these are not available hands should be air-dried. Do not dry hands on personal clothes or on wet soiled towels.

4.2.3 When to Perform Hand Hygiene

Healthcare Workers and Carers

There are five moments during health care delivery when hand hygiene **must** be performed to prevent transmission of germs to or between patients and to protect the HCW or care giver:

5 Moments of Hand Hygiene

1	BEFORE PATIENT CONTACT	WHEN? Clean your hands before touching a patient when approaching him or her WHY? To protect the patient against harmful germs carried on your hands
2	BEFORE AN ASEPTIC TASK	WHEN? Clean your hands immediately before any aseptic task WHY? To protect the patient against harmful germs, including the patient's own germs, entering his or her body
3	AFTER BODY FLUID EXPOSURE RISK	WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal) WHY? To protect yourself and the health-care environment from harmful patient germs
4	AFTER PATIENT CONTACT	WHEN? Clean your hands after touching a patient and his or her immediate surroundings when leaving WHY? To protect yourself and the health-care environment from harmful patient germs
5	AFTER CONTACT WITH PATIENT SURROUNDINGS	WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving - even without touching the patient WHY? To protect yourself and the health-care environment from harmful patient germs

Source: http://who.int/gpsc/tools/5momentsHandHygiene_A3.pdf?ua=1

Additional opportunities for hand hygiene include:

- **Before** entering the facility or ward
- **After** leaving the facility or ward
- **Before** putting on gloves
- **After** removing gloves
- **When gloved hands become visibly soiled**
- **Before** and after cleaning the environment
- **After** touching medical equipment
- **Before** touching your face, mouth, eyes, or nose
- **After** going to the toilet
- **Before** and after preparing food
- **Before** eating and drinking

The use of gloves does not replace the need for hand hygiene. Every time there is an indication to perform hand hygiene during the delivery of care gloves should be removed to allow appropriate hand hygiene eg after removing an IV line.

► 4.2.4 Patients, family members and visitors

Patients, family members and visitors should also be instructed on proper hand hygiene with alcohol rub or soap and water. If a friend or family member is providing care they should be instructed in the five moments of hand hygiene as above.

Opportunities for hand hygiene by patients, family members and visitors include:

- Before eating
- After using the toilet
- Before and after handling their babies
- Before and after helping to care for patients
- When hands are soiled

4.2.5 Additional Information for Hand Hygiene and Hand Care

As part of an overall approach to hand hygiene improvement the following should be observed and adhered to:

- Nails should be short, clean and polish free
- Artificial nails or nail extensions should not be worn
- Do not wear wrist watches and jewellery including wearing rings with ridges or stones
- Cover any cuts or abrasions with waterproof dressings
- Sleeves should be short or rolled up
- Comply with local dress code or uniform policy
- Report any skin conditions affecting hands for (e.g. psoriasis or dermatitis) to Supervisor

Hand Care

Hand care is important to protect the skin from drying and cracking. Cracked skin may encourage microbial colonization and broken areas can present a site of entry for pathogens. Hand creams can be applied to care for the skin on hands.

Communal tubs of hand cream must be avoided as these may contain bacteria over time, and lead to contamination of hands.

4.2.6 Encouraging hand hygiene compliance

Hand hygiene “compliance” is a measure of how often HCWs practice hand hygiene when indicated. To maximise compliance with hand hygiene by HCWs, a five-component strategy of hand hygiene promotion should be implemented at each healthcare facility. This strategy involves:

1. **System changes to facilitate hand hygiene action at the point of patient care**
2. **Training and education**
3. **Reminders in the workplace – posters**
4. **Monitoring of hand hygiene compliance with feedback**
5. **Institutional safety climate – Adoption of a culture of safety**

► 1. System changes

This component involves the need to ensure that the healthcare facility has the necessary infrastructure in place to allow HCWs to perform hand hygiene as appropriate. Necessary infrastructure includes alcohol-based hand rubs, clean running water, soap, and disposable towels. Hand hygiene stations should be as close as possible to the point-of-care. The closer hand hygiene stations are to point-of-care, the more likely HCWs will be to use them. Hand hygiene stations should also be placed in:

- Screening areas
- Out patient
- Isolation areas
- PPE putting on and removal areas
- By latrines

2. Training and Education

All staff should be trained on proper hand hygiene techniques and procedures. Training opportunities should allow for participants to demonstrate their knowledge and competency on their hand washing techniques.

3. Reminders in the workplace – posters

Posters reminding HCWs and patients to wash their hands as well as illustrating the hand washing and hand rubbing steps should be placed throughout the facility and near hand hygiene stations.

4. Monitoring and evaluation of hand hygiene

Monitoring of hand hygiene compliance by the IPC focal person or specifically trained observers is an essential component of assessing general IPC practices within a health facility. Monitoring allows for:

- Assessment of baseline compliance by HCWs
- Provision of feedback to HCWs about how to improve poor practices as well as reinforcement following implementation of successful hand hygiene strategies
- Evaluation of the impact of hand hygiene improvements/interventions

Hand hygiene compliance audits should be performed regularly as part of monitoring. Monitoring and evaluation should also be regularly conducted to confirm that adequate hand hygiene infrastructure and supplies are always available.

5. Institutional safety climate – Adoption of a culture of safety

The commitment and support of leadership, as well as staff accountability, are essential in creating a culture that acknowledges the importance of hand hygiene. Leadership must ensure that hand hygiene supplies are always available and easily procured at facility and ward level. HCWs should ensure that leadership is aware of infrastructure deficiencies that inhibit hand hygiene. Cooperation at all levels optimizes hand hygiene and contributes to the reduction of healthcare-acquired infections.

4.3 Personal Protective Equipment PPE:

Before undertaking any activity / procedure staff should assess the risk of likely exposure to blood or body fluids. If there is a possible risk then Personal Protective Equipment (PPE) should be worn that provides adequate protection against the risks associated with the procedure or task being undertaken.

All PPE should be:

- Available close to the point of use and readily accessible
- Stored in a clean / dry area to prevent contamination until required for use
- Preferably single use If reusable there must be a clear policy and SOP for placement in bins after use and removal for laundering and recycling
- Have an SOP for stock ordering and rotation to ensure there is always an adequate supply based on usage and that older items are always used first. Do not wait for stocks to run out before ordering more

Refer to **Table 1** for a detailed breakdown of the minimum personal protective equipment based on activities. **There is additional information on maternity care in Chapter 5 section 5.3**

Table 1: Recommended PPE for Standard and Transmission-Based Precautions

Standard Precautions (All patients)		Transmission-based Precautions* (In addition to Standard Precautions)		
Recommended PPE (non-Ebola context)	SEE CHAPTER 5.3 for maternity PPE specific guidance	Contact	Droplet	Airborne
Scrubs and closed-toe shoes	√	√	√	√
Gloves	√ When likely to touch blood or other body fluids and contaminated items or surfaces	√	As per risk assessment, according to Standard Precautions	As per risk assessment, according to Standard Precautions
Gown	√ When soiling of scrubs or other body parts likely (i.e., during procedures likely to generate contamination from blood or other body fluids)	√	As per risk assessment, according to Standard Precautions	As per risk assessment, according to Standard Precautions
Apron**	√ If splashes of large amount of body fluid likely (e.g., during delivery or invasive surgical procedures)	As per risk assessment, according to Standard Precautions	As per risk assessment, according to Standard Precautions	As per risk assessment, according to Standard Precautions
Surgical Facemask***	√ Wear regular surgical or medical mask during procedures likely to generate splashes into your mouth and nose	As per risk assessment, according to Standard Precautions	√ Fluid resistant surgical/medical mask	Not appropriate
Respirator (e.g., N95)****	Respirators may be required for certain aerosol generating procedures even when patient is not on airborne precautions	Respirators may be required for certain aerosol generating procedures even when patient is not on airborne precautions	Respirators may be required for certain aerosol generating procedures even when patient is not on airborne precautions	√ High efficiency filtration mask (respirator) (FFP3 or N95)
Face shield	√ If splashes of body fluid likely (e.g., during delivery or invasive surgical procedure)	As per risk assessment, according to Standard Precautions	As per risk assessment, according to Standard Precautions	As per risk assessment, according to Standard Precautions
Goggles + Surgical Facemask	√ If face shield indicated but not available	√ As per risk assessment, according to Standard Precautions	√ As per risk assessment, according to Standard Precautions	√ Not appropriate. Need Goggles and a respirator (e.g., N95 mask)

* See section 4.6 on Transmission-Based Precautions for additional information on Droplet, Airborne, and Contact Precautions. ** Apron is needed in addition to gown when splashes of a large amount of body fluid is anticipated. Apron should be used to protect HCW's body when gown is not available. ***Surgical facemasks are looser-fitting masks that serve as a barrier against infections transmitted through the droplet route, but are not designed to protect lungs from airborne hazards. **** Respirators filter particles from the air when properly fitted, helping reduce the number of particles or microorganisms the wearer breaths in. Respirators may be required for certain aerosol generating procedures even when patient is not on airborne precautions. ►►

Table 2: Recommended PPE for Ebola Virus Disease (EVD) Outbreak Precautions to be used in select patient-care settings at healthcare facilities

Recommended PPE to be used during Ebola Outbreaks	Screening	General Nursing Care (incl maternity care)		Isolation area ◊	Last offices ◊◊
		If risk of exposure to blood or other body fluids, AND maternity care, AND maternity patients at risk for EVD §§	If other risk of exposure to blood or other body fluids §		
Scrubs and closed-toe shoes	√	√	√	√	√
Boots or shoe covers	√	√	√	√	√
Gloves	√ 1 pair	√ 2 pairs; outer are elbow gloves	√ 1 pair (elbow gloves for maternity)	√ 2 pair	√ 2 pair
Gown*	√	√ if no coverall	√	√ if no coverall	√ if no coverall
Coverall*		√		√	√
Apron (fluid-resistant)		√		√	√
Hair cover		√ If no hood (except maternity – Hood essential)		√ If no hood	√ If no hood
Hood		√		√	√
Mask**		√		√**	√**
Respirator (e.g., N95)		For patients with infections transmitted through air (e.g., TB, measles, chickenpox)			
Face shield	√	√	√	√	√
Goggles/mask	√ If no face shield	√ If no face shield	√ If no face shield	√ If no face shield	√ If no face shield

§ Follow Standard and Transmission-Based Precautions in Table 2

§§ If patient does not qualify for all three criteria listed, refer to other two columns under “General nursing care”. For known EVD risk groups, refer to the new WHO maternity guidance risk assessment note due to be issued July/August 2015.

◊ (Area with care of suspected, probable, or confirmed EVD patients)

◊◊ (Area with dead bodies of suspected, probable, or confirmed EVD patients)

*Made of fabric resistant to penetration by blood or body fluid or by blood-borne pathogens; for screening gowns and boots. Shoe covers to be used if cannot maintain 1.5 m distance or assessed increase risk of exposure to body fluids.

** Fluid-resistant medical/surgical mask with a structured design that does not collapse against the mouth (e.g., duckbill, cup shape).

4.3.1 Putting on and Removing PPE

To be effective, PPE must be correctly and carefully put on (also called donning) and removed (also called doffing).

- In all settings, staff should be trained in the appropriate donning and doffing of PPE
- It is recommended to use a buddy (trained observer) while putting on PPE to ensure that it is put on correctly before attending to a patient in or entering an isolation area - see TBP section
- During patient care, PPE must remain in place and be worn correctly while in the contaminated areas
- PPE should not be adjusted during patient care. If there is concern of a breach, leave the area and properly remove and change the PPE in the PPE removal area
- PPE must be removed carefully in the correct sequence to reduce the possibility of self-contamination
- It is recommended to use a buddy (trained observer) while removing used PPE after providing care to isolated patients
- All PPE should be discarded into the infectious clinical waste buckets for decontamination immediately on removal.

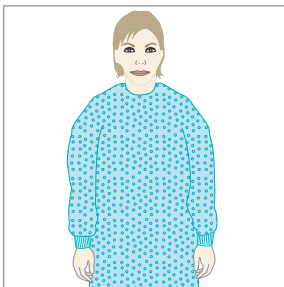
► **Figure 1: Donning and doffing PPE sequence**

How to put on PPE (when all PPE items are needed)



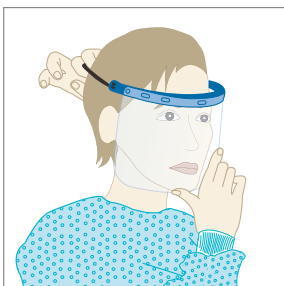
Step 1

- Identify hazards & manage risk. Gather the necessary PPE.
- Plan where to put on & take off PPE.
- Do you have a buddy? Mirror?
- Do you know how you will deal with waste?



Step 2

- Put on a gown.



Step 3a

- Put on face shield.

OR

Step 3b

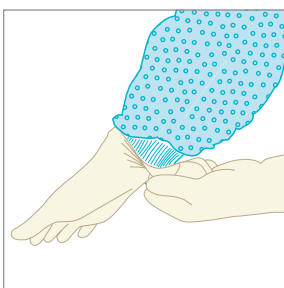
- Put on medical mask and eye protection (e.g. eye visor/goggles)



+



Note: If performing an aerosol-generating procedure (e.g. aspiration of respiratory tract, intubation, resuscitation, bronchoscopy, autopsy), a particulate respirator (e.g. US NIOSH-certified N95, EU FFP2, or equivalent respirator) should be used in combination with a face shield or an eye protection. Do user seal check if using a particulate respirator.



Step 4

- Put on gloves (over cuff).

How to take off PPE

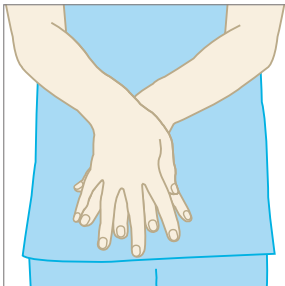


Step 1

- Avoid contamination of self, others & the environment
- Remove the most heavily contaminated items first

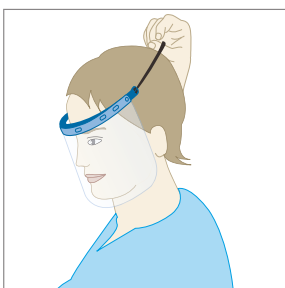
Remove gloves & gown

- Peel off gown & gloves and roll inside, out
- Dispose gloves and gown safely



Step 2

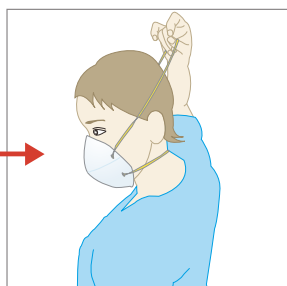
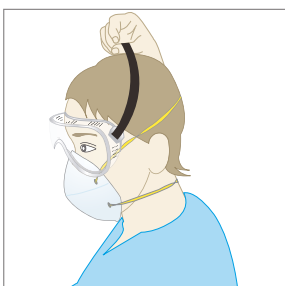
- Perform hand hygiene



Step 3a

If wearing face shield:

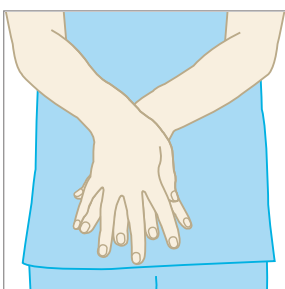
- Remove face shield from behind
- Dispose of face shield safely



Step 3b

If wearing eye protection and mask:

- Remove goggles from behind
- Put goggles in a separate container for reprocessing
- Remove mask from behind and dispose of safely



Step 4

- Perform hand hygiene



Note: for illustrations relating to how to put on and take off PPE in the context of Ebola virus disease (EVD) and other viral haemorrhagic fevers, refer to MoHS Ebola SOPs

4.4 Respiratory Hygiene and Cough Etiquette

Respiratory and cough hygiene is designed to minimize the risk of transmission of respiratory infections:

- When sneezing or coughing cover the nose and mouth with a disposable tissue. Discard immediately into a waste bucket. Do not put the tissue into a pocket
- If disposable tissue is not available cough / sneeze into bent elbow
- Always face away from others when coughing or sneezing
- Wash hands immediately after coughing, sneezing, handling tissues or after contact with respiratory secretions or objects / surfaces contaminated

4.5 Injection and Phlebotomy Safety and Sharps Injury Prevention

A. Introduction

In healthcare settings, injuries from needles or other sharps are the number-one cause of occupational exposure to blood-borne infections.

The term “sharps” refers to any sharp instrument or object used in the delivery of healthcare services including hypodermic needles, suture needles, scalpel blades, sharp instruments, IV catheters, and razor blades.

Unsafe injection practices can put health care workers (HCWs) at risk from the following infection (depending on the local prevalence of disease): Hepatitis C (HCV); Hepatitis B (HBV); HIV; Other blood borne pathogens including Ebola virus disease, Marburg and malaria.

Unsafe injection practices can also harm patients. When HCWs fail to follow infection prevention and control practices when giving injections or taking blood, the patient is placed at risk. Unsafe practices include using unsterile syringes and needles, using the same syringe for multiple patients and poor collection and disposal of used injection equipment.

The following preconditions for prevention of healthcare-associated infections (HAIs) should be addressed by healthcare facility (HCF) leaders and managers, informed by the evidence based information provided:

- **Infrastructure/system change:** access to the right equipment including syringes, needles, PPE, supplies and an environment that facilitates safe injections, phlebotomy and handling of sharps for patient and HCW safety - including receiving adequate prophylactic vaccinations for HCWs
- **Training and education:** a program of routine training and education and periodic retraining for all HCWs responsible for handling and disposing of sharps that is in line with the recommendations presented in this chapter
- **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place
- **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters displayed at the point of care)
- **Safety culture:** managers and leaders at every level of the HCF show their visible support for injection and phlebotomy safety and sharps injury prevention and reinforce a culture of patient safety

B. Practical Guidance for Injection and Phlebotomy Safety

B.1. Definitions

An **unsafe injection** is one that is given with unsterile or improper equipment or technique.

A **safe injection** is the one that:

- Does not harm the recipient
- Does not expose the provider to any avoidable risk (e.g. bloodborne pathogens)
- Does not result in any waste that is dangerous for other people

Injection and phlebotomy safety comprises:

- Safe standard practices (see B2)
- Safe equipment (see B3)
- Safe injection and medication practices (see B4)

► B.2 Safe Practices for Injection and Phlebotomy Activities

Injection and phlebotomy safety is an important component of basic infection prevention control. The concept of “standard precautions”, with mandatory safe practices, must be routinely applied in all healthcare settings for all injection and phlebotomy procedures.



Refer to all other sections of chapter 4 and annex 2 for additional information on standard precautions. Hand hygiene (chapter 4.1) at the right moment is the best and easiest way to prevent the spread of microorganisms. Use: Soap and running water (if hands are visibly soiled), or Alcohol-based hand rubs

B.2.1 General Safety Practices

This section describes the following best practices that are recommended to ensure the safety of injections and related practices to protect patients, health workers and the community:

- Hand hygiene
- Gloves, when appropriate
- Other single-use personal protective equipment, when appropriate
- Skin preparation and disinfection

B.2.1.1 Hand Hygiene

The five moments for hand hygiene must be followed:

1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient when approaching him/her.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
5	AFTER TOUCHING PATIENT SURROUNDINGS	WHEN?	Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.

In the context of injections and related practices Moment 2 and 3 are the critical moments. You may need to perform hand hygiene between injections, depending on the setting and whether there was contact with any soiling, blood, or body fluids.

Avoid giving injections if your skin integrity is compromised by local infection or other skin conditions (e.g. weeping dermatitis, skin lesions or cuts), and cover any small cuts.



http://apps.who.int/iris/bitstream/10665/78060/1/9789241503372_eng.pdf?ua=1

B.2.1.2 Gloves

Healthcare workers should wear non-sterile, well-fitting latex or latex-free gloves when contact with blood, blood products, or other bodily fluids is anticipated.



► **Table 3: Indications for glove use in injection practice**


Key elements	Indications	Precautions
	<p>Wear non-sterile, well-fitting, single-use gloves:</p> <ul style="list-style-type: none"> When contact with a patient's blood or other potentially infectious materials (e.g. body fluids, moist body substances and saliva [in dental procedures]), mucous membranes and non-intact skin is anticipated. During venipuncture or venous access injections, due to the potential for blood exposure at puncture site. If HCW's skin is NOT intact (e.g. through eczema, cracked or dry skin). If patient's skin is NOT intact (e.g. through eczema, burns or skin infections). 	<p>When undertaking injections:</p> <ul style="list-style-type: none"> DO NOT use gloves for routine intradermal, subcutaneous, or intramuscular injections if your skin is intact OR if the patient's skin is intact. DO NOT use the same pair of gloves for more than one patient. DO NOT wash gloves for reuse. Gloves DO NOT provide protection against needle-stick or other puncture wounds caused by sharp objects. Needles, scalpels, and other sharps should be handled with extreme caution.



Table 3 provides information on glove use in relation to any type of injection or phlebotomy. Additional information on glove use can be found in Chapter 4.3

B.2.1.3 Other Personal-Protective Equipment

Masks, eye protection and other protective clothing **ARE NOT** required for injection or phlebotomy procedures unless blood splash is anticipated.

B.2.1.4 Skin preparation and disinfection

- If the patient's skin is **visibly clean**, it is safe to give an injection without skin disinfection
- If the injection site is visibly dirty/soiled, wash with soap and water
- Blood draws**
 - Routine (i.e., not for culture or donation), disinfect with 70% alcohol
 - For culture or donation, disinfect with 2% chlorhexidine (CHX) in 70% alcohol
 - For children of age 2 months or less: use alcohol alone- **DO NOT** use Alcohol and CHX together

Summary of skin preparation recommendations

Procedure	Skin preparation
Patient's skin visibly dirty	Wash with soap and water
Patient's skin clean	-
Intramuscular, subcutaneous, intradermal	Nil required
Immunizations	Nil required
Venous or arterial access (not for blood culture or donation)	Disinfect with 70% alcohol (see technique below)
Venous access for blood cultures or blood donation	Disinfect with alcohol containing 2% Chlorhexidine
Skin prep in children under 2 months old	Alcohol only. Do not use Chlorhexidine (See technique below)

► **To disinfect skin with alcohol, use the following steps:**

1. Apply a 60–70% alcohol-based solution (isopropyl alcohol or ethanol) on a single-use swab or cotton-wool ball
DO NOT use methanol or methyl-alcohol as these are not safe for human use
2. Wipe the area from the center of the injection site working outwards, without going over the same area
3. Apply the solution for 30 seconds then allow it to dry completely

To disinfect skin with alcohol + 2% Chlorhexidine, use the following steps:

1. Apply the alcohol + 2% Chlorhexidine solution on a single-use swab or cotton-wool ball
2. Wipe the area from the center of the injection site working outwards, without going over the same area
3. Apply the solution for 30 seconds then allow it to dry for 30 seconds
4. Do not touch the access site once it has been disinfected



Do not pre-soak cotton wool in a container—these become highly contaminated with hand and environmental bacteria and are therefore unsafe

B.3 Safe equipment

B.3.1 Injection and blood-draw devices

The surest way to protect against unsafe injections is to use devices that have been engineered so they cannot be re-used and do not lead to accidental needle stick injuries among HCWs.

B.3.1.1 Injection and blood-draw devices

There are two main types of syringes preventing reuse:

Auto-disable (AD) syringes for vaccinations	Reuse prevention (RUP) syringes for curative injections
<ul style="list-style-type: none"> • AD syringes possess an internal mechanism that disables the syringe after a single use, either by locking or breaking the barrel • The WHO, United Nations Children's Fund (UNICEF), United Nations Population Fund (UNFPA) and the Global Alliance for Vaccines and Immunisation (Gavi) recommend AD syringes be used for all vaccination processes • Due to a disabling mechanism, AD syringes are NOT to be used for treating medical conditions where barrel draw-ups are required (e.g. mixing drugs in syringe) 	<ul style="list-style-type: none"> • RUP syringes serve the same purpose as AD syringes • In addition, RUP syringes can be used for curative injections • The main difference is that RUP syringes are designed for delivering medicines; thus, RUP syringes allow the HCW to adjust the dose as needed and move the plunger twice when it is necessary to mix two different medicines in one syringe or reconstitute vaccines and medicines, if necessary • Some RUP syringe models include a weak spot in the plunger that causes it to break if the user attempts to pull back on the plunger after the injection • Others have a metal clip that blocks the plunger so it cannot be moved back • Other RUP syringes have a needle which retracts into the syringe barrel at the end of the injection

► B. 3.1.2 Syringes and blood-draw devices that prevent needlestick injuries to HCWs

Syringes and blood-draw devices are also available with “sharps injury protection” (SIP) i.e. possess safety-engineered features to protect health workers from “needle stick” injuries and resulting infections.

In SIP devices the protective mechanism is usually a sheath or hood sliding over the needle, or the needle automatically or manually retracts into the barrel. Both protect the user from being injured accidentally by the needle after the injection is completed. Once activated, most SIP mechanisms cannot be deactivated and thus serve as a re-use prevention feature.

B. 3.1.3 Smart syringes with auto-disable, reuse prevention, and sharps injury protection

It is recommended that “Smart” syringes with RUP and SIP that meet WHO quality standards, be exclusively used for all injections, other than where standard disposable single use syringes are required – see 3.1.4.

B. 3.1.4 Procedures where standard syringes are required

Syringes engineered to prevent re-use are not suitable for certain medical procedures, including the following:

- Administering multiple medicines in same syringe
- Flushing of intravenous line
- Local anaesthesia to multiple sites
- Pushing nutrients through nasal feeding tubes

B. 3.1.5 Responsibility of Procurement Committee/Person

Limiting procurement to a single type of device is too restrictive and will not accommodate all medical procedures. Additionally, safe-injection equipment designs are not available for all sizes and procedures; therefore, a small percentage of standard disposable syringes and other devices may continue to be required.

A mix of safe-injection equipment is recommended to accommodate the broad range of medical procedures that rely on syringes, including continued use of limited quantities of standard disposable syringes.

B. 3.1.6 Categories of devices for procurement

- **AD syringes for vaccination**
 - Sizes and types (fixed needles)– For culture or donation, disinfect with 2% chlorhexidine (CHX) in 70% alcohol
- **RUP technology, therapeutic injections**
 - Sizes and types for vaccination (fixed needles)
 - Sizes and types for general therapeutic injections (fixed or detachable needles)
- **SIP technology, therapeutic injections**
 - Therapeutic injection equipment (fixed or detachable needles)
- **SIP technology, blood drawing**
 - Syringes used for blood drawing with needle-prevention device
 - Vacuum collection for blood drawing
 - Butterfly needles for blood drawing
- **Other specialty devices (with SIP technology wherever possible):**
 - Infusion sets
 - Catheter inserters
 - Insulin syringes
- **Sharps containers**
 - Sizes and types



► **The committee or person responsible for procurement must ensure:**

The ready availability of:

- An adequate supply of all the above-mentioned single-use devices, to allow providers to use a new device for each procedure
- Appropriate types of syringes and needles that:
 - Meet international norms and standards for medical treatment and vaccinations
 - Have re-use prevention features wherever possible
 - Have safety-engineered SIP features wherever possible
 - Accommodate all medical and vaccination procedures

That there is:

- A national procurement policy on procurement of injection equipment and infection prevention control supplies, including sharps containers, to ensure these items meet relevant standards and clinical requirements
- An efficient distribution system to ensure continuous, sufficient and ready availability in all healthcare facilities

That frontline staff who use the devices are involved in the selection and evaluation of all devices, and the evaluation process is documented.

B.3.2. Sharps containers

Safe sharps containers are essential for the correct and immediate disposal of sharps devices to ensure patient, HCW and community safety. The safe disposal of sharps is a major challenge, particularly in developing countries.

An insufficient supply of sharps containers increases sharps injuries among HCWs due to:

- Needle recapping (in an endeavour to protect others)
- More frequent decanting of sharps containers
- Increased walking distance to a sharps container
- Overfilling of sharps containers
- Staff separating needle from syringe to save sharps containers.

Sharps containers must:

- Be sufficient in number so as to be available “within arm’s reach” in all situations where sharps are generated
- Be puncture-resistant, leak-proof, and sealable when full
- Be stable when on horizontal surfaces
- Have an aperture suitable for the safe deposition of sharps used in that area
- Possess a handle for carrying
- Where feasible, be certified to WHO Performance, Quality and Safety (PQS), ISO 23907 or other acceptable sharps container standards
- Be easily visible, accessible, and unobstructed in all areas
- Placed at an ergonomic height to enable staff to readily see into the aperture to ascertain fill-level and presence of any protruding sharps

B.4 Safe injection, blood draw and medication practices

B. 4.1 General Guidance on safe use of injection and blood-draw devices



SUMMARY – THE FIVE RULES:

- *ONE needle, ONE syringe, only ONE use*
- *Ensure a sharps container is always nearby (within arm’s reach)*
- *Never leave ANY needle in ANY vial*
- *Recapping is associated with a high-risk of HCW needlestick injury - Only recap if absolutely necessary*
- *Never recap needles with two hands*



- ▶ • Ensure all HCWs who give injections or draw blood are trained to a competent level in the use of all injection/ blood-draw devices available to them (**competency is defined as...** <N.B. SL colleagues to add appropriate wording>)
- Use a new device for each procedure, including for the reconstitution of a unit of medication or vaccine
- Inspect the packaging of the device to ensure that the protective barrier has not been breached
- Discard the device if the package has been punctured, torn, or damaged or if the expiry date has passed
- Discard a syringe or needle that has touched any non-sterile surface
- Use fluid infusion and administration sets (e.g., intravenous bags, tubing and connectors) for one patient only. Never use the same IV line and fluid bag/bottle with multiple patients
- DO NOT use a single loaded syringe to administer medication to several patients (i.e., ensure one needle, one syringe, one patient!)
- DO NOT change the needle in order to reuse the syringe
- DO NOT use the same mixing syringe to reconstitute several vials

B. 4.2 General safety guidance on preparing injections

- Prepare each injection in a clean designated area away from sinks, other possible sources of contaminations, and patient care area. The area should be free of clutter and can be cleaned easily
- Before starting the injection session and whenever contamination of the preparation area is suspected, clean the surfaces with 70% alcohol (isopropyl alcohol or ethanol) and allow to air-dry
- Assemble all equipment needed for the injections (i.e., sterile single-use needles and syringes, sterile water or diluent, alcohol swabs or cotton wool and sharps containers)
- Do not combine leftover medications for later use
- Draw the right dose as prescribed, including expelling the air
- Make sure that the correct drug, dose, and route are used for the right patient
- DO NOT use bags or bottles of intravenous solution as a common source of supply for multiple patients (except in pharmacies using laminar flow cabinets)

B. 4.2.1 Guidance for septum vials

- DO NOT touch the diaphragm after disinfection
- Use a new sterile syringe and needle for each insertion into a multi-dose vial
- DO NOT re-enter a vial with a needle or syringe used on a patient
- Never leave a needle in a multi-dose vial
- DO NOT enter several vials with the same needle and syringe
- Once the loaded syringe and needle has been withdrawn from a vial, administer the injection as soon as possible



LEAVING A NEEDLE IN A MULTI-DOSE VIAL SHOULD NEVER HAPPEN

B. 4.2.2 Reconstitution

- If reconstitution using a sterile syringe and needle is necessary, withdraw the reconstitution solution from the ampoule or vial, insert the needle into the rubber septum in the single- or multi-dose vial and inject the necessary amount of reconstitution fluid
- After reconstituting the contents of a multi-dose vial, remove the needle and syringe and discard them immediately as a single unit into a sharps container
- Mix the contents of the vial thoroughly until all visible particles have dissolved



► Needleless draw-up system

If a needleless system is available:

1. Wipe the rubber septum of the multi-dose vial with an alcohol swab
2. Insert the spike into the multi-dose vial
3. Wipe the port of the needleless system with an alcohol swab
4. Remove a sterile syringe from its packaging
5. Insert the nozzle of the syringe into the port
6. Withdraw the reconstituted drug

B. 4.2.3 Labeling

- After reconstitution of a multi-dose vial, label final medication container with:

- Date and time of preparation
- Type and volume of diluent (if applicable)
- Final concentration
- Expiry date and time after reconstitution
- Name and signature of the person reconstituting the drug

- For multi-dose medications that **DO NOT** require reconstitution, add a label with:

- Date and time of first piercing the vial
- Name and signature of the person first piercing the vial

Medication safety

- Follow product-specific recommendations for using, storing, and handling equipment and medication
- Whenever possible, use single-dose vials instead of multi-dose vials
- If multi-dose vials must be used, always pierce septum with a new sterile needle
- Open only one vial of a particular medication at a time in each patient-care area
- If possible, keep one multi-dose vial for each patient, and store it with the patient's name on the vial in a separate treatment or medication room
- **DO NOT** store multi-dose vials in the open ward, where they could be inadvertently contaminated
- Discard a multi-dose vial:
 - If sterility or content is compromised
 - If the expiry date or time has passed (even if the vial contains antimicrobial preservatives)
 - If it has not been properly stored after opening
 - Within 24 hours of opening, or after the time recommended by the manufacturer, if the vial does not contain antimicrobial preservatives
 - If found to be undated, improperly stored, inadvertently contaminated or perceived to be contaminated, regardless of expiration date
- Whenever possible, use pop-open ampoules rather than ampoules that require use of a metal file to open
 - If using an ampoule, use a filter needle, if available, to draw medication
- 1. Draw with filter needle from ampoule
- 2. Change gauge to appropriate gauge needle prior to injection
 - If using an ampoule that requires a metal file to open, protect your fingers with a clean barrier (e.g. a small gauze pad) when opening the ampoule

B. 4.4 Administering injections**B. 4.4.1 General safety guidance**

- Check the drug chart or prescription for the medication, the corresponding patient's name, and medication dosage
- Counsel each patient before administering the injection
- Anticipate and take measures to prevent sudden patient movement during and after the injection
- Prepare a well-laid-up tray, including emergency drugs for managing possible drug reactions



- ▶ • Wash skin visibly soiled skin with soap and water
- When skin requires disinfection, apply a 60–70% alcohol-based solution (isopropyl alcohol or ethanol) on a clean single-use swab or cotton-wool ball and maintain the contact time of 30 seconds and allow it to dry completely
- Avoid giving injections on skin that is not intact
- Clean the correct injection site appropriately
- DO NOT allow the needle to touch any contaminated surface; if it does, replace with sterile needle
- If the medication cannot be administered immediately for any reason, cover the needle with the cap using a one hand scoop technique
- Keep patient for at least five minutes after the injection has been given and observe for any possible adverse effects or events
- **NEVER RECAP NEEDLES**

C. Practical guidance for prevention of sharps injuries

Although there is limited data on sharps injuries (SI) in Sierra Leone, from available evidence it is known that: nurses form one of the largest groups reporting SIs; the majority occur in operating rooms, inpatient units and intensive care units¹⁶; injuries most often occur during use of a sharp device on a patient, after use and before disposal (see annex for facts and figures), Table 2 summarizes common factors associated with sharps injuries that can help guide prevention approaches.

Table 2

Common situations when sharps injuries occur	Most common devices causing sharps injuries	Common causes of Sharps injuries
<ul style="list-style-type: none"> • Recapping needles after use • Manipulating used sharps (bending, breaking, cutting hypodermic needles) • Removing used needles from a syringe by hand • Suturing • Accidentally sticking a colleague while carrying unprotected sharps • Getting stuck by sharps in unexpected areas such as surgical drapes or bed linen • Handling or disposing of waste that contains used needles or other sharps • When patients unexpectedly move at the time of injection • Using sharps when working quickly or when tired, overworked or understaffed 	<p>Six devices are responsible for 80% of all injuries and include:</p> <ul style="list-style-type: none"> • Disposable syringes (30%) • Suture needles (23%) • Winged steel needles (8%) • Scalpel blades (8%) • Intravenous (IV) catheter stylets (6%) • Phlebotomy needles (4%) 	<ul style="list-style-type: none"> • Overuse of injections and unnecessary sharps • Lack of safety devices and sharps disposal containers • Lack of access to, and failure to use sharps containers immediately after injection • Lack of personal protective equipment • Inadequate or short staffing • Recapping of needles after use • Lack of engineering controls, such as safer needle devices • Passing instruments from hand to hand in the operating suite • Lack of hazard awareness and lack of training • Unexpected patient reactions

C. 4 Recommendations for prevention of sharps injuries

An effective sharps injury prevention program includes components that must work in concert to prevent healthcare personnel from suffering sharps injuries. Such a program plan must be integrated into existing performance improvement, infection prevention control, and safety programs. The underlying concept is that of a systematic, organization-wide approach for continually improving all processes involved in the delivery of quality products and services. Successful SI reduction programs draws on concepts from the industrial hygiene profession, in which prevention interventions are prioritized based on a hierarchy of control strategies¹³.

C. 5 Risk Reduction Hierarchy

The sharps injury Risk Reduction Hierarchy:

1. Elimination of use of needles and other sharps where possible
2. Engineering controls (SED)
3. Administrative controls
4. Workplace controls
5. PPE



► C. 6.1 Solutions for eliminating use of needles and other sharps

Eliminating unnecessary injections is the best way to prevent injection-associated infections. Up to 70% of injections in some countries are medically unnecessary. It is preferred to give effective treatments by other routes (such as oral or rectal) as it reduces potential exposure to blood and infectious agents, resulting in the reduction of infection risks

What individuals can do to reduce injections:

- **Prescribers**
 - Prescribe oral medication rather than an injection if appropriate
 - Do not prescribe injections based on the request of the patients and/or their family members
 - Do not prescribe injections because of financial incentives from pharmaceutical companies
- **Patients**
 - Communicate preference for oral medications.
- **Healthcare facilities**
 - Monitor health care worker compliance with injection safety guidelines
 - Monitor and supervise prescriptions and conduct prescription audits
 - Monitor monthly use of needles and syringes
 - Develop IEC materials that contains the following messages:
 - *Benefits of oral medicines versus injections*
 - *Risks associated with unsafe and unnecessary injections*

C. 6.2 Engineering Controls

Engineering controls remove or isolate a hazard in the workplace. In the context of sharps injury prevention, engineering controls include sharps disposal containers (see B3.2) and needles and other sharps devices with an integrated engineered sharps injury prevention feature. The safety feature in sharp devices should accomplish the following:

- Be an integral part of the device
- Be simple and obvious in operation
- Be reliable and automatic
- Provide a rigid cover that allows the hands to remain behind the needle
- Ensure that the safety feature is in effect before disassembly and remains in effect after disposal
- Ensure the user technique is similar to that of conventional devices
- Minimize the risk of infection to patients and should not create infection prevention control issues beyond those of conventional devices
- Have minimal increase in volume, relative to disposal
- Be cost effective

C. 6.3 Administrative Controls (“Enabling adequate resources”)

Administrative controls are measures that establish policies, programmes and cultures which enable adequate resources to be directed to sharps injury prevention. Such controls work best when “top-driven”, or when programmes have the support, leadership and backing of the facility manager.

These resources include:

- Adequate clinical, safety and educational staffing levels
- Requirement for all staff who have potential to come in contact with blood, bodily fluids, excretions, or secretions, to be immunized against Hepatitis B virus free of charge
- Provision of post-exposure procedures and readily available prophylactic drugs when indicated by the circumstances of the blood exposure
- Adequate provision for staff competency training and education at orientation, whenever new devices are procured, and on a regular basis thereafter
- Written policies and procedures on mandatory reporting of all sharps injuries by all staff
- Written policies on monitoring and prevention and regular data presentation to staff
- Adequate supply of appropriate safety devices to allow providers to use a new safety device for each procedure ►►

- ▶ • Establishment of Safety and/or Infection Prevention and Control committees
- Requirement and time-allowance for regular meetings of safety committees
- Correct and timely procurement of safety equipment
- Provision for efficient distribution systems to ensure continuous, sufficient, readily available equipment in all healthcare facilities nationally
- A culture supporting the replacement of injectable medications with other non-invasive medications

Such controls, support and resources bring about a culture of sharps awareness and an institution-wide effort to reduce sharps injuries, brought about by the participation of all staff at all levels.

C. 6.4 Workplace Controls (“Establishing sharps safety rules”)

In addition to Administrative Controls, each workplace must establish clear rules for sharps safety and ensure all staff at all levels are familiar with the rules and enact them.

C. 6.4.1 Workplace Controls relevant to sharps safety:

A) Sharps injury reporting

Ensure “no blame, no shame” mechanisms and procedures are in place to enable staff to easily and immediately report their sharps injuries

B) Sharps:

- Discard all sharps in a designated sharps container immediately after use. If available, always use sharps with Sharps Injury Prevention features
- Do not recap needles
- Do not remove needles from syringes
- Discard all sharps as a unit at the point of use in a sharps container
- Avoid manipulating sharps by hand
- Do not give used sharps to patients to carry home even if they came with the equipment. Instead, discard into the sharps container after use



C) Sharps containers (see also B. 3.2)

- Procure sufficient sharps containers to enable placement within arm’s reach at all sites where sharps are generated
- Always have spare sharps containers in the facility store to enable immediate replacement of full containers
- No area where sharps are used must ever be without a sharps container
- It is recommended to use sharps containers that meet WHO PQS, ISO 23907/international standards
 - However, if such sharps containers are not available, sharps containers must be at least puncture-resistant and leak-proof and clearly labelled “Sharps” so that people will not unknowingly use them as a garbage or trash container
 - Containers may be made out of an empty plastic jug, or a metal container if commercial, certified sharps containers are not available for any reason



EXAMPLE OF A SHARPS CONTAINER



EXAMPLE OF A THICK PUNCTURE-RESISTANT BOTTLE USED AS A SHARPS CONTAINER

- Ensure all staff know how to exchange a full sharps container or, if delegated to a staff member, the staff member knows to regularly check and replace full containers and ensure spares are always available
- Ensure sharps containers are easily visible and accessible and not obstructed by furniture or equipment, etc.
- Never place sharps containers behind doors or in cupboards
- Place at an ergonomic height to enable staff to clearly view aperture
- Site within arm's reach of the HCW giving injections
- Do not place in high-traffic areas, such as corridors outside patient-care rooms, where people could bump into them or be stuck by someone carrying sharps.
- Do not place on the floor or anywhere they could be knocked over or easily reached by children
- Do not place near light switches, overhead fans, or thermostat controls where people might accidentally put their hands on them
- Do not place over sinks or over waste receptacles where a dropped sharp could pose a hazard to other staff
- Mark a fill line on sharps containers at three-quarters full and do not fill them above the three-quarters-full mark
- Do not shake a sharps container to settle its contents and make room for more sharps
- Seal a sharps container when it is three-quarters full, do not reopen, empty, or reuse after closing and sealing it.
- Always immediately replace sharps containers when full.

D) Prevention of sharps injuries in operating room

- Use blunt suture needles where possible
- Use instruments, rather than fingers, to grasp needles, retract tissue, and load/unload needles and scalpels
- Give verbal announcements when passing sharps
- Uncapped or otherwise unprotected sharps must never be passed directly from one person to another- use a basin or neutral zone to pass sharps, i.e. pass sharp instruments in such a way that the surgeon and assistant are never touching the item at the same time – this way of passing sharps is known as the “hands-free” technique
- Use alternative cutting methods such as blunt electrocautery and laser devices when appropriate
- Substitute endoscopic surgery for open surgery when possible
- Use round-tipped scalpel blades instead of pointed sharp-tipped blades
- Double glove (reduces volume of blood entering sharps wound)



Using a dish as Neutral Zone

- The assistant places the instrument in a sterile kidney basin or in a designated “safe zone” in the sterile field.
- The assistant tells the service provider that the instrument is in the kidney basin or safe zone.
- The service provider picks up the instrument, uses it, and returns it to the basin or safe zone



► C. 6.5 Personal protective equipment

In the Risk Reduction Hierarchy, personal protective equipment (PPE) is the least effective measure to prevent sharps injuries because sharps can still cut through standard PPE (e.g., face-shield, gloves, gown, apron, etc.) and cause injuries to HCWs. Kevlar or leather gloves may be indicated and effective in specific sharps handling procedures. PPE is very effective in preventing exposure of the skin and mucous membranes (nose and mouth) to potentially harmful microbes.

ANNEX 1: BACKGROUND INFORMATION

Unsafe injection practices cause up to 315,000 Hepatitis C (HCV) infections, 1.7 million Hepatitis B (HBV) infections, and 35,000 HIV infections, annually worldwide. It is estimated that 42% of new hepatitis C cases, 33% of new Hepatitis B, and 2% of new HIV infections are attributed to these unsafe practices. Furthermore, among the 35 million health-care workers (HCW) worldwide, about three million sustain accidental sharps injuries each year while at work. These injuries may result in 15,000 HCV, 70,000 HBV and 500 HIV infections – with more than 90% of these infections occurring in developing countries. Worldwide, about 40% of HCV and HBV infections and 2.5% of HIV infections in health care workers are attributable to occupational sharps exposures. Other bloodborne pathogen (BBP) diseases, such as Ebola, Marburg and malaria, can also be transmitted through reused injection equipment.

Each year, 20 billion injections are administered world-wide, with 16 billion of these injections being administered in developing and transitional countries. Around 95% of these injections are given in curative care and 3% are for immunization. The remainder of these injections are for transfusion of blood and blood products and contraceptive dispensation.

However, it is estimated that a significant proportion of injections are given with unsterile syringes and needles. This proportion can be as high as 70% in developing and transitional countries. Using the same syringe for multiple patients is also unsafe. Other unsafe practices, such as poor collection and disposal of used injection equipment, expose healthcare workers and the community to the risk of needle stick injuries. Unsafe disposal of syringes allows scavenging, resale and/or recycling of equipment on the black market – a danger to handlers, the community, and patients. Thus, correct and safe injection practices and related activities contribute to the safety of patients, HCWs, and the community.

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Limited data are available on sharps injuries (SI) in low-income countries. In a recent large study from a high-income country, the annual incidence of SI was 28.2 per 100 occupied beds, with nurses reporting more than 40% of SIs at an annual sharps injury rate of 3.3 per 100 nurses.¹⁴ The injury rate in low-income countries is likely to be significantly higher as fewer safety engineered devices (SED) are used.

Although sharps can cause injuries anywhere within the healthcare environment, recent data show that the majority (45%) of injuries occur in operating rooms and 29% in inpatient units and intensive care units. The same data show that injuries most often occur during use of a sharp device on a patient (44%), after use and before disposal of a sharp device (37%), and during or after disposal (7%). In low-income countries, because SED use is lower, this 'profile of sharps injuries' will show a significantly higher proportion of sharps injuries occurring "During or After Disposal".



► **ANNEXE 2: BLOOD DRAWING CHECK LIST (ALREADY COVERED IN SHARPS MANAGEMENT)**

Blood drawing is one of the highest risk procedures for accidental blood exposure and injuries. Details guidelines are outlined in the WHO publication 'WHO guidelines on drawing blood: best practices in phlebotomy'. Geneva: World Health Organization, 2010.

(Accessed 23rd June 2015: http://whqlibdoc.who.int/publications/2010/9789241599221_eng.pdf)

- When collecting a blood specimen, follow these guidelines: Assemble equipment and include needle and syringe or evacuated tube system depending on which is to be used
- Wash hands with soap and running water and dry them with a single-use towel, or use a hand sanitizer
- Identify and explain the procedure to the patient or guardian as appropriate
- Select the site for blood drawing—preferably in the antecubital fossa. Hanging the hand down or warming the site might make it easier to locate the vein. Palpate the area to locate the anatomical landmarks, but do not touch the site after the application of antiseptic
- Apply the tourniquet about four- or five-fingers width above the selected venepuncture site
- Ask the patient to form a fist so that the veins are more prominent
- Wear well-fitting, clean examination gloves
- Disinfect the site using 70 percent alcohol for 30 seconds and allow to dry completely. Use a spiral motion from in to out to avoid recontamination of the site
- Anchor the vein by holding the patient arm and placing your thumb below the venepuncture site
- Enter the vein swiftly at a 30-45 degree angle
- When sufficient blood has been collected, release the tourniquet before withdrawing the needle
- Withdraw the needle and give the patient a piece of clean gauze or a dry cotton ball to apply to the site with gentle pressure
- Discard the used syringe and needle or other blood-collection device into a puncture-proof sharps container. Place items that can drip blood or body fluids into the infectious-waste container
- Label the blood specimen. Check the label and form for accuracy
- Remove gloves and place them in the general waste
- Perform hand hygiene. If using soap and water, dry hands with a single-use towel

4.6 Decontamination of Medical Devices, Linen and Laundry and the Environment

This policy section outlines the procedures for the safe and effective decontamination of reusable medical devices, equipment and items used in patient care, Linen and Laundry and the Clinical environment

Organisational Requirements

The following preconditions for prevention of healthcare-associated infections (HAIs) should be addressed by health-care facility (HCF) leaders and managers, informed by the evidence based information provided:

- **Infrastructure/system change:** access to the right equipment including PPE, supplies and an environment that facilitates decontamination for patient and health worker safety.
- **Training and education:** a program of routine training and education, periodic retraining and competency assessment for all HCWs responsible for handling and reprocessing contaminated items that are in line with the recommendations presented in this section. Ensure all HCWs are trained in the theory and practice of decontamination. Ensure HCWs understand the associated risk and when personal protective equipment is required.
- **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place.
- **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters displayed at the point of care and point of decontamination).
- **Safety culture:** managers and leaders at every level of the HCF show their visible support for decontamination to help develop and reinforce a culture of patient safety.



For more information on PPE, hand hygiene, standard precautions and occupational health and safety refer to the relevant sections of chapter 4 and 6 respectively

4.6.1 Levels and Methods of Decontamination of Reusable Patient Care Equipment and Instruments

All medical devices and equipment used in healthcare environments have the potential to become contaminated with micro-organisms. Once medical devices and equipment are contaminated they present a risk to patients, as well as to staff, both in the immediate environment and to those who subsequently handle them (e.g. technicians). To minimise the potential risk of infection to patients and staff, it is important that safe and effective decontamination of all re-usable equipment between use is implemented. This is an essential part of infection prevention and control practices of a health care facility.

This policy outlines; the three main levels of decontamination, the different methods which can be employed and the actions required for safe decontamination of re-usable devices and equipment. By outlining the national guidance governing the decontamination of equipment, the policy aims to:

- Protect, patients, visitors and staff from infection risks via medical devices and equipment
- Eradicate or significantly reduce the number of micro-organisms on medical devices and equipment
- Ensure a high standard of decontamination by providing a code of practice for cleaning and disinfecting medical devices and equipment
- Ensure the healthcare facility meets the Ministry of Health requirements and fulfils its responsibility to providing a safe environment for patients, visitors and staff

This section provides a brief summary on the decontamination and reprocessing of reusable patient care equipment. For more comprehensive details refer to the WHO manual 'Decontamination and Reprocessing Manual for Health care facilities' (anticipated publication date October 2015).



► 4.6.1.1 Definitions

Definitions	
Cleaning	The removal, usually with detergent and water or enzyme cleaner and water, of adherent visible soil, blood, protein substances, microorganisms and other debris from the surfaces, crevices, serrations, joints, and lumens of instruments, devices, and equipment by a manual or mechanical process that prepares the items for safe handling and/or further decontamination. Cleaning is essential prior to the use of heat or chemicals.
Decontamination	The use of physical or chemical means to remove, inactivate, or destroy pathogenic organisms on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal". This term is used to cover cleaning, disinfection and / sterilisation. A risk assessment based on the sections below needs to be conducted to decide the appropriate level of decontamination required.
Disinfection	Either thermal or chemical destruction of pathogenic and other types of microorganisms. Disinfection is less lethal than sterilization because it destroys most recognized pathogenic microorganisms but not necessarily all microbial forms (e.g. bacterial spores). It reduces the number of microorganisms to a level that is not harmful to health or safe to handle.
Sterilization	The complete destruction of all microorganisms including bacterial spores.

4.6.1.2 Risk assessment prior to Reprocessing Instruments and Equipment

There are certain principles that must be applied to ensure instruments and equipment has been appropriately re-processed. Regardless of the type of operative procedure, the steps in reprocessing surgical instruments and other items are the same.

In order to minimise the infection risk, staff at all levels must understand the rationale for each of the recommended infection-prevention processes and their limitations.

The risk of transferring microbes from instruments and equipment is dependent on the following factors;

- The presence of microorganisms, their number, and their virulence
- The type of procedure that is going to be performed (invasive or non-invasive)
- The body site where the instrument or equipment will be used (penetrating the mucosal or skin tissue or used on intact skin).

The body site where the instrument or equipment will be used/have contact with, will determine whether cleaning, high level disinfection or sterilisation is required.

4.6.1.3 The Spaulding Classification

In 1968, Spaulding classified medical/surgical devices as: critical, semi-critical and non-critical based on their potential to spread infections. This classification is useful for understanding the method of decontamination required to ensure safety, break the chain of infection, and protect patients and HCWs from HAI according to the degree of risk for infection involved in use of the items (see Table 1).

► **Table 1: Spaulding classification of equipment decontamination**

CATEGORY	DEFINITION	LEVEL OF MICROBICIDAL ACTION	METHOD OF DECONTAMINATION	EXAMPLE OF COMMON ITEMS/EQUIPMENT
High (Critical)	Critical objects enter normally sterile tissue or vascular system, or through which blood flows.	Kills all microorganisms.	Sterilization by heat or chemical sterilants. (Steam, ethylene oxide, gas hydrogen peroxide plasma etc. or using $\geq 2.4\%$, glutaraldehyde-based formulation 7.5% stabilized hydrogen peroxide, 0.2% peracetic acid).	Surgical instruments and devices, urinary catheters, cardiac catheters, implants, needles and syringes, dressing, sutures, delivery sets, dental instruments, rigid bronchoscopes, cystoscopies etc.
Intermediate (Semi-critical)	Semi-critical objects come in contact with mucous membranes or non-intact skin.	Kills all microorganisms except high numbers of bacterial spores.	High-level disinfection by heat or chemicals.	Respiratory therapy & anesthesia equipment, flexible endoscopes, vaginal specula, laryngoscope blades and airways, reusable bedpans and urinals, equipment etc.
Low (Non-critical)	Non-critical objects will come in contact with intact skin only.	Kill vegetative bacteria, fungi and lipid viruses.	Low level disinfection (cleaning). (Ethyl or Isopropyl alcohol (70-90%); Chlorine (0,01-0,05%); Phenolic and Quaternary Ammonium germicidal detergent solutions).	Crutches, beds, ECG leads; bedside tables, walls, floors and furniture, toilet seats, baths, basins, theatre table etc. Blood pressure cuff, crutches, stethoscopes, Bed side commode.

In summary, any patient care item can be categorised into one of three levels, low, intermediate or high based on the risk of the item transmitting micro-organisms; this informs the level of decontamination required; cleaning, disinfection (low, intermediate or high level) and sterilisation.

For the effective reprocessing of medical devices and equipment cleaning must precede both disinfection and sterilisation.

4.6.1.4 Categories of Disinfection

A. High-level disinfection (HLD)

- Used for (semi-critical items; [except dental] which will come in contact with mucous membrane or non-intact skin (Refer to **Table 1** for examples)
- Disinfection kills microorganisms on instruments and equipment, but it is not a sterilizing process and it should not be used as a substitute for sterilization. HLD is used to destroy organisms on delicate or heat-sensitive instruments that cannot be sterilized
- It is not appropriate for instruments that will be used in critical sites, because these instruments must be sterile
- Although sterilization is the safest and most effective method for the final processing of instruments, it might not always be available or suitable
- In these cases, HLD is the only acceptable alternative and can be achieved either by heat or use of appropriate chemical disinfectants (e.g., hydrogen peroxide 7.5%, peracetic acid 0.2%, , glutaraldehyd $\geq 2\%$, ortho-phthalaldehyde 0.55%)
- Sterile, or bacteria free, water must be used for rinsing to remove disinfectant residues

B. Intermediate-level disinfection (ILD)

- Intermediate-level disinfectants are capable of killing bacteria e.g., mycobacteria, vegetative bacteria, most viruses, and most fungi but do not necessarily kill bacterial spores
- Used for some semi-critical and non-critical items (refer to **Table 2** for examples)



► C. Low-level disinfection (LLD)

- Low-level disinfectants can kill most vegetative bacteria, some fungi, and some viruses in a practical period of time (<10 minutes). Chlorine 0.05% can be used as a low-level disinfectant
- Used for non-critical items which will come in contact with intact skin (refer to table #2 for examples)

Table 2: Type of disinfectants

LOW LEVEL DISINFECTANTS	INTERMEDIATE LEVEL DISINFECTANTS	HIGH LEVEL DISINFECTANTS
<ul style="list-style-type: none"> • Phenolic Disinfectants • Quaternary Ammonium Compounds 	<ul style="list-style-type: none"> • Alcohols • Hypochlorites/Chlorine • Iodine and Iodophor Disinfectants 	<ul style="list-style-type: none"> • Hydrogen Peroxide • Gluteraldehyde • Formaldehyde • Ortho-phthalaldehyde • Peracetic Acid • Peracetic Acid and Hydrogen Peroxide

NB Chlorhexidine gluconate is an antiseptic used for skin decontamination it is not a disinfectant and should not be used as such – Refer to annexe 1 for how to make up chlorine solutions

4.6.1.5 Cleaning prior to disinfection or sterilisation

Cleaning is the essential first step in reprocessing any device after use, because failure to properly clean an instrument may allow foreign material (e.g., soil, organic materials, including microorganisms and inorganic materials and lubricants) located outside and inside of the device to hinder disinfection and/or sterilization processes.

Cleaning is normally accomplished by manual wiping, brushing or flushing using water and detergent, or by using automated washing equipment to remove foreign material. Not every facility has a high level of resources (i.e., cleaning chemistries, mechanical cleaning equipment), irrespective of available resources medical devices must be thoroughly cleaned prior to disinfection or sterilization.



Cleaning is the first and most essential step before any process of disinfection or sterilization can be carried out

4.6.1.6 Decontamination of General Equipment – category (Low: non-critical)

This section focuses on patient care equipment (e.g., crutches, beds, ECG leads; bedside tables, and furniture, toilet seats, baths, basins, theatre table etc.) and medical devices which come into contact with intact skin. Health Care facilities patient care equipment must be properly maintained and should be handled as follows:

- Reusable medical devices and equipment that has been in contact with a patient must always be cleaned before using on another patient. (i.e. before and after use)
- Appropriate PPE must be worn whilst handling soiled and /or contaminated patient-care equipment to prevent exposure to skin and mucous membrane
- Never reuse a disposable item i.e. Single use patient-care equipment, medical devices or medical accessories , they are not designed to be cleaned , disinfected or sterilised and it will be difficult to decontaminate and may alter the nature of the materials making them unsafe
- Always decontaminate equipment prior to repair or service as per manufacturer's instructions. If instructions are not available refer to the local decontamination policy
- (Always clean then disinfect items which are visibly soiled with blood, blood stained body fluids, or other potentially infectious material, if the item is not able to be decontaminated effectively i.e. porous surfaces, then discard
- Only toys that can be effectively decontaminated are permitted. Toys , contaminated with blood, body substances, or other potentially infectious material should be either cleaned and disinfected before use or discarded as clinical waste



► **4.6.1.7 Decontamination of medical equipment and devices – category: (Semi-critical/High-critical medical instruments)**

A. General Principles of Cleaning Prior to High-Level Disinfection or Sterilization

Cleaning is the first step in decontamination for all used instruments and equipment irrespective of where they will be used or level of contamination. **Prior soaking in chlorine 0.5% is no longer recommended.**

Handling prior to decontamination:

- Contaminated items should be contained in enclosed, leak-proof, puncture-proof containers prior to transport
- Soiled instruments should be opened and kept moist by spraying with an enzymatic spray or covered with a moist towel with water (not saline) or foam, spray, or gel specifically intended for this purpose until such time as they can be properly processed. – do not soak instruments in disinfectant prior to cleaning
- Soaking instruments in disinfectant:
 - May damage/corrode the instruments
 - The disinfectant may be inactivated by blood and body fluids, which could become a source of microbial contamination and formation of biofilm
 - Transportation of contaminated items soaked in chemical disinfectant to the decontamination area may pose a risk to healthcare workers and result in inappropriate handling and accidental damage
 - May contribute to the development of antimicrobial resistance to disinfectants
- Do not transport in containers with water as water is a splash hazard
- Do not hold used instruments in a dry container - this allows blood and debris to dry on the surface of the instruments which makes cleaning more difficult

B. Cleaning Methods

Use of detergents are important in cleaning as they reduce surface tension and cut through fat and organic matter. Follow the manufacturer's recommendation for the type of soiling against which the detergent is effective. Detergents used for home cleaning or laundry use are not suitable for the cleaning of medical devices or instruments.

- Use a neutral pH or enzymatic detergent. Detergent suspends grease, oil, and other foreign matters in solution so that they can be removed easily by the cleaning process
- Do not use an abrasive cleaner, such as steel wool used for household cleaning, because it can scratch the instruments, which creates potential sites for microorganisms to harbour
- If an instrument or piece of equipment cannot be cleaned thoroughly, then do not sterilize or disinfect it but discard it. It should not be reused

To clean **instruments** manually:

- Wear PPE (a thick plastic apron, thick rubber gloves, a surgical mask, eye protection,(goggles or face shield)
- Remove any gross soiling on the instrument by rinsing it in water
- Open the instrument like scissors, forceps fully apart and immerse all parts in warm water with a detergent (biodegradable, noncorrosive, nonabrasive, low-foaming and free-rinsing) or enzymatic cleaner.
- Wash the instruments with a long handled brush to reduce risk of sharps injury and to prevent splashing keep the items being washed under the surface of the water
- Rinse in clean water
- Dry the instrument in a drying cabinet or by using a clean, lint-free cloth
- Inspect the instrument to ensure it is clean (if not repeat the cleaning process)
- Pay particular attention to instruments with teeth, joints, or screws where organic material can collect
- Open all jointed instruments
- Dry thoroughly after cleaning and prior to disinfection



► **The Three bucket system for intermediate, semi critical devices.**

Whilst not recommended as best practise many health care facilities still soak instruments in 0.5% chlorine for 10 minutes in the absence of better high level disinfectants. It is essential that the first step in this process in washing of the instruments using clean water and detergent or preferably an enzymatic detergent. The instruments may then be dried and transferred to a second bucket of 0.5% chlorine, prepared within the last 24 hours and fresh (ie not previously used). They should be soaked for 10 minutes fully submerged. Record the time the process starts and do not add any other instruments once the time has been recorded. Transfer to clean water and rinse thoroughly prior to drying. Instruments should be stored in a covered tray or other receptacle.

C. Cleaning New Instruments

All new instruments are supplied without lubrication. Carefully wash and dry all new instruments and lubricate all moving parts. When they are no longer new, do not let stained steel instruments come in contact with barium chloride, aluminium chloride, or compounds that contain bromide and iodine.

- Summary of cleaning of medical devices/instruments Medical devices should be disassembled, where necessary to allow effective cleaning
- Ensure that all surfaces of instruments and equipment, including channels and bores are cleaned
- Physical cleaning reduces the bio-burden or the microbial load sufficiently to allow the process of sterilization or high-level disinfection to be effective
- Organic matter protects microorganisms from contact with the disinfectants, steam and other chemicals, thereby rendering the process ineffective
- Some chemicals used for reprocessing devices are inactivated in the presence of organic matter
- Some chemicals used for reprocessing are inactivated when mixed with other chemicals (incompatible)
- The life of the instruments is prolonged if soil and debris is removed regularly

Depending on the classification described in **Table 1**, once cleaned the item will either undergo:

High-level disinfection (HLD) Sterilization

- High level disinfection is required for instruments that cannot be sterilised in an autoclave or using chemical sterilisation methods
- Ortho-phthalaldehyde has a better safety profile than glutaraldehyde and is recommended as agent of choice, subject to being compatible with the device being decontaminated
- Once cleaned and dried (section 4.6.1.8.) follow these steps for high level disinfection:
 - Follow the manufacturers' instructions to prepare and monitor a 0.55 % Ortho-phthalaldehyde solution or appropriate concentration of another chemical solution. Use chemical indicator strips to monitor effectiveness of solution with every use
 - The solution needs to be changed every 14 days of use (shelf life) or sooner if visibly soiled
 - After preparing the solution, put it in a clean container with a lid and always mark the container with the preparation date and the expiration date
 - Open all hinged instruments and other items and disassemble those with sliding or multiple parts and completely submerge all instruments and other items in the solution. Place any bowls and containers upright, not upside down, and fill with the solution. The solution must contact all surfaces to ensure high level disinfection
 - Follow the manufacturers * instructions regarding the necessary contact time to ensure maximum sterilization.
 - In general, if the solution contains 0.55 % Ortho-phthalaldehyde, cover the container and allow the instruments and other items to soak for 10 hours. Record the time the process starts and when it should be complete. Do not add or remove any instruments or other items timing starts
 - Use large, sterile pickups (lifters, cheatle forceps) or sterile gloves to remove the instruments and other items from the solution (pickups should be sterilized regularly)
 - Rinse items thoroughly with sterile water to remove the residue that chemicals leave on instruments and other items. This residue is toxic to skin and tissues
 - Place the instruments and other items on a sterile tray or in a sterile container and allow them to air dry before use. Use the instruments and other items immediately or keep them in a covered and dry sterile container and use them within one week*

Note: High level disinfectants should be changed after 14 days or earlier if failed chemical indicator test. Use chemical indicators to monitor the concentration of Ortho-phthalaldehyde solution with every use *Instruments that are used for semi-critical procedures do not have to be sterile and therefore can be held for longer as long as suitably stored.



Caution: Ortho-phthalaldehyde may be irritant to the eyes and nasal pathway and may cause respiratory illness (asthma) and allergic dermatitis. Glutaraldehyde should not be used in an area with little or no ventilation, as exposure is likely to be at or above the current occupational exposure standards.

Appropriate PPE (e.g., Eye protection, a plastic apron, and gloves) must be worn when Ortho-phthalaldehyde liquid is made up, disposed of, or when immersing instruments. Latex gloves may be worn and discarded after use if the duration of contact with Ortho-phthalaldehyde is brief (i.e., less than 5 min). For longer duration, nitrile gloves must be worn. It should be stored away from heat sources and in containers with close-fitting lids.

**Follow manufacturer's guideline for safe and proper disposal.*

4.6.1.8 Sterilization

- Sterilization is the destruction of all microorganisms (bacteria, viruses, fungi, and parasites), including bacterial endo-spores, from instruments and other items
- Sterilization protects patients and is recommended for all instruments and other items that will come in contact with the blood stream or tissues under the skin, as well as on drapes and some surgical attire. Items and equipment can be sterilized by either physical or chemical methods, such as the following:
 - High-pressure steam (autoclaving)
 - Dry heat (oven)
 - Chemical disinfectant
- Heat, is the most effective method of sterilization and is reliable if monitored carefully. It is also less expensive than chemical methods. Heat should be considered first, for all medical equipment that can withstand it. Where heat cannot be used, chemicals such as
- Hydrogen Peroxide and Ortho-phthalaldehyde are the best alternatives
- Before sterilizing any instrument or equipment ensure that it can withstand the process (e.g., steam under pressure), has been adequately cleaned, and does not require any special treatment
- Records should be kept of the sterilization process and for the traceability of instruments

A. Wrapping Items for Steam Sterilization

- All materials must be double wrapped before steam sterilization. Wrapping helps prevent recontamination after sterilization and prior to the item's use. Refer to Annex 1
- Only wrapped or packaged sterilized materials should be described as sterile
- The properties of the wrapping material should allow it to act as a barrier against dust particles, to repel water, and to provide an adequate seal of the contents
- The wrapper should resist tears and punctures, and be free of holes and toxic ingredients
- The sizes necessary to wrap the instruments and items to be processed must be available in sufficient quantities and be stored in a manner that allows HCWs' access
- All wrappers must be lint free
- Wrappers have to completely enclose the instrument or item. The edges need to be properly folded so the tool can be aseptically presented during a procedure. While the edges and corners of the wrapper need to be tucked in, there should not be excessive wrapping material on and around the item as this interferes with the steam penetration
- If the wrapper is to be used as a sterile field, it should provide a field of at least six inches beyond the four sides of the table. The wrappers should be used simultaneously to wrap the contents. Pins, staples, paperclips, and other sharp objects should never be used to secure a wrapped item.
- All sterile packages should be handled as little as possible
- There should be an indication on the pack to show if the item is ready for patient use (e.g., indicator tape with date of sterilization clearly noted on the package)



► 4.6.1.9 Steam Sterilization (Autoclaving)

Autoclaving is the use of high-pressure steam to sterilize equipment and instruments.

A. Types of Autoclaves

- There are several types of autoclaves:
 - Downward (gravity) displacement sterilizers (jacketed and non-jacketed) are designed for sterilizing bio-hazardous waste, solutions, and instruments. They are not the best option for wrapped packs or porous materials
 - Non vacuum steam sterilisers, Self-contained (bench-top) sterilizers are often used for office-based practices, as they are suitable for relatively few or simple items
 - In Sierra Leone Pressure Cookers are used as steam sterilisers. They are adequate for solid items such as scissors and forceps but not for hollow bore items. Items sterilised using a pressure cooker should be resterilised immediately before use if they are to be used in critical procedures (see Spaulding classification)
 - Pre-vacuum (porous load) sterilizers are suitable for sterilization of wrapped clean instruments, gowns, drapes, towelling, and other dry materials that are required for surgery

B. Guidelines for Operating and Maintaining Autoclave Machines

- An autoclave or sterilizer machine will reliably sterilize items only when it is kept in good working condition and operated correctly. Instructions for the operation and routine maintenance of autoclave machines should be included in HCWs' basic training. Sterilization by heat is most effectively achieved by moist heat sterilization.
 - Moist heat sterilization: Moist heat is far more penetrative than dry heat and, hence, more effective for killing microorganisms. Steam under pressure is frequently used in sterilization procedures which can be achieved in an autoclave or sterilizer. The materials to be sterilized are placed in the chamber, which is then sealed. Steam is introduced under pressure into the chamber and held in there for the necessary time and then vented from the chamber. Sterilizers have pressure gauges and thermometers that monitor the sterilization process. In addition to these, sterilizers are also monitored using chemical and biological indicators. The cycles most frequently used for sterilization are 134–138°C for 3 min, 121–124°C for 15 min, or 115°C for 30 min. (this is the actual sterilization time not the whole cycle time which can be considerably longer).
- To ensure proper steam contact, first clean and dry objects before autoclaving
- Keep instruments disassembled, opened, and unlocked
- Do not stack the instruments
- Do not wrap the packages too tightly
- Do not arrange the packs in the sterilizer too close to each other
- Position the containers in a way that air can easily be displaced and steam can have enough contact with all surfaces
- Ensure that the small drain strainer at the bottom of the sterilizer is not clogged. This could result in trapping air inside the sterilizer
- Follow specific operating instructions from the manual that was supplied by the manufacturer
- Ensure that there is at least 7-8 centimetres (3 inches) of space between the packages and the autoclave chamber walls
- Place bottles, solid metal, and glass containers on their sides with lids held loosely in place
- Place instruments trays (mesh or perforated bottom only) flat
- Do not overload the sterilizer or make packs too large
- Apply a chemical indicator on the pack of instruments to indicate whether the item has been subjected to a sterilization process. Indicators are available that will show that a specific temperature or pressure has been reached
- Double wrap items using correct wrapping material (cloth, or muslin)

4.6.1.10 Dry Heat Sterilization

- Dry heat sterilization requires higher temperatures for much longer exposure periods than moist heat sterilization to kill all microorganisms
- Because of high temperatures, only glass or metal objects can be sterilized by dry heat. Do not use this method ►►

- ▶ for other items such as gauze or cotton which may melt or burn
- Dry heat ovens are not as safe as autoclaves. As they do not maintain consistent heat it may result in lack of sterilization. If there is however no alternative then it is essential to use an industrial dry heat oven rather than the common home oven which is not reliable or safe to use. Microwaves are also not appropriate and cannot be used
- The oven must have a reliable temperature gauge and where possible a timer
- If no timer is available, a portable timer is required

A. Steps of Dry Heat Sterilization

- **Step 1:** Clean and dry all instruments and other items to be sterilized
- **Step 2:** Put unwrapped instruments in a box

Note: Because dry-heat sterilization works by raising the temperature of the entire item to the designated temperature, it is not necessary to open or unlock hinged instruments or other items or to disassemble those with sliding or multiple parts. In addition, instruments and other items can be placed in closed containers as heat can penetrate the box (unlike steam which cannot).

- **Step 3:** Place instruments and other items in the oven, and heat to the designated temperature. Once the oven reaches the designated temperature, start the timer. Do not open the door or add more instruments during the procedure. Once the desired time has been reached, turn off the oven

– Temperature:

- 170 degrees C – 1 hour
- 160 degrees C – 2 hours
- 150 degrees C – 2.5 hours
- 140 degrees C – 3 hours

Note: Because dry heat can dull sharp instruments, these items should not be sterilized at temperatures higher than 160 degrees C.

- **Step 4:** Leave items in the oven to cool before removing. When they are cool remove single items using sterile forceps and use immediately or store (maximum 24 hours)
- **Step 5:** Store items properly. Proper storage is as important as the sterilization process itself. For boxed, instruments store up to 24 hours

B. Maintenance of dry heat ovens

Maintenance of dry-heat ovens should be part of every sterilization procedure. If the ovens do not reach the correct temperature, sterilization will not be achieved. Be sure to:

- Keep the oven clean
- Check that the temperature gauge is working correctly on a regular basis every week by putting a thermometer in the oven and comparing the temperature reading with the one on the gauge

4.6.1.11 Monitoring Sterilization Procedures!

Complying with the standards for monitoring the sterilisation process will be challenging for Sierra Leone however the section is included for best practise.

Annexe 2 details the various methods.



► 4.6.1.12 Storage

Proper storage of sterile instruments and equipment is essential in ensuring that the product maintains its level of sterilization or disinfection. Most instruments and equipment are dry and packaged once they have been sterilized. Store them in a clean, dry environment that is protected from any damage. The storage area should be separate, enclosed, and located next to or connected to the area where sterilization occurs. In smaller clinics, this area may be just a room. The area should be used solely to store sterile and clean supplies for patient care. Access to this area should be limited.

- The storage area for sterile product must be separated from dirty linen, dirty utility/sluice area, and must be away from storage of clinical waste. In addition, the sterile material should be far from sources of moisture
- The storage area should be large enough for the amount of material that needs to be stored, should have an adequate level of lighting and the walls should be smooth and easy to clean. Access to the area should be restricted
- They storage shelves should be located at a minimum distance of 30 cm. from the floor, 45 cm. from the ceiling and 5 cm. from the wall and should be maintained at the temperature between 15 °C – 28 °C and humidity between 30% – 50%. Recommended air exchange in the storage room should 10 changes per hour for a theatre sterile pack store
- Shelving or cabinets should be selected based on the rotation of the materials and of personnel access to the area and must always be kept in optimal conditions in terms of order and cleanliness
- Packages should be placed on shelves or in cabinets. If they are small packages, they should be placed in drawers or baskets. It is recommended that the storage containers should not be wooden
- The material should be placed in a position that makes it simple to see the label and visualize the expiry date indicated on the container
- When accessing the materials needed, don't touch the other material when removing the one that is needed
- Before use, packages should be inspected in order to verify that it meets the requirements of a sterile product

Adapted from Sterilization manual for health centres. Washington: Pan American Health Organization, 2009

4.6.1.13 Shelf Life

The shelf life of an item after sterilization is event related:

- The item remains sterile until something causes the package or container to become contaminated—the time that has elapsed since sterilization is not always the determining factor
- To make sure items remain sterile until you need them, prevent events that can contaminate sterile packs, and protect them by placing them in plastic covers (thick polyethylene bags)
- Before using any sterile item, look at the package to make sure the wrapper is clean, dry, intact, the seal is unbroken, and no water stains are present
- If the quality of wrapping cloth is poor and plastic bags are not available, limit the shelf life to help ensure the sterility of the instruments

► **ANNEX 1: Making up a disinfectant solution - this annex could be simplified with diagrams**

The recommended decontamination agent is a 0.5 % chlorine solution (also referred to as 5000ppm), used for ILD or LLD). Make a fresh solution every morning, or after 8 hours, or more often if the solution becomes visibly dirty. A 0.5 % chlorine solution can be made from readily available liquid chlorine (bleach) or chlorine tablets (NaDCC). **Chlorine is a good disinfectants however it is very unstable, corrosive and will damage many materials.**

The formula for making a dilute solution from liquid bleach solutions is as follows:

$$\left(\frac{\% \text{ chlorine in liquid bleach}}{\% \text{ chlorine desired}} \right) - 1 = \text{Total parts of water for each part of bleach}$$

Example 1: To make a 0.5% chlorine solution from 3.5% bleach:

$$\left(\frac{3.5\%}{0.5\%} \right) - 1 = 7 - 1 = 6 \text{ parts of water for each part of bleach}$$

Therefore you must add 1 part of 3.5% bleach to 6 parts of water to make a 0.5% chlorine solution.

Parts can be used for any unit of measure (e.g. ounce, litre, gallon) or any container used for measuring such as a pitcher.

Example 2: To make a 0.5% chlorine solution from bleach powder

If using bleach powder, calculate the amount of bleach to be mixed with each litre of water by using the following formula:

$$\left(\frac{\% \text{ chlorine desired}}{\% \text{ chlorine in bleach powder}} \right) \times 1,000 = \text{Grams of bleach powder for each litre of water}$$

Example – to make a 0.5% chlorine solution from calcium hypochlorite (bleach) powder containing 70% active chlorine:

$$\left(\frac{0.5\%}{70\%} \right) \times 1,000 = 0.007 \times 1000 = 7$$

Therefore you must dissolve 14.3 grams of calcium hypochlorite powder in each litre of water used to make a 0.5% chlorine solution.

Cover containers containing 0.5 % chlorine solution and protect them from light.

Caution: Do not mix chlorine solutions with acid-based or acid solutions, because toxic gas might be produced.

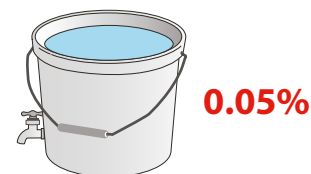
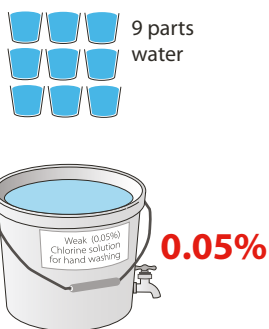
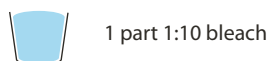
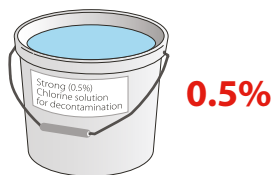
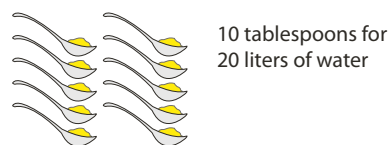
► ANNEX 2: Making up a disinfectant solution - this annex could be simplified with diagrams



- NOTE: Solutions of sodium hypochlorite (household chlorine bleach) can be an effective disinfectant for ILD or LLD when used properly and in the right concentration.
- Chlorine solution should not be used for HLD.
- Understanding the concentration of your bleach solution is important for achieving effective disinfection.
- Because the concentration of commercially sold bleach varies by brand and country (from 3 to 15 %), as a result the amount of bleach needed to achieve a 0.05% solution (suitable for LLD) will also vary. Therefore, it is essential that the dilution of bleach must be based on the initial concentration.

Preparing Chlorine Solution

Wear gloves, eye protection and face mask while preparing chlorine solution

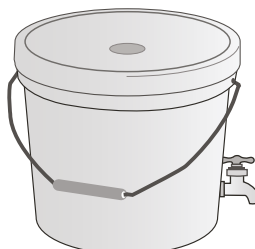


Always cover the bucket with a lid

Keep it in shade away from direct sunlight

Always stir the mixture very well and wait at least 30 minutes before use

Prepare solution fresh daily or frequently as needed



Throw away any leftover solution from the day before

Do not use dirty chlorine solution

Use strong (0.5%) chlorine solution to disinfect surfaces and objects

Use weak (0.05%) chlorine solution to wash hands



- ▶ The sterilisation process should be monitored to ensure it has been effective. This is not currently standard practise in Sierra Leone although as sterilisation procedures improve they should be introduced. See Annexe 2 for details of biological and chemical indicators.

Monitoring sterilization procedures include routine biological, mechanical, and chemical monitoring to ensure that all parameters of sterilization are met before using the instrument on patients.

A variety of indicators can be used to monitor the sterilization process:

- Use biological Indicators (BIs) at regular intervals: *Geobacillus stearothermophilus*, weekly and as needed for steam sterilizers; and *Bacillus subtilis*, weekly and as needed for dry-heat sterilizers
- BIs should also be used:
 - Whenever a new type of packaging material or tray is used
 - After training new sterilization personnel
 - After a sterilizer has been repaired
 - After any change in the sterilizer loading procedures

Note: If the mechanical (e.g., time, temperature, pressure) and chemical (internal or external) indicators suggest that the sterilizer is functioning properly, a single positive spore test result probably does not indicate sterilizer malfunction. Items other than implantable items do not necessarily need to be recalled; however, sterilizer operators should repeat the spore test immediately using the same cycle that produced the positive BI. The sterilizer should be removed from service and sterilization operating procedures reviewed to determine whether operator error could be responsible.

BIs should also be used with every load with an implantable device (might not be feasible in Sierra Leone). If not available an external chemical indicator should be used.

- There are different categories of chemical indicators (see Table 2) which are used to monitor sterilization process
- Use external indicators to verify that items have been exposed to the correct conditions of the sterilization process and that the specific pack has been sterilized
- Place internal indicators inside a pack or container in the area most difficult for the sterilization agent (steam or heat) to reach (for example, in the middle of the linen pack)
- Mechanical indicators for sterilization provide a visible record of the time, temperature, and pressure for that sterilization cycle. This is usually a printout or graph from the sterilizer, or it can be a log of time, temperature, and pressure kept by the person responsible for the sterilization process that day
- All Sterilization procedures require appropriate routine biological, mechanical, and chemical monitoring to ensure that all parameters of sterilization are met before using the instrument on patients

4.6.2 Decontamination

4.6.2.1 Safe Handling of Linen and Laundry Processing

Used linen potentially contains large numbers of microorganisms. However, the use of standard precautions in all situations when linen is handled will reduce risks to healthcare workers (HCW). Work-related infections that do occur are usually a result of failure to practice standard precautions (e.g., wearing appropriate Personal Protective Equipment (PPE) and practicing hand hygiene when appropriate) during handling and after processing linen- especially soiled and “infectious” linen.



For information on hand hygiene, standard and transmission-based precautions and injections safety and prevention of sharps injuries refer to the relevant sections within this chapter

The following preconditions for prevention of healthcare-associated infections (HAI) should be addressed by health-care facility (HCF) leaders and managers, informed by the evidence based information provided:

1. **Infrastructure/system change:** access to the right equipment including PPE, supplies and an environment that is designed and planned to facilitate safe handling of used linen for patient and health worker safety.
2. **Training and education:** a program of routine training and education and periodic retraining for all personnel involved in the collection, transport, sorting, and washing of soiled linen that is in line with the recommendations presented in this chapter.
3. **Monitoring, evaluation and feedback:** a program of regular supervision and feedback is in place.
4. **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters displayed in clinical areas).
5. **Safety culture:** managers and leaders at every level of the HCF show their visible support for a clean environment to help develop and reinforce a culture of patient safety.



All used/soiled linen is considered contaminated and should be handled with caution, following the general precautions

4.6.2.2 General Precautions for Processing Linen

Housekeeping and laundry personnel should follow these general guidelines in all stages of processing linen:

- **Minimal handling:** Handle soiled/used linen as little as possible and with minimum agitation to prevent gross microbial contamination of the air and of persons handling the linen
- **PPE:** Use appropriate PPE for the task (such as gloves and plastic aprons) when collecting, handling, transporting, and sorting linen
- **Hand hygiene:** Perform hand hygiene before and after changing or removing gloves and according to the Five Moments for Hand Hygiene
- **Linen from operating theatres:** Consider all cloth items, such as surgical drapes, gowns, abdominal packs and wrappers that have been used during a procedure as contaminated and potentially infectious; thus, even if there is no visible contamination, the item must be laundered
- **Handling:** Never place soiled linen on the floor or any clean surfaces
 - Do not shake linen and be vigilant for sharps, instruments, or broken glass that might be folded into linen or in the laundry bags
 - Do not sort or pre rinse linen in patient-care areas



► – **Reusable utility gloves:**

1. Wash reusable utility gloves after each use with soap and water
2. Soak gloves in 0.05% hypochlorite solution for 30 minutes
3. Rinse with clean water and check for leaks (discard if punctured or torn)
4. Hang dry by finger tips and allow to air dry

Practices and Precautions in Laundry Facilities

- Hand hygiene facilities should be available in laundry facilities to enable hand hygiene at the right moments
- Linen bags and carts for storing and transporting linen should be handled as follows:
 - Separate 'used' linen (without visible contamination) from 'grossly soiled/wet' and 'infectious' linen
 - Assign labels, or colour coding to identify bags or containers used for transporting contaminated linen
 - Use separate carts, labelled accordingly, for 'used' and 'clean' linens
 - Cover laundry carts used to collect or transport used linen
 - Thoroughly clean carts that transport used linen with water and detergent, disinfect with 0.5% hypochlorite solution (5,000 ppm available Chlorine) and allow carts to dry

4.6.2.3 Collecting, Sorting, and Transporting Soiled Linen

Collecting Used Linen

- Segregate used linen at the point of generation and place linen in appropriate colour coded bags (see Table 1)
- Collect and remove used linen daily, or more often as needed, from patient rooms and also after each invasive medical or surgical procedure
- Collect used linen in cloth or plastic bags, containers with lids, or covered laundry carts
- Cloth bags are adequate for the majority of patient-care linen and require the same handling and processing to prevent the spread of microorganisms to personnel, patients and environment
- Confine the used linen to designated areas (interim storage areas away from public traffic) until transported to the laundry
- Cloth or strong impervious plastic bags must be tied securely when they are three-quarters full before transport to the designated area for collection
- Large amounts of faeces or blood clots should be removed from linen with a gloved hand and toilet tissue, placed in a bedpan/commode bucket and emptied into a toilet or pit latrine

Sorting Used Linen

The processing/sorting area for used linen must be separate from other areas such as those areas utilized for folding and storing clean linen. There should be adequate ventilation (air should flow from clean to dirty area) and physical barriers between the clean and soiled linen areas. The following practises must be adhered to when sorting used linen:

- All workers must cover all lesions on exposed skin with waterproof plasters and wear appropriate heavy duty utility gloves, and other PPE (e.g., eyewear, gumboots, and a plastic or rubber apron) while carefully handling soiled linen, as:
 - Used linen, such as large drapes and towel drapes, from the operating room or other procedure areas occasionally contain sharps (scalpels, sharp-tipped scissors, hypodermic and suture needles, etc.)
 - Bedding from patient's rooms may be wet with blood or other body fluids and contain soiled dressings
- Do not pre-sort or wash linen at point of use
- Clean hands before donning and after removing gloves
- Some linens, such as infectious linen (linen from persons with a diagnosis of highly infectious microorganisms e.g. Ebola, Lassa fever or other viral haemorrhagic fevers), pose special hazards and must be separated from other linen, as it requires special handling
- Bags containing infectious linen must be sealed, with a label attached, indicating the point of origin





For more information on Ebola virus disease refer to local policy and Standard Operating Procedures

Table 1: Recommended colour-coding of linen bags

When appropriate coloured bags are not available use a system for marking bags in line with colour coding eg a red cross, a clearly and firmly attached label of the appropriate colour etc.

Colour coding of bags	
Red bags	For linen from patients with infectious conditions (e.g., Ebola, Lassa fever). Place linen in a strong impervious plastic bag to avoid leakage, label indicating point of origin
Yellow bags	For used linen. (e.g., visibly soiled with blood or body fluids)
Black bags	For used linen (e.g., not visibly soiled) from general patient-care wards and departments
White bags	For clean linen from the laundry
Green bags	For used (visibly and non-visibly soiled) linen from special departments such as the operating theatre and the labour and delivery wards

4.6.2.4 Laundering Linen

All linen items, including bed sheets, surgical drapes, masks, and gowns, should be thoroughly washed or sterilized before reuse.

Heavy-duty washers and dryers are recommended for the hospital laundry, if not available washing by hand may be undertaken as described below.

Washing Linen by Machine

The following practices apply to routine laundering of visibly and non-visibly soiled linen by machine:

- Wash visibly soiled linen (e.g., soiled with blood/body fluids/excretions/secretions) separately from non-visibly soiled linen
- Wash with detergent and water (70°C to 80°C) for at least 3 minutes, rinse with clean water, disinfect with 0.5% chlorine solution for at least 10 minutes, wash again with clean water and air dry (preferably in the sun)
- When the wash cycle is complete, check the linen for cleanliness
 - Rewash linen if dirty or stained
 - Heavily soiled linen might require two wash cycles
 - Do not use stained linen for patient care
- High-temperature washes (hotter than 71°C) are necessary if cold water detergents are not used
- Adjust the temperature and time cycle of the machine according to manufacturer's instructions and type of soap or other washing products being used
- Both cold and hot water washing cycles must include a hypochlorite solution (bleach) cycle to reduce bacterial counts in the linen
- Wash coloured and white linen separately
- Wash linen from the nursery department separately
- Do not remove excrement by spraying with water as this process will generate aerosols, potentially causing the dispersal of microorganisms, scrape it off carefully into a toilet or latrine bucket
- Wash heavy blankets in warm water and dry in the sun or in dryers at cool temperatures



► Washing Linen by Hand

The following practices apply to routine laundering of visibly and non-visibly soiled linen by hand, if a machine is not available:

- Wear appropriate PPE
- Wash heavily soiled linen (e.g., visibly soiled with blood or body fluids) separately from non-visibly soiled linen
 - Wash linen with detergent and water, rinse with clean water
 - Disinfect with 0.5% chlorine solution for at least 10 minutes
 - Wash again with clean water and air dry, preferably in the sun
- Wash all used linen in water with soap even if no soiling is visible
 - Check items for cleanliness
 - Rewash if they are dirty or stained
 - Do not use stained linen for patient care

4.6.2.5 The following guidelines apply to items that require additional cleaning or sterilization:

- Surgical gowns and linens that have been used in sterile procedures should be sterilized by steam after the normal washing-and-drying cycle to destroy microorganisms
- Sterilise linen to be used in the operating rooms or theatres in an autoclave

4.6.2.6 Drying, Checking, Ironing, and Folding Linen

The steps for drying, checking, ironing, and folding linen are the same for both hand- and machine washed linens:

- Air or machine dry thoroughly before further processing
- Air-dry in direct sunlight, if possible, keeping the fabric off the ground and away from dust and moisture
- After linen is totally dry, check for holes and threadbare areas and if found to be not acceptable, remove from general patient-care use
 - Consider using these linens as cleaning cloths
- Iron and fold clean and dry linen, including drapes, if acceptable
- Do not iron linen that is going to be sterilized
- If surgical drapes are to be sterilized, do not iron them
 - Ironing dries out the material, making autoclaving more difficult

4.6.2.7 Storing, Transporting, And Distributing Clean Linen

- Keep clean linen in clean (wrapped or covered), closed storage areas
- Use physical barriers to separate folding and storage rooms from soiled areas
- Keep shelves clean
- Handle stored linen as little as possible
- Transport clean and soiled linen separately
- Only clean white bags should be used for 'clean' linen
- Transport and store clean linen in a manner that prevents its contamination and ensures its cleanliness
- After laundry, clean linen should be covered during storage and transport in a separate dedicated laundry cart and **must not** be transported in the same cart with dirty linen
- The bottom shelf of the clean linen cart should have a solid barrier to prevent dust from the floor contaminating the linen



► **Transporting Linen**

- If one container or cart is used to transport linen, transport clean linen before used linen
- Containers or carts used to transport soiled linen should be thoroughly cleaned with soap and water then dried then dried thoroughly before next use
- If different containers or carts are used to transport clean and soiled linen, label carts/containers 'clean linen' or 'soiled linen'

Distributing Clean Linen

Protect clean linen until it is distributed for use:

- Do not leave extra linen in patients' rooms
- Avoid shaking clean linen, which releases dust and lint into the room
- Thoroughly clean the used mattresses with detergent first and then wipe it with 0.5% hypochlorite solution, allow to air dry before putting on clean linens



Do not soak soiled mattresses with hypochlorite solution as it will damage the mattresses. Remove/discard mattresses that are soiled and cannot be cleaned

4.6.3 Decontamination

4.6.3.1 Environmental Decontamination and Management Practices

In the prevention of healthcare-associated infections (HAIs), a clean environment plays an important role. Many factors, including the design and organization of healthcare setting, availability of clean water, appropriate sanitation, laundry systems, and air quality can significantly influence transmission of infections.

The following preconditions for the prevention of HAIs should be addressed by healthcare facility (HCF) leaders and managers, informed by the evidence based information provided:

1. **Infrastructure/system change:** access to the right equipment including personal protective equipment (PPE), supplies and an environment that is designed and planned to facilitate environmental decontamination for patient and health worker safety.
2. **Training and education:** a program of routine training and education, and periodic retraining for all HCWs responsible for environmental decontamination that is in line with the recommendations presented in this chapter.
 - Training must be provided to all new staff as part of their induction
 - Training to other staff responsible for cleaning staff must be updated on regular basis or when new cleaning product or procedures are introduced
 - Housekeeping staff should be trained to perform their assigned tasks and supervised on a regular basis
3. **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place.
4. **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters).
5. **Safety culture:** managers and leaders at every level of the HCF show their visible support for a clean environment to help develop and reinforce a culture of patient safety.

4.6.3.2 Facility Design and Planning

It is desirable that IPC practitioners input into the design of healthcare facilities at the planning stage.

The following general points highlight the IPC requirements in a well-designed, safe HCF:

- **Adequate supply (quantity, quality and access) of safe water:**
 - 5-400 litres per person per day (outpatient services require less water, while operating theatres and delivery rooms require more water. The upper limit is for viral haemorrhagic fever (e.g., Ebola) isolation centres)
 - Water should be available within all treatment wards and in waiting areas
 - Drinking-water should comply with World Health Organization (WHO) Guidelines for drinking water
- **Adequate floor space for beds and adequate space between beds (e.g., 1.5 meter)**
- **Adequate number and appropriate position of hand hygiene facilities:**
 - Water, soap, and alcohol-based hand rubs (ABHR) should be available in all key areas of the facility for ensuring good hygiene practices and compliance with the WHO's 5 Moments (i.e., ABHR at the point of care)
 - WHO recommends a minimum of one hand wash basin per every 10 beds, per unit including procedure and clinical examination rooms
 - Sinks should be deep enough and designed to prevent splashing when the tap is open, which will help to reduce opportunities for contamination by microorganisms that are resident in the drain
 - Sinks must be sealed to the wall or placed far enough from the wall to allow effective cleaning
- **The surrounding area must be nonporous to resist growth of fungus and bacteria**
 - Taps (preferably elbow-operated) and soap should be available
 - In areas when pipe borne water is not available, a bucket with tap (e.g., veronica bucket) or pour pitcher can be used
 - Hand-washing basins must not be used for disposal of liquid clinical/medical waste



- ▶ • **Adequate sanitary facilities:**
 - At least One toilet for every 10 users for inpatient setting
 - At least four toilets per outpatient setting
 - Separate toilets for patients and staff
 - Sanitation quality should be appropriate for local technical and financial conditions, safe, clean, accessible to all users including those with reduced mobility
 - Toilets should be built according to technical specifications to ensure excreta are safely managed
 - A reliable water point with soap available in all treatment areas, waiting rooms, and near latrines for patients and staff
- **Adequate ventilation should be in place for isolation room and 'high risk' areas (e.g., operating theatres, intensive-care areas)**
- **Adequate facilities required for isolation of patients requiring contact and airborne precautions**
- **Regulation of traffic flow to minimize exposure of high-risk patients and to facilitate patient transport.**
- **Precautions to control rodents, pests, and other vectors**
- **Appropriate facilities and practices in place for waste management**
- **Surfaces, including walls and ceilings must be smooth, and easy to clean**
 - This is particularly important in areas where contact with blood, body fluids, and other potentially infectious materials could be present, such as delivery rooms, operating theatres, and laboratories
- **Moisture retaining, horizontal surfaces should not be used**
- **Avoid designs that accumulate dusts (e.g., horizontal surface) and moisture**
- **Floors must be nonslip, smooth, impervious, and seamless for easy cleaning**
- **Carpets are not recommended as they have the potential to harbour large numbers of both pathogenic and non-pathogenic microorganisms including fungi and they are impossible to clean and disinfect**
- **Cupboards, which prevent the accumulation of dust, are recommended in preference to shelves**
- **Cupboards must be placed in such a way that all surfaces are easily accessible for cleaning**
- Furnishings and fittings must be able to withstand appropriate disinfectants
- **Furniture should be made with impervious material, easy to clean and durable**
- **Mattresses should be covered with impervious material, easy to clean and durable.**
- **Curtains must be easy to clean**
- Use of curtain blinds should be avoided as they are difficult to clean
- If blinds are used, then vertical instead of horizontal blinds should be used to minimize accumulation of dust
- **Ceiling mounted fans should be reachable for regular cleaning to remove any dust. If they are used it is essential the environment is kept thoroughly clean to prevent dust build up to minimise any aerosols created by the disturbance of the air.**



- *For more information on hand hygiene, standard precautions, transmission based precautions and isolation, and waste management see relevant sections within this chapter.*
- *For information on occupational health and safety refer to chapter 6.*
- *Refer also to WHO Essential Environmental Health Standards in Health Care (2008) http://www.who.int/water_sanitation_health/hygiene/settings/ehs_hc/en/*

Outpatient Areas

- Outpatient areas must be able to separate patients who are suspected to have highly infectious disease, provide prompt triage, and treat patients immediately
- They must be equipped with the appropriate hand hygiene facilities and appropriate PPE must be available
- HCWs should be skilled to promptly refer and commence initial treatment



► Ventilation

- Ventilation systems should be designed and maintained to minimize microbial contamination
- Air-conditioning must be maintained and filters regularly checked, cleaned and changed
 - Fans disperse pathogens in air and should not be used especially in 'high-risk' areas such as operating rooms, burns unit, intensive care, and neonatal units. Where they are used in place of air conditioning they should be well maintained and damp dusted regularly
 - Operating rooms require special ventilation systems
- If the healthcare facility has ventilation systems in various areas, then they also must be maintained according to the written Standard Operating Procedures

To achieve maximum effectiveness, all disinfectants **must** be diluted as per manufacturer's instructions. Too high and/or too low concentrations reduce the effectiveness of disinfectants. In addition, high concentrations of disinfectant may damage surfaces.

4.6.3.3 General Principles for Housekeeping of Health Care Facilities

Environmental housekeeping of HCFs refers to the general cleaning of hospitals and clinics. Cleaning consists of the removal of dust, soil, and contaminants on environmental surfaces and ensures a hygienic and healthy hospital environment for patients, staff, and visitors.

The environment must be thoroughly cleaned, with the following general principles in mind:

- **Always clean first!** Cleaning is an essential step prior to any disinfection process to remove dirt, debris, and other materials, as dirty surfaces decrease the effectiveness of chemical disinfectants
- Scrubbing (frictional cleaning) is the best way to physically remove dirt, debris, and microorganisms
- Cleaning products are useful and effective for environmental cleaning
 - The use of neutral detergent solution is essential for effective cleaning, as it removes dirt while improving the quality of cleaning by preventing the build-up of biofilms
- **Routine bacteriological monitoring to assess the effectiveness of environmental cleaning, is not generally required**
 - Routine bacteriological monitoring may be useful to establish the potential source of an outbreak
- **Direction of cleaning :**
 - From the least soiled areas (cleanest) to the most soiled areas (dirtiest) so that dirtiest areas are cleaned last
 - From higher levels to lower levels so that debris may fall on the floor and is cleaned last
- **Avoid large-surface cleaning methods that produce mists or aerosols, or disperse dust in patient-care areas**
 - e.g. dry sweeping, mopping, spraying or dusting
 - Airborne fungal spores are especially dangerous, because they can cause fatal infections in immunosuppressed patients

Refer to tables 1 and 2 for additional information on cleaning requirements and how to manage blood spillages.



Always clean before disinfecting. Scrubbing is the best way to physically remove dirt, debris, and microorganisms

► **Table 1: Cleaning requirements for various surface types**

Surface type	Surface type	Cleaning requirement
High touch surface	Any surface with frequent contact with hands	Requires special attention. Requires more frequent cleaning and the use of appropriate disinfectants must be considered to decontaminate these surfaces
Minimal touch surface (eg, walls, ceilings, window sills, etc.)	- Minimal contact with hands - Not in close contact with patient or patient's immediate surroundings	Requires cleaning on a regular basis with detergent only or when soiling or spills occur, and when the patient is discharged from the healthcare setting
Administrative & Office areas		Require normal domestic cleaning
Floors	- Any surface with minimal contact with hands - Not in close contact with patient or patient's immediate surroundings	Require cleaning by wet mopping. Do not use brooms. Dry sweeping is not recommended. Clean floors twice daily and as needed.
Equipment	- Varies	Requires cleaning as per written protocols (e.g., daily, weekly, after each patient use etc.), which should include use of appropriate PPE, cleaning methods, schedules of cleaning, type of surface etc. Schedules and procedures should be consistent and updated on a regular basis
Surface contaminated with blood and body fluids	- Any areas that are visibly contaminated with blood or other potentially infectious materials	Requires prompt cleaning and disinfection (see Table #2)
Isolation room or any other room that hosted patients with known transmissible infectious diseases	- Any room that hosted patients with known transmissible infectious diseases	Requires cleaning with a detergent and disinfectant solution at least daily
Horizontal surfaces (e.g. cupboard tops)	- Any horizontal surface	Requires cleaning at least once daily and as needed



For more information on cleaning operating theatres, refer to chapter 5, section 5.1

► 4.6.3.4 Cleaning blood splashes/drips and larger spills

Table 2: Methods to clean blood spills

(From: Damani N. *Manual of Infection Prevention and Control*. Oxford: Oxford University Press, 2012.)

Splashes and drips
<ul style="list-style-type: none"> • Wear non-sterile gloves for this procedure. • Wipe the area immediately with a paper towel/absorbent cloth • Discard immediately as clinical/infectious waste • Disinfect using 0.5% chlorine solution • Dry the surface with disposable paper towels • Discard gloves and paper towels as clinical/infectious waste in accordance with local policy • Wash hands with soap and water and dry hands immediately afterwards
Larger spills
<ul style="list-style-type: none"> • Wear heavy duty gloves and appropriate PPE including a face shield if there is a risk of splashing.. • Use absorbent towels • Disinfect using 0.5% chlorine solution • POUR solution directly onto spillage it may cause splashing, and widen the area of contamination • If chlorine granules are available sprinkle the spill with chlorine granules, until the fluid is absorbed (if the quantity is small i.e. 30 ml). See annex 1 Leave on the spill for a contact period of about 3-5 min to allow for disinfection • Depending on the method used, either lift the soiled paper towels or scoop up the absorbed granules and discard into a yellow plastic waste bag as clinical/medical waste • Wipe the surface area with fresh chlorine solution of 0.5% chlorine solution to remove any remaining spillage and rinse with clean water as the chlorine solution may be corrosive • Dry the surface with disposable paper towels • Remove gloves and plastic apron and discard as clinical waste according to local policy • Wash hands with soap and water and dry hands immediately

4.6.3.5 Selecting a Cleaning and Disinfecting Product

Different types of cleaning products are available:

- Liquid soap and detergents
- Disinfectants
- Combinations (detergent and disinfectant)

Each type of cleaning product has different properties and antimicrobial activities. When selecting a disinfectant, detergent, or other cleaning product, consider factors such as intended use, efficacy, antimicrobial activities, acceptability, safety, and cost.

An ideal cleaning product should have the following properties:

- Suspend fats in water
- Make fats water-soluble (saponification)
- Decrease surface tension of water and allow greater penetration of the agent into the dirt (surfactation)
- Break up soil into small particles (dispersion)
- Break up protein (protein destruction)
- Remove calcium and magnesium (soften the water)

Although chlorine-containing solutions (e.g. hypochlorite solution [bleach]) are excellent and inexpensive disinfectants, they should not be mixed with cleaning solutions containing acid, ammonia, or ammonium chloride, because doing so will release chlorine gas and other by-products that can be toxic. *Chlorine-containing solutions should not be used on urine spills. How do you clean urine spills? In addition, stability of chlorine is affected by the following factors:

- Presence of heavy metal ions
- Incompatible with cationic detergents
- Diminishing efficiency with an increase in solution's pH
- Temperature of the solution
- Presence of biofilms



- ▶ • Presence of organic matter (particularly if used in low concentrations)
- Ultraviolet radiation

It is important that diluted hypochlorite solutions should be freshly prepared daily and kept in an opaque container to prevent degradation by the sun's rays.

4.6.3.6 Cleaning Methods and Frequency

Common methods of cleaning are shown in Table 3 below:

Table 3: Method of Cleaning

Method Of Cleaning	Description
Wet Mopping* (Common method to clean floors)	Single-bucket technique: Clean clothes or mops are wetted with a cleaning solution that is contained in a bucket. Use just one bucket of cleaning solution. Change the solution when it becomes dirty. Due to inactivation, the killing power of the cleaning product decreases with the increasing contamination of soil and organic material.
	Triple-bucket technique: On top of the double-bucket technique, use a third bucket for wringing out the mop before rinsing, which extends the life of the rinse water.
Dusting*	Dusting is most commonly used for cleaning walls, ceiling, doors, windows, furniture, and other environmental surfaces (unless visibly soiled).
	Dry dusting should be avoided, and dust cloths and mops should never be shaken—shaking spreads microorganisms. Dusting should be performed in a systematic way, using a starting point as a reference to ensure that all surfaces have been reached. When dusting ceiling, tiles and walls, check for stains that may indicate possible leaks- leaks should be repaired as soon as possible, because moist ceiling tiles provide a reservoir for fungal growth.

**Note: Appropriate PPE, such as utility gloves, protective shoes, plastic aprons, masks, and protective eyewear should be used at all times during cleaning.*

4.6.3.7 Guidelines for Cleaning Specific Areas

It is essential that **all** cleaners go through education and training not only on methods of cleaning but also on preparation and use of detergents and disinfectants and risk of infections and hazard associated with using of chemical disinfectants. Housekeeping schedules should be planned, written out, and closely monitored and strictly adhered to. Cleaning practices are periodically monitored and audited using check list and immediate feedback to the cleaning staff should be provided. Cleaning schedules should be developed according to the needs of each area. The following are recommended cleaning procedures:

- **Walls, windows, ceilings, and doors:**
 - Spot clean when visibly dirty with a damp cloth, detergent and water
 - In general, routine damp dusting is adequate for these areas and disinfection is not usually necessary
 - As long as the surfaces remain dry and intact, these surfaces are rarely heavily contaminated with microorganisms
- **Chairs, lamps, tables, table-tops, beds, handrails, grab bars, lights, door handles, tops of doors, and counters:**
 - Wipe daily with detergent solution and whenever visibly soiled with a cloth that is dampened with appropriate disinfectant solution
 - Pay attention to contaminated areas on these surfaces and treat any blood or other body fluid spills as described in Table 2 and annex 1



- **Floors:**
 - Clean floors at least once daily and as needed with a wet mop, detergent, and water
 - Only use a disinfectant when the floor is contaminated with blood or body-fluid spills (see Table 2)
- **Sinks:**
 - Scrub frequently (daily or more often as needed) with a cloth or brush and a disinfectant cleaning solution
 - Rinse with water
- **Toilets and latrines:**
 - Scrub frequently at least twice daily and as needed with a separate dedicated mop, cloth, or brush and a disinfectant cleaning solution
- **Patient rooms:**
 - Clean at least one to two times daily and after patient discharge if single rooms
 - The same cleaning process applies to rooms of patients who are under isolation precautions
 - Clean with detergent and disinfect any cleaning equipment that has been used in the rooms of patients under isolation precautions before the equipment is used in another room
- **Procedure rooms:**
 - Wipe horizontal surfaces, equipment, and furniture that are used for procedures with a detergent-disinfectant solution after each procedure
 - Whenever visibly soiled, decontaminate the rooms before cleaning
- **Examination rooms:**
 - Wipe horizontal surfaces with a detergent-disinfectant solution after each procedure and whenever they are visibly soiled
 - Change the linen or paper on the examination table after each patient
 - Decontaminate before cleaning blood or other body-fluid spills
- **Laboratory:**
 - Clean and wipe countertops with a detergent-disinfectant cleaning solution after each shift or earlier when visibly soiled as per laboratory protocol
- **Curtains:**
 - Change and clean curtains weekly and when soiled
- **Carpets:**
 - Carpets should not be used in health care facilities
 - Instead, use easy-to-clean flooring such as tile
- **Soiled linen:**
 - Collect soiled linen twice daily (or more often as needed) in closed leak-proof containers (refer to section on Linen)



For more information on Linen handling refer to Chapter 4, section 4.2.2

- **Waste:**
 - Collect waste from all areas at least three times a day (or more frequently as needed)
 - Do not allow waste to overflow
 - Transport waste in a covered cart or wheelbarrow
- **Waste containers:**
 - Disinfect and clean contaminated waste containers every time they are emptied
 - Disinfect and clean non-contaminated waste containers when they are soiled
 - Use a disinfectant cleaning solution and scrub to remove soil and organic material
- **Cleaning spills and other body fluids:**
 - Clean spills of blood, body fluids, and other potentially infectious fluids immediately (see Table # 2)



► **4.6.3.8 Schedule and Procedures for the Operating Room, Maternity and Delivery Rooms**
Preparation of the Operating Room/Delivery Room before the first case

At the beginning of each day, all flat surfaces should be wiped with a clean, lint-free moist cloth to remove dust and lint. Total cleaning is not necessary between each case for surgical procedures but any spillages of blood or body fluids should be removed promptly as above.

A thorough clean of the operating room should be done at the end of each day. All areas of the surgical suite, scrub sinks, scrub or utility areas, hallways, and equipment should be totally cleaned, regardless of whether they were used during the last 24 hours.

Total Cleaning

- Operating rooms that have been in use should be thoroughly cleaned at the end of each day even if they have been cleaned between cases
- Operating rooms in which procedures may be performed, even if not used, should be terminally cleaned once every 24-hour period during the regular work week
- Scrub/utility areas should be terminally cleaned daily during the regular work week
 - Clean the area first by using detergent and water if soiling with debris (blood and body fluid) and then disinfect with 0.5% with freshly prepared hypochlorite solution
 - Clean and disinfect all exposed surfaces, including wheels and casters, of all equipment (e.g., foot pedals, kick buckets, telephones, light switches, push plates, Mayo stands, handles on cabinets, vents, walls, etc.)
- Special emphasis must be paid in cleaning and disinfecting high/hand touch surfaces
- Clean and disinfect the floor with a wet vacuum or single-use mop, moving equipment around the room to clean the floor underneath
- Remove all contaminated waste containers and replace with clean containers
- Close and remove sharps containers if they are three-quarters full
- Remove soiled linen in closed leak-proof containers

Between Each Case

Between each case, clean according to the following guidelines:

- Clean spills as outlined in Table 2
- Clean and wipe all surfaces and mattress pads with a disinfectant cleaning solution
- Clean and wipe all the flat surfaces that have come in contact with a patient or a patient's body fluids with a disinfectant cleaning solution
- Mop the centre of the operating room surrounding the operating room bed with disinfectant cleaning solution
- Collect and remove all waste from the operating room in closed, leak-proof containers
- Close and remove containers from the operating room when they are three-quarters full
- Remove soiled linen in covered and leak-proof linen containers.



For more information on Operating theatres, refer to chapter 5, section 5.1

► **ANNEX 1: Making up a solution for dealing with blood spillages**

A 1 % chlorine solution is also referred to as 5,000 ppm available chlorine. Make a fresh solution every morning, or after 8 hours, or more often if the solution becomes visibly dirty.

Instructions:

- Calculate amount of water and chlorine product (liquid/powder) needed to make desired final concentration
- Add correct amount of chlorine product (liquid or powder) and water to container or bucket
- Stir well to provide a uniform solution
- Cover bucket with lid to protect from light
- Label the container with the strength of the chlorine solution it contains, and the time and date it was made
- Wait 30 minutes before using

The formula for making a dilute solution from liquid bleach solutions is as follows:

$$\left(\frac{\% \text{ chlorine desired}}{\% \text{ chlorine in bleach solution}} \right) - 1 = \text{Total parts of water for each part of bleach}$$

Example 1: To make a 0.1% chlorine solution from 3.5% bleach:

$$\left(\frac{3.5\%}{0.5\%} \right) - 1 = 7 - 1 = 6 = 6 \text{ parts of water for each part of bleach}$$

Therefore you must add 1 part of 3.5% bleach to 6 parts of water to make a 0.5% (5,000ppm) chlorine solution.

Parts can be used for any unit of measure (e.g. ounce, litre, gallon) or any container used for measuring such as a pitcher.

► **Example 2: To make a 0.5% chlorine solution from chlorine powder:**

If using chlorine powder, calculate the amount of powder to be mixed with each litre of water by using the following formula:

$$\left(\frac{\% \text{ chlorine desired}}{\% \text{ chlorine in bleach powder}} \right) \times 1,000 = \text{Grams of bleach powder for each litre of water}$$

Example – to make a 0.5% chlorine solution from chlorine powder containing 70% active chlorine:

$$\left(\frac{0.5\%}{70\%} \right) \times 1,000 = 29 \text{ grams}$$

Therefore you must dissolve 29 grams of chlorine powder in each litre of water used to make a 1% chlorine solution.

Important Information:

- Containers must be labeled accurately
- One must know the exact starting concentration of chlorine in order to calculate how much to use
 - Do not use chlorine of unknown exact concentration
- **Chlorine loses strength with time**
 - Make a fresh solution every morning, or after 8 hours, or more often if the solution becomes visibly dirty.
- **Chlorine solutions need to be stored safely**
 - Close containers with lids
- **Sunlight weakens chlorine solution**
 - Close containers with a lids or keep the chlorine solution in a shaded area away from direct sunlight
- **One degree chlorum = 0.3% active chlorine**

Caution: Do not mix chlorine solutions with acid-based or acid solutions, because toxic gas might be produced.

4.7 Health Care Waste Management

Healthcare waste includes all the waste generated by healthcare establishments, research facilities, and laboratories related to healthcare services. Adherence to established environmental standards should be observed in all waste management activities and compliance with National policies on waste, environmental health and vector control.

Healthcare waste management is a process that includes all activities involving waste generation, waste minimisation, avoidance, segregation, collection, transportation, storage, treatment, and final disposal or recycling and reuse for all waste types generated.

This process ensures that all inputs (manpower, skills, equipment, finances, etc.) enable outputs such as:

- Patient, healthcare worker and visitor safety through reduced healthcare-associated infections (HAI) and reduced risk of injury
- Clean and safe workplaces in the healthcare facilities (HCF)
- Reduced waste-related odours and reduced attraction for vermin
- Vector management to minimise spread of disease
- Eliminating risk of injury and disease transmission to the public
- Clean and well protected environment (soil, water, and air)

The hazards emanating from poor healthcare waste management include chemical, biological, and physical hazards. The absence of management measures to prevent exposure to these hazards may result in contamination of the environment and increased health and injury risk to patients, staff and public. All staff have a responsibility to dispose of healthcare waste in a manner that poses minimal hazard to patients, visitors, other healthcare workers, and the community.

The following preconditions for prevention of HAI should be addressed by HCF leaders and managers, informed by the evidence based information provided:

1. Infrastructure/system change: access to the right equipment and supplies including PPE, and an environment that is designed and planned to facilitate patient and health worker safety.
2. Training and education: a program of routine training and education and periodic retraining for all personnel involved in healthcare waste management.
3. Monitoring, evaluation and feedback: a program of regular monitoring, supervision and feedback is in place.
4. Awareness raising/promotion to HCW, patients, visitors, care givers: the practices, including the Waste Management Plan described in the chapter are reinforced through awareness raising e.g. use of posters displayed across the HCF.
5. Safety culture: managers and leaders at every level of the HCF show their visible support for waste management safety to help develop and reinforce a culture of patient safety. Policies and procedures should be developed, reviewed periodically, revised as necessary, and readily available in the practice setting.

4.7.1 Types of waste in HCF

The type of healthcare waste generated in a HCF is determined by the services and activities carried out at the facility (Table 4.1). Wastes from HCFs in Sierra Leone are categorised as follows:

4.7.1.1 General

General waste is waste that:

- Does not possess any hazardous physical or chemical characteristics
- Is NOT contaminated with blood, body fluids, secretions, or excretions (BBF)

General waste accounts for 80-90% of all HCF waste. Examples include: paper, trash, boxes, bottles, empty containers, wrapping, etc.



► 4.7.1.2 Infectious

Infectious waste is any item suspected of containing pathogens in sufficient concentration or quantity to cause disease in susceptible hosts (refer to the chain of infection diagram in chapter 3). It includes vessels or materials containing or contaminated by BBF or any other materials deemed by the HCF to have an infection risk. It may account for 10-15% of all HCF waste. Examples include: bloody or purulent bandages, laboratory specimens and cultures, used PPE, drainage bags, etc.

4.7.1.3 Sharps

Sharps are a subset of infectious waste capable of causing cuts or puncture wounds to skin whether contaminated with BBF or not. In developing countries, sharps waste may account for 1-3% of all HCF waste. Examples include: needles, needles and syringes, scalpels, scissors, broken ampoules or bottles, and any item easily broken that could produce sharp fragments.



*Of all hazardous wastes, **SHARPS** and **LABORATORY SPECIMENS** pose the highest risk of disease transmission*

4.7.1.4 Pathological

Pathological waste (sometimes termed “anatomical waste”) is any recognisable human tissue, organ, body part, or BBF. It accounts for <1% of all HCF waste. Examples include: placentae, limbs, etc.

4.7.1.5 Chemical

Chemical waste consists of discarded solid, liquid, or gaseous chemicals possessing toxic, flammable, corrosive, reactive, or oxidizing characteristics. It accounts for <3% of all HCF waste. Examples include: mercury, acids, solvents, lithium batteries, etc.

4.7.1.6 Pharmaceutical and Cytotoxic

Pharmaceutical waste includes expired, unused, spilt, and unwanted contaminated pharmaceutical products, drugs, vaccines, and sera. Cytotoxic waste includes expired, unused, spilt, and unwanted chemotherapeutic or antineoplastic drugs commonly used in the treatment of cancer patients. Both categories also include discarded items used in their handling such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials. It accounts for <3% of HCF waste. Examples include: discarded antibiotics, returned dosages, left-over drugs, IV lines used to administer cytotoxic drugs, etc.

4.7.1.7 Radioactive

Radioactive waste is any liquid, gas, or solid contaminated with radionuclides whose ionizing radiations have genotoxic effects on human tissue. Such products are used in organ imaging and tumour localization, and various investigative and therapeutic practices. This type of waste also includes excreta from patients on cytotoxic therapy. Such wastes account for <1% of all HCF waste. Examples include: unused radioactive seeds, syringes used to inject radioactive tracers, etc.

► **Table 1: Examples of healthcare waste from different sources**

	SHARPS	INFECTIOUS AND PATHOLOGICAL WASTE	CHEMICAL, PHARMACEUTICAL AND CYTOTOXIC	GENERAL WASTE
GENERAL WASTE				
Medical ward	Hypodermic needles, IV set needles; broken vials, ampoules syringes	Dressings, bandages, gauze, and cotton contaminated with blood or body fluids (BBF); used diapers, used PPEs	Broken thermometers, blood pressure gauges, spilt medicines, spent disinfectants	Packaging, food scraps, paper, flowers, empty bottles
Operating theatre	Needles, IV sets, scalpels, blades, saws	BBF; suction canisters; used PPEs, gauze, other waste contaminated with BBF; tissues, organs, fetuses, body parts	Spent disinfectants	Packaging
Laboratory	Needles; broken glass, slides, cover slips; pipettes	BBF, microbiological cultures and stocks, tissue, infected animal carcasses, tubes and containers contaminated with blood or body fluid, used PPEs	Fixatives, formalin, xylene, toluene, methanol, methylene chloride, and other solvents; broken lab thermometers	Packaging, paper, plastic containers
Pharmacy store	Needles; broken ampoules, glass	Used PPEs	Expired drugs; spilled drugs; contaminated sharps, vials	Packaging, paper, empty containers
Radiology	Needles; broken ampoules, glass	Used PPEs	Silver; fixing and developing solutions; acetic acid; glutaraldehyde	Packaging, paper
Chemotherapy	Needles and syringes	Used PPEs	Bulk chemotherapeutic waste; vials, gloves and other material contaminated with cytotoxic agents; contaminated excreta and urine	Packaging, paper
Vaccination campaigns	Needles and syringes	Used PPEs	Bulk vaccine waste; vials	Packaging
Environmental services	Broken glass	Used PPEs	Disinfectants (glutaraldehyde, phenols, etc.), cleaners, spilled mercury, pesticides	Packaging, flowers, newspapers, magazines, cardboard, plastic and glass containers, yard waste
Engineering			Cleaning solvents, oils, lubricants, thinners, asbestos, broken mercury devices, batteries	Packaging, demolition waste, wood, metal
Food services				Food scraps; plastic, metal, glass containers; packaging
MINOR SOURCES				
Physicians' offices	Needles and syringes, broken ampoules and vials	Cotton, gauze, dressing, used PPEs and other materials contaminated with blood or other body fluids	Broken thermometers and blood pressure gauges; expired drugs; spent disinfectants	Packaging, office paper, newspapers, magazines, uncontaminated gloves and masks
Dental offices	Needles and syringes, broken ampoules	Cotton, gauze, used PPEs and other materials contaminated with blood	Dental amalgam; spent disinfectants	Packaging, office paper, newspapers, magazines,
Home healthcare	Lancets and insulin injection needles	Bandages and other material contaminated with blood or other body fluids	Broken thermometers	Domestic waste

Adapted from: *Safe management of wastes from health-care activities 2nd Ed.* Edited by Chartier Y, et al. WHO Geneva.2014

► 4.7.1.8 Factors affecting volumes of waste generated

It is in the interest of the HCF, community, and environment to reduce wastes wherever possible. Many factors affect the rate of waste generation. These include:

- Level of activity (often measured in terms of the number of occupied beds, number of patients per day, and/or number of staff)
- Type of department (e.g., general ward, surgical theatre, office, etc.)
- Type or level of facility (e.g., hospital, Peripheral Health Unit (PHU), etc.)
- Location (rural or urban)
- Waste minimization policies
- Regulations or policies on waste classification
- Segregation practices
- Temporal variations (e.g., week day vs. weekend, seasonal)

4.7.1.9 Healthcare facility responsibilities

Healthcare facilities are responsible for their waste from the point of generation to final disposal. National laws and guidelines, and a clear understanding of the principles of disease transmission and hazardous chemical exposure will assist in determining the proper classification of specific waste items. The infection prevention and control (IPC) focal person plays an important role in this process.

It is the HCF manager's responsibility to ensure the HCF waste management policy and procedures:

- Protect people who handle waste items from accidental injury
- Prevent the spread of infection to patients, clients, and staff
- Prevent the spread of infection and minimize physical risks to the local community
- Enable safe disposal of hazardous materials
- Minimize the impact of wastes on the environment
- Minimize the volumes of waste generated and discarded

The physico-chemical characteristics of HCF waste (e.g., volume, weight, density, composition, moisture content) vary widely and are useful in studying recycling options and in improving segregation, containment, collection, storage, transport, treatment, and disposal systems. On a regular basis (at least annually), the waste generator should monitor the waste types, volumes, and masses generated in their HCF.

4.7.1.10 Legislative and Regulatory Aspects

The management of healthcare waste shall be in accord with the Government of Sierra Leone legislation comprising the Environmental protection Act, Local Government Act and Public Health Act and the Integrated National Waste Management Policy 2012.

Based on the national policy, a national strategy to achieve the policy objectives should:

- Reflect priorities within HCFs for treatment and disposal of healthcare waste
- Set goals for and means of monitoring infection control and environmental protection
- Provide an optimal selection of technologies for packaging, transportation, treatment, and disposal of waste
- Identify appropriate options for centralized and decentralized waste disposal systems
- Reflect distribution of responsibility in the sector among central, regional, and local authorities
- Propose guidelines for healthcare waste management training programmes at healthcare facilities, municipal, regional, and country levels
- Provide guidelines for the setup of a monitoring and documentation system on healthcare waste management





- Propose an action plan for the implementation of improved healthcare waste management
- Provide an investment plan and annual operation and maintenance plan of the implementation of the strategy
- Establish waste management committees, plans and waste audits
- Waste minimisation, avoidance, segregation, recycling
- Waste container labelling and waste containment
- Proper healthcare waste handling, storage and transport
- Correct healthcare waste treatment and disposal
- Increased knowledge of segregating and recycling health care waste

The purpose of this is to:

- Protect public health and safety
- Provide a safer working environment
- Minimize waste generation and environmental impacts of healthcare waste and disposal
- To ensure compliance with legislative requirements

4.7.2 Hazards from Healthcare waste

4.7.2.1 Infectious waste and sharps

Infectious waste may contain any of a great variety of pathogenic microorganisms. Pathogens in infectious waste may enter the human body by a number of routes:

- A puncture, abrasion, or cut in the skin
- The mucous membranes
- Inhalation
- Ingestion

All staff must understand the Chain of Infection in disease transmission, and that through containment and appropriate destruction / decontamination of hazardous waste, an effective healthcare waste management system will break the “*Mode of Transmission*” and “*Pathogen*” links.



Refer to chapter 3 introduction to HAI and IPC for more information on the Chain of Infection

Examples of infections that might be caused by exposure to healthcare waste are listed in **Table 1**, together with the body fluids and waste items that may be potential vehicles of transmission. Concentrated laboratory cultures of pathogens and contaminated sharps represent the most acute potential infectious hazards to health of healthcare workers and public.

Sharps may not only cause cuts and punctures but also transmit infectious diseases such as HIV and hepatitis B if they are contaminated with pathogens. Because of this double risk - of injury and disease transmission - **sharps are considered a very hazardous waste class.**



***REMEMBER:** Syringes and needles MUST NEVER BE REUSED. They are single-use items and must be discarded and destroyed after ONE use*



- In Sierra Leone, there is potential for transmission of viral haemorrhagic fevers (e.g., Ebola) from contaminated waste. Also of concern is infection with human immunodeficiency virus (HIV) and hepatitis viruses B and C. These viruses are generally transmitted through injuries from contaminated needles (particularly hollow-bore).



Refer to relevant MoHS SOP on Ebola virus disease for more detailed guidance on waste management within the context of Ebola

The existence in HCF of bacteria resistant to antibiotics and chemical disinfectants may also contribute to the hazards created by poorly managed healthcare waste.⁴

Table 2: Potential infections caused by exposure to healthcare wastes, causative organisms, transmission vehicles and relevant wastes*

Type of infection	Examples of causative organisms	Specific Body Substance	Examples of relevant wastes
Gastroenteric infections	Enterobacteria (e.g. <i>Salmonella</i> , <i>Shigella</i> spp.; <i>Vibrio cholerae</i> ; <i>Clostridium difficile</i>), helminths	Faeces and/or vomit	Diapers/pads, clean-up materials, contaminated PPE, lab specimens
Respiratory infections	<i>M. tuberculosis</i> ; measles virus; <i>Streptococcus pneumoniae</i> , SARS, MERS, Influenza virus A/B	Respiratory secretions, saliva	Contaminated PPE, respiratory tissues, lab specimens
Ocular infection	Herpesvirus	Eye secretions	Contaminated PPE, tissues, lab specimens
Genital infections	<i>Neisseria gonorrhoeae</i> ; herpesvirus	Genital secretions	Contaminated PPE, wipes, lab specimens
Skin infections	<i>Streptococcus haemolyticus</i> , <i>Staphylococcus aureus</i>	Pus, Vesical fluid	Contaminated PPE, dressings, lab specimens
Anthrax	<i>Bacillus anthracis</i>	Skin secretions	Contaminated PPE, wipes, lab specimens
Meningitis	<i>Neisseria meningitidis</i>	Cerebrospinal fluid	Contaminated PPE, lab specimens, sharps
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)	Blood, sexual secretions, body fluids	Contaminated PPE, lab specimens, sharps
Haemorrhagic fevers	Junin, Lassa, Ebola, and Marburg viruses	Blood and secretions	PPE, lab specimens, sharps, diapers/pads, clean-up materials
Septicaemia	<i>Staphylococcus</i> spp.; (including Methicillin-resistant <i>S. aureus</i>); <i>Enterobacter</i> , <i>Enterococcus</i> , <i>Klebsiella</i> , <i>Streptococcus</i> spp.	Blood, pus	Contaminated PPE, lab specimens, bandages, contaminated IV lines, sharps
Hepatitis A	Hepatitis A virus	Faeces	Diapers/pads, contaminated PPE, lab specimens
Hepatitis B and C	Hepatitis B and C viruses	Blood and body fluids	Contaminated PPE, lab specimens, sharps

*Adapted from: *Safe management of wastes from health-care activities 2nd Ed.* Chartier Y, et al. WHO Geneva.2013

4.7.2.2 Hazards from chemical and pharmaceutical waste

Many of the chemicals and pharmaceuticals used in HCF are hazardous (e.g., toxic, genotoxic, corrosive, flammable, reactive, explosive, shock-sensitive). These substances are commonly present in small quantities in waste but larger quantities may be found when unwanted or outdated chemicals and pharmaceuticals are discarded.

⁴ Safe management of wastes from health-care activities 2nd Ed. Chartier Y, et al. WHO Geneva.2013 Accessed Jun 8, 2015. http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/.



► Chemicals may cause:

- Intoxication, either by acute or by chronic exposure via absorption of a chemical or pharmaceutical through the skin or the mucous membranes, or from inhalation or ingestion
- Injuries to the skin, the eyes, or the mucous membranes of the airways can be caused by contact with flammable, corrosive, or reactive chemicals (e.g., formaldehyde and other volatile substances). The most common injuries are burns

Chemical and pharmaceutical residues discharged into the sewerage system may have adverse effects on the operation of biological sewage treatment plants or toxic effects on the natural ecosystems of receiving waters. A heightened adverse effect occurs when these wastes are discharged without treatment to natural waterways.

The severity of the hazards in handling cytotoxic waste is governed by a combination of the substance toxicity itself and the extent and duration of exposure. Exposure to genotoxic substances may occur via inhalation of dust or aerosols or by absorption through the skin, during:

- Preparation and dilution of concentrated forms of the drugs
- Dilution of drug prior to administration
- Treatment
- Disposal of bodily fluids and secretions of patients undergoing chemotherapy

Experimental studies have shown that many antineoplastic drugs are carcinogenic and mutagenic; secondary neoplasia (occurring after the original cancer has been eradicated) is known to be associated with some forms of chemotherapy.

Many cytotoxic drugs are extremely irritant and have harmful local effects after direct contact with skin or eyes. They may also cause dizziness, nausea, headache, or dermatitis. Meta-analysis of multiple studies detected an excess of spontaneous abortions among healthcare workers exposed to cytotoxic drugs. Special care in handling genotoxic waste is absolutely essential; in addition, any discharge of cytotoxic wastes into waterways could have serious ecological consequences.

4.7.2.3 Hazards from radioactive waste

The type of disease caused by radioactive waste is determined by the type and extent of exposure. It can range from headache, dizziness, and vomiting to much more serious problems. Because radioactive waste is genotoxic, it may also affect genetic material. Handling of highly active sources (e.g., certain sealed sources from diagnostic instruments) may cause much more severe injuries such as destruction of tissue, necessitating amputation of body parts and should therefore be undertaken with the utmost care.

The hazards of low-activity waste may arise from contamination of external surfaces of containers or improper mode or duration of waste storage. The facility must ensure their radioactive waste policy and procedure protects healthcare workers engaged in handling, storing and disposal of such wastes.

4.7.2.4 Hazards from waste treatment methods

In addition to the specific hazards posed by different types of healthcare waste, there are hazards associated with the treatment processes and methods used.

- Burn pits present a hazard to healthcare workers disposing of waste not only from an infection or chemical hazard risk during waste depositing and burning but through physical risk of a fall. In addition, unfenced burn pits present a risk to the general public through human and animal scavenging. Also, incomplete, low-temperature burning presents an environmental pollution risk
- Healthcare waste treatment equipment such as shredding devices, waste compression tools, and autoclaves can cause injury when improperly operated or inadequately maintained. Waste management officers should be trained to safely operate and maintain equipment
- The use of chemical disinfectants such as chlorine may result in burns or intoxication through inhalation



- ▶ • The use of incinerators may present a hazard to people in both close and more distant proximity by gases released during the incineration process. Again it should be stressed that the health risk is significantly increased where the incinerator is improperly operated or poorly maintained
- Residue ash from the incineration of hazardous waste may continue to pose a risk as needles and glass that may have been decontaminated, can still cause physical injury. Furthermore, the incinerator fly ash discharged into the air may contain heavy metals and other toxic items such as dioxins and furans
- Burial of untreated healthcare waste in landfill sites presents health hazards from direct physical contact to workers and others on the site and the potential for release of contaminated leachates into surface and ground water

4.7.3 Healthcare Waste Management Planning

Identifying clear objectives for safe handling and disposal of waste and planning for the delivery of these objectives is an integral component for successful management of healthcare waste at local, regional, and national levels. Planning at the national level is critical for defining and allocating the necessary resources required for successful implementation of a National Waste Policy for healthcare waste. Planning at the regional and local levels allows an accurate understanding and assessment of needs, resource requirements, constraints, and skills available and ensures the selection of appropriate technology options.

The Ministry of Health and Sanitation (MoHS) is the principal authority for ensuring the safe management of waste in all HCF. The MoHS, in cooperation with other ministries, the private sector, nongovernmental organizations (NGOs), and professional organizations, as necessary, endeavours to ensure compliance with a national healthcare waste management policy. This commitment is reflected in appropriate budgetary allocations at district and facility levels.

4.7.3.1 Waste Management Plan for a HCF

Each HCF shall establish a waste management plan. A responsible person at the HCF shall prepare a comprehensive document that outlines policies and procedures for the management of HCF waste as outlined in this document. The waste management plan should be widely promoted within the facility to all staff involved.

In consideration of the transport infrastructure, distances between HCF, and impact of climate on vehicular movements, each HCF shall be responsible for on-site treatment of their wastes to:

- Eliminate offsite transport of wastes
- Minimize risks to public health and the environment by confinement of wastes to the HCF premises and promote greater control of disposal processes

4.7.3.2 Waste Management Team

Healthcare facilities shall establish a waste management team. Membership will be dictated by the size of the HCF and in most HCFs, the role of the waste management team is commonly assumed by the IPC Committee.

In the initial planning stages of the healthcare waste management system, it may be necessary for relevant members of the IPC Committee to hold ad hoc meetings to discuss in detail the establishment of a healthcare waste management system suitable for implementation at their HCF. Thereafter, healthcare waste management may be dealt with as normal IPC Committee agenda matters.

In PHUs, the waste management team may comprise only a few staff, but in hospitals it may comprise:

- Head of the HCF
- Heads of Departments
- IPC Focal Person
- Pharmacist
- Radiation Officer
- Matron



- ▶ • Hospital Engineer/ Head of maintenance
- Financial Manager
- Cleaning Supervisor
- Waste Management Officer/ Environmental health officer

In all HCFs, irrespective of size, at least one person must be responsible for waste management. The team members responsible for waste management should:

- Develop a written waste management plan
- Ensure that the plan clearly defines the duties and responsibilities of all members of staff, both clinical and non-clinical, in the handling of healthcare waste, and establishment of lines of accountability
- Ensure that all members of the waste management team are aware of their roles and responsibilities in ensuring the waste management plan is adhered to in their departments and areas of authority
- Keep the plan up to date by setting regular review dates
- Ensure that:
 - The plan clearly states the mechanisms for:
 - Segregation
 - Containment, colour-coding and labelling
 - Collection and transport
 - Storage
 - Treatment
 - Disposal of wastes
 - The waste management plan incorporates:
 - Waste reduction principles
 - Regular monitoring of healthcare waste management procedures
 - Training of all staff in waste segregation and management occurs
 - Handling, treatment, and disposal of wastes is safe and in compliance with any national policy and legislation
 - Written procedures are available and that all personnel are aware of the action to be taken in the event of incidents or accidents when handling wastes
- Ensure that the Waste Management Officer or person responsible shall:
 - Control the collection, transport, storage, and disposal of wastes
 - Liaise with Logistics to ensure an adequate supply of appropriate bags, containers, PPE, and carts are available and used in accord with the waste management plan
 - Liaise with the matron and/or hospital manager to ensure all staff are aware of their waste management responsibilities
 - Monitor the volume and type of waste generated at the HCF

4.7.4. Healthcare Waste Management Planning

4.7.4.1 Waste Management Hierarchy

If locally achievable, the most preferred approach is to avoid producing waste as much as possible and thus minimize the quantity entering the waste stream. Where practicable, the next most preferable method is recovering waste items for secondary use where this can be done safely with appropriate decontamination when necessary (reduce, reuse, recover) Single use items such as giving sets should not be re-used.

Waste that cannot be recovered must then be dealt with using the least preferable options, such as treatment or land disposal, to reduce negative health and environmental impacts.



Fig 1: Waste Management Hierarchy

4.7.4.2 Waste minimization

In order to reduce costs and create a clean, more sustainable environment, waste minimization must be an integral part of all waste management plans. If waste cannot be avoided, then mechanisms by which it can be minimized are as follows:

- Establish a Waste Minimization Plan (see below)
- Environmentally Preferable Purchasing (e.g., least damaging products to environment)
 - Green procurement (e.g., less packaging, less toxicity, easily recycled)
 - Purchase devices that can be reused safely
 - Purchase items that can be recycled or recovered (i.e., converted into new products or energy)
- Manage stock expiry, including hazardous chemicals (order more frequently)
- Convert to reusable items where possible according to manufacturer instruction (e.g., cups, spoons)
- Conveniently place “reuse/recycle” containers for staff to use and access easily
- Ask suppliers and local industries what wastes they can take or buy back

Waste Minimization Plan:

- First assess the total waste generated (everything)
- Set an annual “% reduction” goal that is achievable
- Brain-storm mechanisms by which your goal can be achieved (search web for ideas)
- Assess the success of the goal
- Re-set a higher goal for the following quarter or year





4.7.5 Waste Segregation, Handling, Transport and Storage

4.7.5.1 Guiding Principles

The guiding principles to waste segregation, handling, transport, and storage are:

- Healthcare facility managers and all staff have a duty of care to ensure that waste is kept under control at all times and disposed of safely
- Health-care waste shall be segregated into different components, based on their potential hazard and disposal route, by the person who generates each waste item
- Separate containers shall be available for each segregated waste component
- Waste containers shall be clearly labelled to help managers control waste production
- Lidded containers should be used for all hazardous waste streams
- Hazardous & general wastes should not be mixed during collection, transport or storage
- Collected waste may be taken to central storage onsite before treatment and disposal provided it is stored securely and remains appropriately labelled and segregated, for full details of the standards required see the MOHS Integrated National Waste Policy 2012
- Staff shall have adequate training so as to understand the risks and safety procedures for the wastes they are handling

4.7.5.2 Segregation Systems

Correct segregation of waste is the responsibility of the person who produces each waste item, whatever their position in the organization. The HCF management is responsible for making sure there is a suitable segregation, transportation, and storage system, and that all staff adhere to the correct procedures.

Separate waste containers are required for each waste fraction to facilitate safe handling and disposal. Separate containers are required for:

- Infectious waste (non-sharps)
- Sharps waste
- Pathological waste
- General waste

And depending on the HCF's waste types, separate containers may be required for:

- Chemical and pharmaceutical wastes
- Radiological waste (stored till it is non-radioactive, then disposed of as general waste unless another hazard overrides, e.g., sharps)

Tips for segregating waste

- Place a General Waste container as close as possible to every hand hygiene station – this will keep paper hand-towels out of Infectious Waste bins
- Use coloured plastic containers; painted drums, and readable labels to help distinguish between General and Infectious waste containers. For example, paint the containers used for Infectious waste yellow and use yellow plastic bags if available
- Place sharps containers as close as possible to where sharps are used so that staff do not have to walk carrying used sharps

4.7.5.3 Container colour and labels

The same system of segregation and identification of healthcare waste streams shall be used throughout Sierra Leone – see Table 7.3. The MOHS Integrated National Waste Management Policy 2012 adopts the WHO guidelines and colour ▶▶



PROMINENT, CONVENIENT, EASILY RECOGNISED CONTAINERS make it easier for staff to segregate their wastes. The more staff have to walk with wastes, the less they segregate

Colour coding of containers and waste streams makes it easier for healthcare workers to:

- Put waste items into the correct container
- Maintain segregation of the wastes during transport, storage, treatment & disposal
- Visually recognise the potential risk posed by the waste in that container
- Correctly treat and dispose of the waste stream
- Correctly manage their wastes irrespective of the HCF they may be working in

Table 3: Recommended Segregation Scheme























Waste type	Container Colour and markings	Symbol	Type of container
Infectious Clinical Waste	Yellow with biohazard symbol		Strong, leak-proof plastic bag. Held inside rigid, clearly marked lidded bin. Bag preferably 70 µm thick (ISO 7765 2004)
Sharp	Yellow, labeled "sharps", with Bio-hazard symbol		Rigid, puncture-resistant container preferably commercial and Standard- certified
Pathological Autoclave and Laboratory waste	Red, label "Pathological for Burning"		Rigid, leak-proof container with sealable lid
Chemical & Pharmaceutical	Brown, label with relevant symbol and "Do not autoclave"	See Table 2 (4.7)	Unspecified. Bag/box/bin must adequately contain substance (no leakage)
Radiological	Not specified. Label with Radioactive symbol, and "Do not burn"		Lead-lined box (for on-site storage until activity level falls below proscribed limit)
General	Black	None required	Plastic bag

Table 4: Hazard symbols

Old Symbol	Hazard	New Symbol*
	Explosive	
	Flammable	
	Oxidising	
	Danger	
	Biohazard (Infectious)	NONE
	Radiological NB. The new radiation symbol was adopted in 2007; the older symbol is widely recognised and expected to remain in common usage for years to come.	
	Corrosive	

	Harmful	
	Dangerous for Environment	
NONE	Gases under pressure	
NONE	Carcinogen	

**Adapted from: United Nations Economic Commission for Europe (UNECE) Globally harmonized system of classification and labelling of chemicals. <http://www.unece.org/trans/danger/publi/ghs/pictograms.html>.*

4.7.5.4 Waste Hazard Hierarchy

Among the hazardous wastes generated in a HCF, there is a hierarchy of hazard risk. The following hazardous waste types are listed in order of increasing risk:

- Pharmaceutical
- Infectious
- Cytotoxic
- Radiological
- General waste must not be mixed with Pharmaceutical Waste, and if they are mixed they must be marked and handled as Pharmaceutical Waste
- Pharmaceutical waste and General Waste must not be mixed with Infectious Waste, and if they are mixed they must be marked and handled as Infectious Waste
- Infectious waste must not be mixed with Cytotoxic Waste, and if they are mixed they must be marked and handled as Cytotoxic Waste
- Cytotoxic waste must not be mixed with Radiological Waste, and if they are mixed they must be marked and handled as Radiological Waste

► 4.7.5.5 Handling wastes

All hazardous wastes must be handled minimally. This reduces the risk of accidents, self-contamination and contamination of others and the environment.

- Special care must be taken when handling used needles and other sharps as they pose the greatest risk of accidental injury and infection
- Place waste containers convenient to the point of waste generation to allow for minimal handling
- **PPE:** All staff must wear PPE when handling hazardous wastes. The level of PPE is dictated by risk assessment of the specific wastes being handled. Cleaning staff, should as a minimum when handling waste bins and bags, wear utility gloves, heavy-duty apron and boots



For more detailed information on Personal Protective Equipment refer to chapter 4.3

4.7.5.6 Capacity and design of waste containers

Attention must be given in the waste management plan to the size and design of waste containers. They must be sufficiently large to hold the types of wastes discarded in them yet not be too large that their weight poses a lifting hazard for the stature of staff handling the bins, or pose an ergonomic hazard in the room. They must also be of ergonomic design to allow easy closure, lifting, carriage and transport.

Whether a reusable bin is used alone, or in combination with a bag, is up to the waste management team. In high-income countries the bag-in-bin system has proved more convenient, poses less of an infection risk and is the recommended method because:

- It enables the bin to be left in-situ and the more-easily-transported bag to be removed and placed in a cart, and a new bag-liner inserted
- It allows tying off of the bags, thus enabling secure transport through the HCF
- Bag-liners keep bins free of debris and body fluids and reduces cleaning frequency
- Bag-liners reduce the risk to staff posed by emptying bins manually

However, even with liners, the bins get soiled over time and this may pose an odour and infection issue. Thus the containers must be regularly inspected and cleaned, if soiled.

Using an unlined bin is more economical (saves on buying plastic bags, and less impactful on environment) but the bins need replacing with an empty one immediately on removal for emptying (thus many bins may be needed in larger HCFs), and every bin will need washing before reuse.

If unlined bins are used, they must not be emptied in patient care areas as this may lead to spills and contamination of the surroundings, thus posing increased the of injury and infection to staff, patients and visitors. See Transport section 7.7.9.

4.7.5.7 Collection of Waste

Waste containers must be collected on a regular basis to reduce overfilling and odour risk.

It is recommended bins be emptied on a daily basis or whenever they are $\frac{3}{4}$ full. Bins more than $\frac{3}{4}$ full pose significant risk to staff. Sharps bins must never be filled more than $\frac{2}{3}$ full and the lid must close fully. Overfilled bins /sharps boxes are hazardous via sharps injuries, attempts at compressing the waste into the bin, or removing waste to put into a new bin.





NEVER put hands into a waste bin; attempt to take waste by hand out of a waste bin; or attempt to use your hand to compress waste in a bin. Never remove Sharps from a sharps box

4.7.5.8 Transport of wastes

A. External transport: Currently in Sierra Leone, it is unlikely that wastes generated by a HCF will be transported offsite. If this is necessary they will need to be transported in accordance with Sierra Leone Integrated National Waste Management Policy 2012 and other statutes and international codes to which Sierra Leone may be signatory (e.g., UN Model Regulations for Transport of Dangerous Goods).

B. Internal transport:

1. **In PHUs,** wastes will commonly be carried by hand to their final disposal or treatment area
 - All bins and bags must be closed/lidded when carried, and carried such that they do not touch the body of the carrier
 - Bags must always be carried by their top. Never use a hand to support their bottom or sides (a sharp may have wrongly been discarded into the bag)
2. **In hospitals,** wastes will commonly be transported by internal cart or trolley.
 - As stated in section 4.7.6 bins must not be emptied in patient-care areas
 - Unlined bins must be closed, transported upright, and safely emptied directly into the pit, burn pit, incinerator, or other treatment systems appropriate for the category of waste
 - The transport route is unimportant from an infection risk point of view provided necessary safeguards are in place, but account should be taken of public aesthetics, patient and public traffic, ease of transport and route efficiency
 - When emptying bins, only the sides or handle(s) should be grasped, not the upper rim
 - All bins must be washed clean prior to reuse
 - Carts/trolleys for collection of wastes from the bins, must be regularly decontaminated



NEVER carry a bag with your hand on the bottom or place the bag on your shoulder or against your body. A sharp may have inadvertently been discarded into the bag!

4.7.5.9 Storage of waste

If possible, wastes, once collected, should be disposed of immediately. In larger HCFs it may be necessary to store wastes onsite while awaiting treatment. If storage is necessary:

- Store for the minimum time possible, preferably only a few hours
- Store the waste at a reduced temperature, or minimize waste in warm climates to avoid the production of odour
- Ensure that carts/trolleys can be wheeled inside the storage area
- Consider bunding or another form of catch-containment if liquids are stored
- Waste must be stored:
 - Preferably in a ventilated area
 - In a secure area not accessible to patients, the public, or animals
 - So as not to attract or be accessible to vermin
 - In a covered area so that it remains dry

- ▶ • Waste must be labelled with the relevant hazard symbols (see Table 3)
- A spill containment kit and fire extinguisher should be available inside the storage area for any stored liquids or inflammables
- **Radioactive waste** must be stored separately behind lead shielding until the radioactivity has decayed to legislatively acceptable levels, after which it may be discarded as general waste unless a higher risk category is present (e.g., sharps)

4.7.6 Storage of waste

A) General waste

- May be disposed of according to legislative guidelines
- No treatment is necessary
- Consideration must be given to rendering the waste inaccessible to animals & vermin
- Burial in a pit (with or without burning) is acceptable

B) Infectious and sharps waste

- Must be disposed of in a manner aesthetically acceptable to the HCF and community while not posing an infection risk to the HCF, community, or environment
- Liquid infectious wastes:
 - i. May be disposed of safely by carefully pouring into a latrine, avoiding splashing
 - ii. Buckets used for liquid infectious wastes must be cleaned and then disinfected with 0.5% chlorine solution before reuse
- Common solid-waste treatment methods for infectious wastes are:
 - i. Incineration above 8000C (such incinerators are not available in Sierra Leone; most incinerators are locally built and unlikely to reach the preferred temperature)
 - ii. Fire-box or fire-drum (poor confirmation of burn parameters and efficacy)
 - iii. Autoclaving(a preferred waste treatment method for all types of infectious waste, but not widely available in Sierra Leone)
 - iv. Chemical treatments (none available in Sierra Leone for HCF waste)
 - v. Burn pit (most common method in Sierra Leone)

NB. By international agreement (IStAATT*), treatment methods are deemed effective if they achieve a 4 log kill of *Geobacillusstearothermophilus* spores embedded in the waste. This validation is not applicable to burn-pit methodologies.*http://www.istaatt.org/index.php?option=com_docman&task=doc_view&gid=5&tmpl=component&format=raw&Itemid=2
- **Burnpit construction (Fig. 2)**
 - i. Locate away from public access areas, patient care areas, vegetable gardens, water-tables, and water courses
 - ii. Dig hole at least 2meters deep and 1.5 to 2meters across. The bottom of the pit should be at least 2 meters above the water table
 - iii. There should be earth mound around the pit to keep surface water out of the pit
 - iv. Add a fence around the pit to preclude public, children, animals
- Burn pit operation
 - i. Carefully place waste into pit. Avoid container rupture or splashing
 - ii. Pour diesel fuel on the waste and carefully ignite from a distance
 - iii. Watch and ensure all waste is burned
 - iv. If pit-fire goes out before waste is completely burned, repeat burning
 - v. When waste is completely burnt, cover with 10cm dirt
 - vi. When pit is $\frac{3}{4}$ full, fill it with dirt and dig a new burn pit

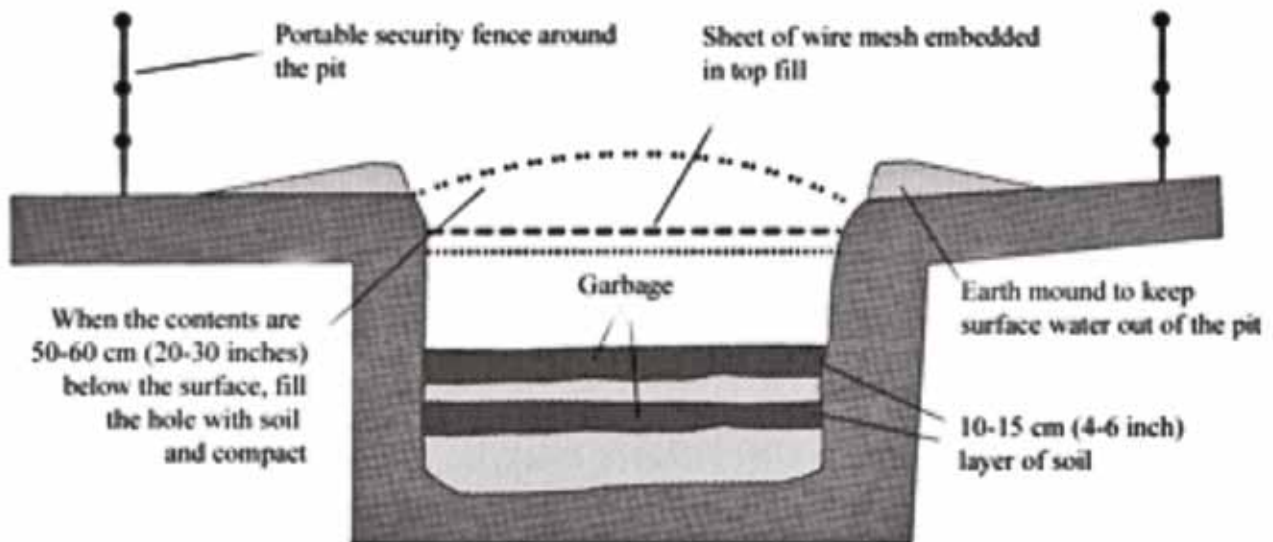


Fig 2: Plan of a burn pit and its construction

- **Waste autoclave operation**

– Autoclaves must:

- Only be operated by trained and certified staff
- Be operated strictly according to manufacturer instructions
- Must be validated as achieving the IStAATT 4-Log spore kill
- Must comply with recommended time, pressure, and temperature to achieve an effective treatment of waste
- Once autoclaved the decontaminated waste may be managed as general waste

C. Pathological waste (limbs, organs, placentae, etc.)

- Body parts must be disposed of safely and with respect to local culture
- Remember – body parts are infectious waste
- Body parts must not be placed in burn-pit but buried in a separate 2m deep (non-burn) pit away from public access areas, patient-care areas, vegetable gardens, water-table and water courses
- Seal body-part container (bag or bin) with tape
- Transport and lower carefully and with respect into burial pit
- Cover with 10cm soil after each deposition into pit
- When pit is $\frac{3}{4}$ full, fill with soil, dig new pit

D. Pharmaceutical, cytotoxic, and chemical wastes

- In the absence of high-temperature incineration, the safest treatment for chemical wastes is to contain them in plastic bags and bury in non-burn pit
- If culturally permitted, bury in pathological waste pit
- Remember – handle with care and lower bags, do not throw them into pit
- Cover with 10cm soil after each deposition into pit
- When pit is $\frac{3}{4}$ full, fill with soil, dig new pit



E. Radiological waste

- i. Radiological waste can never be destroyed, not even by high temperature incineration
- ii. It must be stored behind a lead shield under the supervision and monitoring of the HCF Radiation Safety Officer
- iii. Such storage must continue until sufficient decay has occurred (and activity-monitoring confirms) that the waste is beneath the legislative definition of radioactive waste
- iv. After reaching non-hazardous levels of activity, the waste may be discarded as general waste unless it possesses another hazardous characteristic (e.g., sharps) and if so, it must be treated/discarded in a manner appropriate for that hazard type

4.8 Transmission-based Precautions



For additional information on Standard Precautions, see other sections of Chapter 4

Transmission-based Precautions are intended to **supplement** Standard Precautions in patients with known or suspected colonization or infection of highly transmissible or epidemiologically important pathogens. Transmission-based Precautions depend on the modes of transmission of infectious disease, and are aimed at reducing or halting the spread of infections in healthcare facilities (HCFs). Preventing the spread of an infection may require **one or more** Transmission-based Precautions.

Transmission-based Precautions can be categorized as:

- Contact Precautions
- Droplet Precautions
- Airborne Precautions

If the specific infectious agent is known, pathogen-specific Transmission-based Precautions can be implemented. If the specific infectious agent is not known, empiric-based Transmission-based Precautions can be implemented.



See Appendix A for an alphabetical list of pathogen-specific Transmission-based Precautions, taken from the “2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings”

The following preconditions for prevention of healthcare-associated infections (HAIs) should be addressed by HCF leaders and managers, informed by the evidence based information provided:

- **Infrastructure/system change:** access to the right equipment including personal protective equipment (PPE) and supplies and an environment that facilitates isolation, standard and transmission based precautions for patient and health worker safety (e.g., isolation facilities, safe waste management etc)
- **Training and education:** a program of routine training and education and periodic retraining for all HCWs (clinical and support staff) that is in line with the recommendations presented in this chapter. Additionally carers (family or friends) need guidance prior to delivering care on safe practises
- **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place
- **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters for type of precautions displayed at the point of care, on the job training,)by attending patient safety/IC meetings, or equivalent))
- **Safety culture:** managers and leaders at every level of the HCF show their visible support for Standard and Transmission-based precautions to help develop and reinforce a culture of patient safety

4.8.1 Implementing Empiric Precautions in Response to Clinical Syndrome/Conditions until Diagnosis is Confirmed

Since the microbe causing the infection is often unknown at the time of admission, Transmission-based Precautions are often used empirically (i.e., based on observation of symptoms and signs), according to the clinical syndrome and then modified when the pathogen is identified or a transmissible infectious etiology is ruled out.

HCFs should integrate implementation of empiric precautions as part of the screening, triage and admission criteria.. Many reported healthcare associated outbreaks (e.g., Ebola, Middle East Respiratory Syndrome coronavirus (MERS-CoV), Severe Acute Respiratory Syndrome (SARS)) have been associated with lack of implementation of empiric precautions whilst awaiting diagnosis.





See Table 2 at the end of this chapter for a summary of the empiric application of Transmission-based Precautions

4.8.2 Duration of Transmission-based Precautions

Transmission-based Precautions are used for a limited amount of time, in accordance with the known pattern of the disease persistence and shedding of a specific pathogen. This time period will differ for different diseases. While some Transmission-based Precautions will remain in effect until laboratory tests show that the tests are negative and the pathogen has been eradicated, this is not always the case. See Table 2 for the duration of implementing Transmission-based Precautions empirically and Appendix A for the duration of Transmission-based Precautions implementation for when the infectious agent is known. Review national and local laws, healthcare policy, and any other regulatory body's policies, to ensure that proper precautions are being taken in addition to using Tables 2 and 3.

4.8.3 Isolation Practices

Isolation practices involve the creation of a barrier to prevent the spread of infectious diseases from a patient to other patients, HCWs, Carers and visitors. Effective isolation practices include patient placement, personal protective equipment (PPE), patient transport, patient-care equipment, exposure management, and environmental measures, based on the infection transmission pathway (contact, droplet, or airborne). Isolation practices include the designation of an isolation room to place suspected or confirmed patients, the disinfection of patient-care equipment, and/or the management of exposure by providing immunizations to HCWs for specific pathogens. Identifying patients with a suspected infectious disease, ensuring HCWs delivering care have appropriate PPE to protect them from the route of transmission and protecting other patients from exposure is an important step in infection prevention and control, and may require the isolation of suspected or confirmed patients and HCWs.



See chapter 4, section 4.3 for information on PPE. See chapter 6 for further information on occupational safety and employee health

4.8.3 Roles of HCWs Implementing Transmission-based Precautions

The doctor or medical person in charge is responsible for instituting Transmission-based Precautions based on the clinical syndrome and the likely etiologic agents at the time. In their absence, the other HCWs in the facility can initiate Transmission-based Precautions based on the history and/or test results of the patient while awaiting confirmation by the doctor or medical person in charge. All infectious cases of National concern (e.g., tuberculosis, HIV, Ebola) should be officially reported to the Ministry of Health and Sanitation, Directorate of Disease Surveillance and Response for further investigation, following existing national guidelines.

- Appropriate application of specific Transmission-based Precautions requires collaboration among health providers in a timely manner
- Nursing personnel should be responsible for the following:
 - Informing the doctor or medical person in charge when a patient's condition/history/results warrants placement of the patient in an isolation room either on admission or because of changing symptoms during admission
 - Confirming the doctor orders the required diagnostic tests for suspected patient(s)
 - Explaining procedures and the need for placing the patient in an isolation room to the patient and family and demonstrating use of PPE and other required measure to family carers
 - Preparing a clean, well-ventilated room or area for isolation with all the necessary supplies, equipment and support
 - Notifying the facility's Infection Prevention and Control (IPC) focal person within 24 hours of placing the patient in an isolation room for suspected or confirmed infectious disease that require isolation
 - Displaying a {STOP} sign clearly in the patient's isolation area, notifying visitors to report to the medical person in charge prior to visiting the patient
- If medical person in charge not readily available, a security guard or equivalent personnel should wait at the entrance to the isolation area to assist/guide visitors

- ▶ See Chapter 4.3 for detailed summary of appropriate PPE General Principles of Transmission based precautions
Patients suspected of having a transmissible infection should be managed in isolation in a single room with their own toilet and washing facilities. If single room isolation is not possible patients with similar symptoms should be cohort nursed still using the principles of transmission based precautions eg individual bed side table, individual toilet / latrine bucket . Patients may have similar symptoms but different infections and staff must always be mindful of this.

4.8.4 Contact Precautions

In **addition** to Standard Precautions, use Contact Precautions to prevent and control infections that spread **via direct contact** with the patient or indirectly from the patient's immediate care environment (including care equipment). This is the most common route of cross-infection transmission. Contact Precautions are effective in preventing infection from patients with excessive wound drainage, faecal incontinence, and bodily fluids and secretions that might be associated with extensive contamination of the environment and risk of infection transmission.

Contact transmission, is divided into two subgroups:

Direct contact transmission - occurs when pathogens are transferred from person to person without a contaminated intermediate (e.g., body fluids from patient directly enter HCW or other patients body through mucous membrane or non-intact skin)

Indirect contact transmission - occurs when pathogens are transferred from person to person with a contaminated intermediate (e.g., contaminated hands, patient-care devices, instruments or toys)

See Annex A for a list of infections/conditions requiring contact precautions.

The following Contact Precautions should be implemented when caring for patients with suspected/known disease or condition with increased risk of contact transmission during hospitalization and transport.

A. Patient Placement

- Patients that are known or suspected to have illnesses that are transmitted by direct or indirect contact should be cared for in a single room
- If a single room is not available and rooms must be filled with multiple patients,
 - Prioritize patients with conditions that may facilitate transmission (e.g., uncontained drainage, stool incontinence) for single rooms
 - Place patients infected or colonized with the same organism (and no other infectious agent) in the same room together i.e cohort nursing.
 - Provide separate commode / latrine bucket for each patient .
 - Keep beds at least 1,5 meter apart
 - Draw curtain between patient beds
- In outpatient setting, place patients who require Contact Precautions in an examination room or separation area as soon as possible

B. PPE

- All PPE must be donned before entry to the room and doffed before exiting the room
 - Dispose of PPE in accordance with the chapter Waste Disposal, Chapter 4.6.1
 - Refer to Table 3, for summary of complete PPE requirements for Contact Precautions
 - Change protective clothing between patients and practice hand hygiene according to the Five Moments described in section 4.1
- Gloves
 - Wear gloves during any contact with patient or potentially contaminated surfaces in his/her environment
 - Put on gloves upon entering the room if this is anticipated
 - Change gloves after contact with infectious materials, such as wound drainage or fecal material, Perform hand hygiene as in section 4.2 before changing gloves to continue giving care
 - Remove gloves and dispose of them before leaving room and perform hand hygiene





- After removal do NOT touch or allow clothing to touch potentially contaminated surfaces or items before leaving the room
- If the patient is not in a single room gloves Must be removed, hand hygiene performed and new gloves put on before delivering care to the next patient
- Aprons/Gowns
 - Wear aprons/gowns when in any contact with the patient or potentially contaminated surfaces in his/her environment
 - Put on apron/gown upon entering the room if this is anticipated
 - Change apron/gown after contact with infectious materials, such as wound drainage or fecal material, and perform hand hygiene
 - Remove apron/gown before leaving room and dispose of it in infected waste bin or place in a dedicated receptacle for laundering. Perform hand hygiene
 - Ensure clothing and skin do not contact contaminated environmental surfaces
- Eye protection
 - Wear goggles or a face shield in case there is a risk of splash
 - Put goggles/face shield on, in the room, before carrying out any tasks with a risk of blood or body fluid splash (eg removal of an IV line, removal of a urinary catheter etc)

4.8.5

C. Patient Transport

- Limit the transport and movement of such patients outside of their rooms unless medically necessary
- If transport is necessary
 - Before transport
 - Make sure any area of patient's body that could shed infectious material, such as a wound, is contained and covered
 - Remove and dispose of any contaminated PPE before leaving the room, perform hand hygiene and don fresh PPE if it is necessary to transport the patient to another location
 - The receiving facility or recipient of the patient should be notified of the patient's condition to ensure appropriate precautions are taken to prevent/reduce risk of disease transmission
 - At transport destination,
 - Advise anyone performing care on the patient to wear PPE and follow the recommendations for PPE for contact precautions as described above
 - After transport,
 - Decontaminate the room/bed used by the patient
 - Decontaminate the stretcher, wheelchair, or equipment used to transport the patient

4.8.5.4

E. Equipment

- Dedicate noncritical patient-care equipment (or disposable equipment) for use with a single patient if possible
- If not possible,
 - Decontaminate the equipment appropriately if contaminated and before use on another patient (e.g., clean and/or disinfect), as described in the section on cleaning and decontamination (See chapter 4 section 4.2.1)

4.8.5.5

F. Environment

- Clean and disinfect rooms of patients on Contact Precautions frequently (at least twice daily), particularly the frequently-touched surfaces (e.g., bedrails, door handles) and immediately when visible contamination is present (e.g., blood and body fluids, following recommendations for spillages covered in section 4.6.3)



- Ensure the consistent availability of adequate supplies and equipment is a high priority
- The room should be thoroughly cleaned and disinfected once the patient is discharged / transferred and before any other patient is admitted



See chapter 4, section 4.2.3 for additional information on environmental disinfection

4.8.6 Droplet Precautions

In addition to Standard Precautions, use Droplet Precautions for patients who are known or suspected to have illnesses that are transmitted by large particle droplets. These precautions reduce the risks for transmitting pathogens that are spread wholly or partially by droplets larger than 5 micrometers (μm) in size, generated by coughing, sneezing or talking. Droplet particles remain in the air for a short time and travel only between 3-6 feet (1 – 2 metres). Droplet precaution measures are similar to contact precautions while steps to further separate patients based on the premise of the dispersal of droplets (1-2 metres) is additionally important.



See Appendix A for an alphabetical list of pathogen-specific Transmission-based Precautions, taken from the “2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings”

The following Droplet Precautions should be implemented when caring for patients with suspected/known disease or condition with increased risk of transmission during hospitalization and transport.

4.8.6.1 Patient Placement

- Patients that are known or suspected to have illnesses that are transmitted by droplets should be cared for in a single, clean, and **well-ventilated** room
- If a single room is not available and rooms must be filled with multiple patients,
 - Prioritize patients who require Droplet Precautions with excessive cough and sputum production for single rooms
 - Avoid placing patients on Droplet Precautions in the same room with other patients at increased risk of infection (e.g., immunocompromised patients)
 - Place patients infected or colonized with the same organism (and no other infectious agent) in the same room
 - Keep beds at least **1-2 meters apart**
 - Draw curtain between patient beds
- Make sure not to share items between infected/colonized patient and other patients
- In an outpatient setting, place patients who require Droplet Precautions in an examination room or cubicle as soon as possible

4.8.6.2 PPE

- All PPE must be donned before entry to the room and doffed before exiting the room
 - Dispose of PPE in accordance with the chapter Waste Disposal, Chapter 4.6.1
 - Refer to Table 3, for summary of complete PPE requirements for Droplet Precautions
 - Change protective clothing between patients and practice hand hygiene according to the Five Moments described in chapter 4 section 4.1
- *In addition to standard precautions/basic PPE, a surgical facemask must be worn by HCWs upon entry into the patient room or cubicle. Respirators are not necessary for patients under Droplet Precautions*
- *Further Additional PPE beyond that stated above may be necessary based on the type of pathogen or risk of exposure to blood/body fluid splashes - refer to recommendations for PPE under Contact Precautions (i.e a combination of droplet and contact precautions may be required)*

► 4.8.6.3 Patient Transport

- Limit the transport and movement of such patients outside of their rooms unless medically necessary
- If transport is necessary,
 - Patient must wear a surgical facemask, if medically possible, and instructed to follow respiratory hygiene and cough etiquette
- Prior to transport, the receiving facility or recipient of the patient should be notified of the patient's condition to ensure appropriate precautions are taken to prevent/reduce risk of disease transmission
 - This should include wearing of a mask if within 1-2 meters of the patient

4.8.6.4 Equipment

- Apply Contact Precautions recommendations

4.8.6.5 Environment

- Apply Contact Precautions recommendations

4.8.7 Airborne Precautions

In **addition** to Standard Precautions, use Airborne Precautions for patients known or suspected to have illnesses that are transmitted by airborne particles 5 micrometres (μm) or less in size and when a patient has an illness that is transmitted by droplets but is undergoing some aerosol generating procedures such as bronchoscopy or suctioning of respiratory secretions. These particles can remain in the air for several hours and be widely spread.



See Appendix A for an alphabetical list of pathogen-specific Transmission-based Precautions, taken from the "2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings"

The following Airborne Precautions should be implemented when caring for patients with suspected/known disease or condition with risk of airborne transmission during hospitalization and transportation.

4.8.7.1 Patient Placement

- Patients known or suspected to have serious illnesses that are transmitted by airborne particles should be cared for in a well-ventilated room. Options include the following, in order of decreasing priority:
- Airborne infection isolation room (AIIR)
 - Single-occupancy patient-care room
 - Negative pressure in room (air flows under door gap into room)
 - Air flow rate of 6-12 air changes per hour (ACH)
 - Direct exhaust of air from room to the outside of the building or recirculation of air through HEPA filter before returning to circulation
- Air-conditioned single room with an exhaust
- Well-ventilated single room this is probably the best achievable within Sierra Leone at this time.
 - Ideally well-ventilated single room is located on a high level to increase natural ventilation
 - Exhaust fan or similar portable solution placed in room to direct airflow towards an outside window, away from clinical and public areas
 - Windows open and door closed
- If a single room is not available, place the patient in a room with other patients that are actively infected with the same disease and no other infectious agent (based on clinical picture and diagnosis when known)
 - Keep patients and patient beds at 1.5 meters apart



- ▶ • Once the patient leaves, allow for full exchange of air (e.g., adequate ventilation for at least 1 hour) before placing another patient in the room
- In an outpatient setting, place patients who require Airborne Precautions in an examination room and place a mask on the patient.
- Once the patient leaves, allow for full exchange of air (e.g., adequate ventilation for at least 1 hour) before placing another patient in the room

Cough Etiquette

- Instruct patient to observe respiratory hygiene and cough etiquette :
 - The elements of respiratory hygiene and cough etiquette include:
 - Source control measures (e.g., covering the mouth/nose with a tissue when coughing, prompt disposal of used tissues, and/or using surgical masks on the coughing person)
 - Hand hygiene of HCWs after contact with respiratory secretions
 - Spatial separation, ideally at least 1-2 meters

4.8.7.2 PPE

- All PPE must be donned before entry to the room and doffed before exiting the room
 - Dispose of PPE in accordance with the chapter on Waste Disposal, Chapter 4.6.2
 - Refer to Table 3 and chapter 4.3.1, for summary of complete PPE requirements for Airborne Precautions
 - Change protective clothing between patients and practice hand hygiene according to the Five Moments described in chapter 4.1
- Respirators (e.g. N-95) must be worn by HCWs when entering the patient's room
 - If N-95 or higher-level respirators are not available, use a surgical facemask
 - Patients under Airborne Precautions do not need to wear masks inside their room or isolation area
 - Visitors should be limited in number and should wear respirators (e.g., N-95) while in the room or isolation area
 - Children, pregnant women, and immunocompromised individuals should be restricted from entering the room or isolation area
 - HCWs should remove their respirator after leaving the room without touching the front part of the respirator
 - Discard any respirator following aerosol generating procedures, when contaminated with blood or other patient bodily fluids, if damaged (e.g., dirty wet or torn) or if breathing becomes difficult
 - Even if implementing extended use of N-95 respirators
- The decision to implement policies that permit extended use of N-95 respirators should be made on a case by case basis, taking into account respiratory pathogen characteristics, local conditions and manufacturer's recommendations

Extended use refers to the practice of wearing the same N-95 respirator for repeated close contact encounters with several patients, without removing the respirator between patient encounters. It is favored over limited reuse because it is expected to involve less touching of the respirator and therefore less risk of contact transmission.

Limited reuse refers to the practice of using the same N-95 respirator for multiple encounters with patients but removing it ('doffing') after each encounter.

- ▶ • If the respirator will have extended use:
 - The maximum length of continuous use in non-dusty healthcare workplaces is typically dictated by hygienic concerns (e.g., the respirator was discarded because it became contaminated) or practical considerations (e.g., need to use the restroom, meal breaks, etc)
 - Prior to donning respirators, HCWs should prepare for extended use by anticipating practical considerations (e.g., using rest room prior to entering ward);
 - Supervisors should clarify the maximum time that HCWs are expected to use the respirator, based on comfort, practicalities and hygiene
 - Perform hand hygiene before and after touching or adjusting the respirator (if necessary for comfort or to maintain fit)
 - Respirators with limited reuse are not recommended in Sierra Leone
 - Additional PPE may be necessary, based on the type of pathogen or risk of exposure to blood/body fluid splashes

4.8.7.3 Patient Transport

- Limit the transport and movement of such patients outside of their rooms unless medically necessary
- If transport is necessary,
 - Before transport, the patient must wear a surgical facemask, if their medical condition allows, and instructed to follow respiratory hygiene and cough etiquette
 - The elements of respiratory and hygiene and cough etiquette include:
 - Source control measures (e.g., covering the mouth/nose with a tissue when coughing and prompt disposal of used tissues, using surgical masks on the coughing person
 - Hand hygiene of HCWs after contact with respiratory secretions
 - Spatial separation, ideally at least 1-2 meters
 - The receiving facility or recipient of the patient should be notified of the patient’s condition to ensure appropriate precautions are taken to prevent/reduce risk of disease transmission.
 - During transport: HCWs do not need surgical facemask or respirator if patient is wearing a surgical facemask (and infectious skin lesions are covered) and is compliant with the requirement to wear it.
 - After transport: Decontaminate the patient room

4.8.7.4 Exposure management

- Provide immunizations to susceptible persons as soon as possible after unprotected contact to a patient with measles, varicella, or smallpox
 - Measles (rubeola) vaccine must be administered within 72 hours after exposure
 - Varicella (chickenpox) vaccine must be administered within 120 hours after exposure
 - Smallpox vaccine must be administered within 4 days after exposure

See Chapter 6 for guidance on immunization of healthcare workers

- Provide immunizations to all healthcare workers and health associated personell susceptible to be exposed to vaccine preventable microorganism

4.8.7.5 Equipment

- Apply Contact Precautions recommendations, using disinfectants that are known to remove/kill the infectious material that is present

4.8.7.6 Environment

- Apply Contact Precautions recommendations and ensure that room is ventilated for at least one hour and decontaminate the room before admitting next patient





For more information on environmental disinfection, consult the “Environmental Decontamination and Management” chapter

4.8.8 General Practices for placing patients in an Isolation room/area

The following describe general practices for isolating patients. Refer to facility guidelines for further guidance.

General Principles for Isolating Patients

- Patients should be:
 - Informed about their infection in a clear and understandable way and reminded how to prevent spread to others using any relevant IEC materials, including leaflets, diagrams
 - Remember this can be very frightening for the patient particularly if staff are wearing full PPE with masks.
- Items used by the patients during isolation should **not be** shared
- Change protective clothing between contact with patients even if being cared for in the same isolation area with the same condition
- Perform hand hygiene according to the Five Moments
- Limit the transport and movement of such patients outside of their rooms unless medically necessary
- For children in isolation, only plastic toys should be encouraged so that they can be cleaned after use, before shared with any other children
- Mothers should wear disposable gowns and mask (if necessary) and be advised about basic hygiene procedures

4.8.9 Handling Patients in an Isolation room/area

The following rules and guidelines apply to interacting with a patient who is on isolation:

- Patients known or suspected to have serious illnesses that are transmissible should be cared for in a well-ventilated single room
- Ensure adequate and trained personnel are assigned to the patient – (e.g., HCWs are knowledgeable about transmission modes, required PPE and, if staffing levels permit, staff should not be required to care for other patients at the same time)
- Ensure all equipment and supplies that will be required to provide care are continuously available in the patient area
- Notify all support and essential staff, including health facility IPC focal point that patient has been placed in isolation (e.g., contact, droplet or airborne)
- Establish, support, and monitor, a schedule for the daily routine cleaning and maintenance of the isolation area
- Educate HCWs, patients and family members regarding the illness, and precautionary measures required (e.g., PPE, hand hygiene) while visiting/caring for the patient
- Assure the patient and family that he/she will not be neglected, will receive excellent care, will be provided with emotional support and will be removed from isolation as soon as conditions warrants and tests confirm that patient is no longer infectious
- Keep the patient’s chart and records outside of the patient’s room (ensure patient confidentiality) if this is a safe way to manage the patient’s condition



► 4.8.10 Handling Medical Equipment

The following rules and guidelines apply to the handling of medical equipment used during isolation:

- Contaminated, reusable critical medical devices or patient-care equipment must be sterilized
- Semi-critical medical devices or patient-care equipment (equipment that touches mucous membranes) must be sterilized
- Noncritical equipment (equipment that touches the skin) that becomes contaminated with blood, body fluids, secretions, or excretions must be cleaned
- Contaminated disposable (single-use) patient-care equipment must be handled and transported as any other biohazard waste

4.8.11 Utensils for food used for patients in isolation

Facility procedures for cleaning and disinfecting utensils used for patients in isolation will be followed, however the following points should be considered in these situations:

- Wash utensils with detergent and hot water
- Soaking is not recommended, but may be necessary if debris remains; this should be done in a clean covered container dedicated for this purpose and utensils should be washed with detergent and hot water again afterwards
- Disposable utensils can also be utilized and should be disposed of per facility guidelines including incineration

4.8.12 Housekeeping (Cleanliness, Organization, Maintenance of health care facilities)

The following rules and guidelines apply to housekeeping procedures for patients who are isolated:

- Remove debris (e.g., blood clots, feces, vomitus) by scraping debris into a commode bucket prior to transport
- Launder soiled linen in a manner that avoids transferring microorganisms to patients, personnel, and environment
- Perform terminal cleaning and disinfection when the patient no longer occupies the room/area
 - Terminal cleaning consists of a more intensive cleaning procedure than daily cleaning
 - Key cleaning steps in terminal cleaning include:
 - Hand hygiene and appropriate PPE
 - Dusting the room with a damp duster, and cleaning floors, bathrooms, and high-touch surfaces
 - Cleaning the room, or area, and bedside equipment of patients in isolation with water and soap followed by disinfection (for example, with chlorine solution 0.5%)
 - Adequately disinfect bedside equipment and environmental surfaces (bed rails, bedside tables, carts, door-knobs, with 0.5% chlorine solution)

4.8.13 Visitors to Patients in Isolation

Clear, compassionate communication is important when talking to visitors and family members about the need for isolation. The following guidelines apply to visitors of patients in isolation:

- Consider limiting the number of visitors
- Visitors should adhere to facility guidelines when entering the patient care area
- Visitors and patient caregivers should be informed of the importance of hand hygiene at the right moments (see chapter 4 section 4.1)
- Visitors and patient caregivers should be advised not to sit or lay down on the patient's bed
- Instruct visitors on use of appropriate PPE required when touching/caring for their relatives
- Counsel visitors on precautions needed to prevent the spread of infection to family, friends and the community
- Depending on the probable or confirmed infection, check all visitors for susceptibility before allowing them to visit



Table 1: Summary of Infection Prevention precautions for Standard Contact , Droplet and airborne transmission

ACTIVITY	STANDARD PRECAUTIONS	CONTACT TRANSMISSION	DROPLET TRANSMISSION	AIRBORNE TRANSMISSION
Isolation room	Single room not required	Single room* and minimize time outside	Single room*, minimize time outside, patient should wear mask	Single well-ventilated room*, minimize time outside when patient may wear mask. Exclude non-essential susceptible people
Hand hygiene according to Five Moments	Yes	Yes	Yes	Yes
Gloves	When likely to touch blood, body fluids and contaminated items	Wear gloves on entering room to provide patient care and when likely to touch blood, body fluids and contaminated items	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>
Apron/gown	If soiling likely i.e. during procedures likely to generate contamination from blood and body fluids	Wear it on entering room if clothing will have substantial contact with the patient, environmental surfaces or items in the patient's room	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>
Mask	Wear regular mask during procedures likely to generate contamination with aerosols**	Use risk assessment judgement as per <i>Standard Precautions</i>	Wear fluid resistant surgical/medical mask on entering patient room/ cubicle	Wear high efficiency filtration mask (FFP3 or N95) on entering the room.
Eye protection/ face-shields	During procedures likely to generate contamination with blood and body fluids	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>
Equipment decontamination	Yes	Yes	Yes	Yes
Environment cleaning	Yes	Yes	Yes	Yes
Miscellaneous	Avoid contaminating environmental surfaces with gloves	Remove gloves and gown, wash hands before leaving patient's room	Provide at least 1,5 metre (3 feet) of separation between patients in cohort	Advise patient to cover nose and mouth when coughing or sneezing Non-essential susceptible people should be excluded

*Single, commode / latrine buckets should be provided for each patient . Patients should not share even if cohorted

**Only for situations that may provoke contamination of mucous membrane. Procedures that are likely to create significant aerosols; suctioning, dentistry, intubation, chest physiotherapy, etc.

***Adapted from:** : Damani NN. *Manual of Infection Prevention and Control*. Oxford: Oxford University Press, 2012

► **Table 2: Clinical Syndromes/Conditions Warranting Empiric Transmission-Based Precautions in addition to Standard Precautions***

Clinical Symptom or Condition	Empiric Transmission-Based Precautions ¹	Duration of Precaution ²	Additional Symptoms ³	Potential Pathogens based on additional symptoms ⁴	Potential Pathogen-Specific Recommended Precaution ⁵	Duration/Comments for potential pathogen-specific precautions
DIARRHEA: Acute diarrhea with a likely infectious cause in an incontinent or diapered patient	C	Duration of Illness	Fever, malaise, anorexia, nausea, abdominal discomfort	Hepatitis A virus	C	Infants and children <3 yrs age = duration of hospitalization; children 3-14yrs = 2 weeks after symptom onset; > 14yrs = 1 week after onset of symptoms
			Nausea, Vomiting	Enteric pathogens (e.g. <i>C. difficile</i> , <i>Cholera</i> , <i>Escherichia coli</i> O157:H7, Noroviruses, Rotavirus, <i>Shigella spp</i>)	C	Duration of Illness or to control institutional outbreaks
MENINGITIS: Fever, headache, neck stiffness, altered mental status, nausea/vomiting	ALL	Duration of 24 hours or until patient has three negative sputum smears for AFB	Coryza, pharyngitis, exanthem, myositis	Enteroviruses	C	For infants and children
			Cough, fatigue, night sweats, weight loss, pleuritic pain	<i>M. tuberculosis</i>	S	Duration is until patient has three negative sputum smears for AFB OR if another diagnosis explains clinical syndrome. If pulmonary infiltrate then <u>Airborne Precautions</u> . If potentially infectious draining body fluid present, <u>Airborne & Contact Precautions</u> .
			Photophobia	<i>Neisseria meningitidis</i>	D	<u>Droplet Precautions</u> for first 24 hours of antimicrobial therapy; mask and face protection for intubation. Postexposure chemoprophylaxis for household contacts, HCWs exposed to respiratory secretions; postexposure vaccine only to control outbreaks.

RASH or EXANTHEMS	ALL	D for 24 hours then C for 3 weeks, or duration of illness if illness is longer than 3 weeks	Petechial/ecchymotic with fever (general) & If positive history of travel to an area with an ongoing outbreak of VHF in the 10 days before onset of fever	Ebola, Lassa, Marburg viruses	C & D	For duration of illness. Contact & Droplet Precautions, with face/eye protection, emphasizing safety sharps and barrier precautions when blood exposure likely. Use N95 or higher respiratory protection when aerosol-generating procedure performed.
			Maculopapular with cough, coryza, and fever	Rubeola (measles) virus	A	Duration of 4 days after rash onset and for duration of illness for immunocompromised. Immune HCWs preferable. Higher respiratory protection when aerosol-generating procedure performed. Exposed HCWs must be excluded from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine
			Petechial/ecchymotic with fever (general)	<i>Neisseria meningitidis</i>	D	Droplet Precautions for first 24 hours of antimicrobial therapy; mask and face protection for intubation. Postexposure chemoprophylaxis for household contacts, HCWs exposed to respiratory secretions; postexposure vaccine only to control outbreaks.
			Vesicular	Herpes simplex	C & A	Until lesions dry and crusted
			Vesicular	<i>Varicella-zoster (shingles)</i>	C & A	Duration of Illness, Immune HCWs preferable
			Vesicular	<i>Variola (smallpox)</i>	C & A	<u>Airborne & Contact Precautions</u> for duration of illness which is until all scabs have crusted and separated ~ 3-4 weeks, Immune HCWs preferable
			Vesicular	Vaccinia viruses	C	Duration until herpes simplex until lesions dry and crusted, scabs separated. Vaccinated HCWs preferable

RESPIRATORY INFECTIONS: Cough, fever, pulmonary infiltrate	ALL	Longest period of time from either: 5 days from onset of symptoms, duration of illness, or until patient has three negative sputum smears for AFB	Cough/fever/pulmonary infiltrate in any lung location	<i>M. tuberculosis</i> , Respiratory viruses, <i>S. pneumoniae</i> , <i>S. aureus</i> (MSSA or MRSA)	D & A	Duration is until patient has three negative sputum smears for AFB OR if another diagnosis explains clinical syndrome. Use eye/face protection if aerosol-generating procedure performed or contact with respiratory secretions anticipated. If <i>M. tuberculosis</i> unlikely and no respirators available, use Droplet Precautions instead of Airborne Precautions if patient is HIV-positive
			Cough/fever/pulmonary infiltrate in any lung location in a patient with a history of recent travel (10-21 days) to countries with active outbreaks of SARS, avian influenza	<i>M. tuberculosis</i> , severe acute respiratory syndrome virus (SARS-CoV), avian influenza	D & A	Duration is until patient has three negative sputum smears for AFB OR if another diagnosis explains clinical syndrome. If pulmonary infiltrate then <u>Airborne Precautions</u> . If potentially infectious draining body fluid present, <u>Airborne & Contact Precautions</u> . Include eye protection. If SARS and tuberculosis unlikely, use <u>Droplet Precautions</u> instead of Airborne Precautions
			Respiratory infections, particularly bronchiolitis and pneumonia, in infants and young children	Adenovirus, Human metapneumovirus, Influenza virus, parainfluenza virus, Respiratory syncytial virus	C & D	5 days from onset of symptoms or duration of illness-whichever time period is longer. May need <u>Contact & Droplet Precautions</u> . <u>Droplet Precautions</u> may be ruled out when adenovirus and influenza has been ruled out.
SKIN or WOUND INFECTION	C & D	Up to 24 hours	Abscess or draining wound that cannot be covered	<i>Staphylococcus aureus</i> (MSSA or MRSA), group A streptococcus	C & D	<u>Contact & Droplet Precautions</u> for the first 24 hours of appropriate antimicrobial therapy if invasive Group A streptococcal disease is suspected

*Infection control professionals should modify or adapt this table according to local conditions. To ensure that appropriate empiric precautions are implemented always, hospitals must have systems in place to evaluate patients routinely according to these criteria as part of their preadmission and admission care.

1. Most conservative set of Transmission-based Precautions and Duration of Precaution use, based on Clinical Symptom

2. Based on CDC's 2007 "Guidelines for Isolation Precautions"; Heymann's 19th edition "Control of Communicable Diseases Manual", and the "Red Book: 2009 Report of the...XXX"

3. S= Standard but has specific Transmission-Based Precautions based on additional symptoms; C = Contact; D = Droplet; A = Airborne; ALL = Contact, Droplet, & Airborne Precautions

4. The organisms listed under the column "Potential Pathogens" are not intended to represent the complete, or even most likely, diagnoses, but rather possible etiologic agents that require additional precautions beyond Standard Precautions until they can be ruled out.

5. If in doubt, duration of the empiric precautions is usually the duration of symptoms or the duration of the specific disease if final diagnosis is reached

► **Table 3: Summary of infection control precautions for various categories**

ACTIVITY	STANDARD PRECAUTIONS	CONTACT TRANSMISSION	DROPLET TRANSMISSION	AIRBORNE TRANSMISSION
Isolation room	Single room not required	Single room* and minimize time outside	Single room*, minimize time outside, patient should wear mask	Single well-ventilated room*, minimize time outside when patient may wear mask. Exclude non-essential susceptible people
Hand hygiene according to Five Moments	Yes	Yes	Yes	Yes
Gloves	When likely to touch blood, body fluids and contaminated items	Wear gloves on entering room to provide patient care and when likely to touch blood, body fluids and contaminated items	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>
Apron/gown	If soiling likely i.e. during procedures likely to generate contamination from blood and body fluids	Wear it on entering room if clothing will have substantial contact with the patient, environmental surfaces or items in the patient's room	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>
Mask	Wear regular mask during procedures likely to generate contamination with aerosols**	Use risk assessment judgement as per <i>Standard Precautions</i>	Wear fluid resistant surgical/medical mask on entering patient room/ cubicle	Wear high efficiency filtration mask (FFP3 or N95) on entering the room.
Eye protection/ face-shields	During procedures likely to generate contamination with blood and body fluids	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>	Use risk assessment judgement as per <i>Standard Precautions</i>
Equipment decontamination	Yes	Yes	Yes	Yes
Environment cleaning	Yes	Yes	Yes	Yes
Miscellaneous	Avoid contaminating environmental surfaces with gloves	Remove gloves and gown, wash hands before leaving patient's room	Provide at least 1,5 metre (3 feet) of separation between patients in cohort	Advise patient to cover nose and mouth when coughing or sneezing Non-essential susceptible people should be excluded

► **Appendix A: TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS**, if they do not appear in this list then standard precautions apply but ALWAYS risk assess and if necessary take additional precautions

Infection/condition	Type of precautions	Duration of precautions	Additional information
Abscess			
• Draining, major	C	DI	No dressing or containment of drainage; until drainage stops or can be contained by dressing
• Draining, minor or limited	S		Dressing covers and contains drainage
Acquired human immunodeficiency syndrome (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures.
Adenovirus infection (see agent-specific guidance under gastroenteritis, conjunctivitis, pneumonia)			
Anthrax	S		Infected patients do not generally pose a transmission risk.
• Cutaneous	S		Transmission through non-intact skin contact with draining lesions possible, therefore use Contact Precautions if large amount of uncontained drainage. Hand washing with soap and water preferable to use of waterless alcohol based antiseptics since alcohol does not have sporicidal activity.
• Pulmonary	S		Not transmitted from person to person
• Environmental: aerosolizable spore-containing powder or other substance	A C	DE	Until decontamination of environment complete. Wear respirator (N95 mask or PAPRs), protective clothing; decontaminate persons with powder on them (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5135a3.htm) Hand hygiene: hand washing for 30-60 seconds with soap and water or 2% chlorhexidine gluconate after spore contact (alcohol handrubs inactive against spores). Post-exposure prophylaxis following environmental exposure: 60 days of antimicrobials (either doxycycline, ciprofloxacin, or levofloxacin) and post-exposure vaccine under IND
Antibiotic-associated colitis (see Clostridium difficile)			
Bronchiolitis (see respiratory infections in infants and young children)	C	DI	Use mask according to Standard Precautions.
Brucellosis (undulant, Malta, Mediterranean fever)	S		Not transmitted from person to person except rarely via banked spermatozoa and sexual contact. Provide antimicrobial prophylaxis following laboratory exposure.
Campylobacter gastroenteritis (see gastroenteritis)			
Clostridium			
• C. botulinum	S		Not transmitted from person to person
• C. difficile (see Gastroenteritis, C. difficile)	C	DI	
• C. perfringens			
• Food poisoning	S		Not transmitted from person to person
• Gas gangrene	S		Transmission from person to person rare; one outbreak in a surgical setting reported. Use Contact Precautions if wound drainage is extensive

Infection/condition	Type of precautions	Duration of precautions	Additional information
Congenital rubella	C	Until 1 yr of age	Standard Precautions if nasopharyngeal and urine cultures repeatedly neg. after 3 mos. of age
Conjunctivitis			
• Acute bacterial	S		
• Chlamydia	S		
• Gonococcal	S		
• Acute viral (acute hemorrhagic)	C	DI	Adenovirus most common; enterovirus 70, Coxsackie virus A24 also associated with community outbreaks. Highly contagious; outbreaks in eye clinics, pediatric and neonatal settings, institutional settings reported. Eye clinics should follow Standard Precautions when handling patients with conjunctivitis. Routine use of infection control measures in the handling of instruments and equipment will prevent the occurrence of outbreaks in this and other settings
Corona virus associated with SARS (SARS-CoV) (see severe acute respiratory syndrome)			
Coxsackie virus disease (see enteroviral infection)			
Croup (see respiratory infections in infants and young children)			
Crimean-Congo Fever (see Viral Hemorrhagic Fever)	S		
Decubitus ulcer (see Pressure ulcer)			
Diarrhea, acute-infective etiology suspected (see gastroenteritis)			
Diphtheria			
• Cutaneous	C	CN	Until 2 cultures taken 24 hrs. apart negative
• Pharyngeal	D	CN	Until 2 cultures taken 24 hrs. apart negative
Ebola virus (see viral hemorrhagic fevers)			
Echovirus (see enteroviral infection)			
Encephalitis or encephalomyelitis (see specific etiologic agents)			
Enterocolitis, C. difficile (see C. difficile, gastroenteritis)			
Enteroviral infections (i.e., Group A and B Coxsackie viruses and Echo viruses) (excludes polio virus)	S		Use Contact Precautions for diapered or incontinent children for duration of illness and to control institutional outbreaks
Epiglottitis, due to Haemophilus influenzae type b	D	U 24 hrs	See specific disease agents for epiglottitis due to other etiologies)
Erythema infectiosum (also see Parvovirus B19)			
Escherichia coli gastroenteritis (see			

Infection/condition	Type of precautions	Duration of precautions	Additional information
gastroenteritis)			
Food poisoning			
• Botulism	S		Not transmitted from person to person
• C. perfringens or welchii	S		Not transmitted from person to person
• Staphylococcal	S		Not transmitted from person to person
Escherichia coli gastroenteritis (see gastroenteritis)			
Food poisoning			
• Botulism	S		Not transmitted from person to person
• C. perfringens or welchii	S		Not transmitted from person to person
• Staphylococcal	S		Not transmitted from person to person
• Campylobacter species	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
• Cholera (Vibrio cholerae)	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
• C. difficile	C	DI	Discontinue antibiotics if appropriate. Do not share electronic thermometers; ensure consistent environmental cleaning and disinfection. Hypochlorite solutions may be required for cleaning if transmission continues. Handwashing with soap and water preferred because of the absence of sporicidal activity of alcohol in waterless antiseptic handrubs.
• Cryptosporidium species	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
• E. coli			
• Enteropathogenic O157:H7 and other shiga toxin-producing Strains	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
• Other species	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
• Giardia lamblia	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
• Noroviruses	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks. Persons who clean areas heavily contaminated with feces or vomitus may benefit from wearing masks since virus can be aerosolized from these body substances; ensure consistent environmental cleaning and disinfection with focus on restrooms even when apparently unsoiled). Hypochlorite solutions may be required when there is continued transmission. Alcohol is less active, but there is no evidence that alcohol antiseptic handrubs are not effective for hand decontamination. Cohorting of affected patients to separate airspaces and toilet facilities may help interrupt transmission during outbreaks.
• Rotavirus	C	DI	Ensure consistent environmental cleaning and disinfection and frequent removal of soiled diapers. Prolonged shedding may occur in both immunocompetent and immunocompromised children and the elderly.
• Salmonella species (including S. typhi)	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks

Infection/condition	Type of precautions	Duration of precautions	Additional information
<ul style="list-style-type: none"> Shigella species (Bacillary dysentery) 	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<ul style="list-style-type: none"> Vibrio parahaemolyticus 	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<ul style="list-style-type: none"> Viral (if not covered elsewhere) 	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
<ul style="list-style-type: none"> Yersinia enterocolitica 	S/C		Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks
German measles (see rubella; see congenital rubella)			
Giardiasis (see gastroenteritis)			
Gonococcal ophthalmia neonatorum (gonorrheal ophthalmia, acute conjunctivitis of newborn)	S		
Haemophilus influenzae (see disease-specific recommendations)			
Hand, foot, and mouth disease (see enteroviral infection)			
Hansen's Disease (see Leprosy)			
Hepatitis, viral			
<ul style="list-style-type: none"> Type A 	S		Provide hepatitis A vaccine post-exposure as recommended ¹⁰⁶⁵
Diapered or incontinent patients	C		Maintain Contact Precautions in infants and children <3 years of age for duration of hospitalization; for children 3-14 yrs. of age for 2 weeks after onset of symptoms; >14 yrs. of age for 1 week after onset of symptoms. See specific recommendations for care of patients in hemodialysis centers
<ul style="list-style-type: none"> Type C and other unspecified non-A, non-B 	S		See specific recommendations for care of patients in hemodialysis centers
<ul style="list-style-type: none"> Type D (seen only with hepatitis B) 	S		
<ul style="list-style-type: none"> Type E 	S		Use Contact Precautions for diapered or incontinent individuals for the duration of illness
<ul style="list-style-type: none"> Type G 	S		
Herpangina (see enteroviral infection)			
Herpes simplex (Herpesvirus hominis)			
<ul style="list-style-type: none"> Encephalitis 	S		
<ul style="list-style-type: none"> Mucocutaneous, disseminated or primary, severe 	C	Until lesions dry and crusted	
<ul style="list-style-type: none"> Mucocutaneous, recurrent (skin, oral, genital) 	S		
<ul style="list-style-type: none"> Neonatal 	C	Until lesions dry and crusted	Also, for asymptomatic, exposed infants delivered vaginally or by C-section and if mother has active infection and membranes have been ruptured for more than 4

Infection/condition	Type of precautions	Duration of precautions	Additional information
			to 6 hrs until infant surface cultures obtained at 24-36 hrs. of age negative after 48 hrs incubation
Herpes zoster (varicella-zoster) (shingles)			
Disseminated disease in any patient Localized disease in immunocompromised patient until disseminated infection ruled out	A,C	DI	Susceptible HCWs should not enter room if immune caregivers are available; no recommendation for protection of immune HCWs; no recommendation for type of protection, i.e. surgical mask or respirator; for susceptible HCWs.
Localized in patient with intact immune system with lesions that can be contained/covered	S	DI	Susceptible HCWs should not provide direct patient care when other immune caregivers are available.
Human immunodeficiency virus (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures see section 6 Occupational Health
Human metapneumovirus	C	DI	HAI reported, but route of transmission not established. Assumed to be Contact transmission as for RSV since the viruses are closely related and have similar clinical manifestations and epidemiology. Wear masks according to Standard Precautions..
Impetigo	C	U 24 hrs	
Infectious mononucleosis	S		
Influenza			
• Human (seasonal influenza)			See www.cdc.gov/flu/professionals/infectioncontrol/healthcaresettings.htm for current seasonal influenza guidance.
• Avian (e.g., H5N1, H7, H9 strains))			See www.cdc.gov/flu/avian/professional/infect-control.htm for current avian influenza guidance.
• Pandemic influenza (also a human influenza virus)	D	5 days from onset of symptoms	See http://www.pandemicflu.gov for current pandemic influenza guidance.
Lassa fever (see viral hemorrhagic fevers)			
Lice			http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm
• Head (pediculosis)	C	U 24 hrs	
• Body	S		Transmitted person to person through infested clothing. Wear gown and gloves when removing clothing; bag and wash clothes according to CDC guidance above
• Pubic	S		Transmitted person to person through sexual contact
Malaria	S		Not transmitted from person to person except through transfusion rarely and through a failure to follow Standard Precautions during patient care. Install screens in windows and doors in endemic areas. Use DEET-containing mosquito repellants and clothing to cover extremities
Marburg virus disease (see viral hemorrhagic fevers)			
Measles (rubeola)	A	4 days after onset of rash; DI in immune	Susceptible HCWs should not enter room if immune care providers are available; no recommendation for face protection for immune HCW; no recommendation for type of face protection for susceptible HCWs, i.e., mask or respirator. For exposed susceptibles, post-exposure vaccine within 72 hrs. or immune globulin

Infection/condition	Type of precautions	Duration of precautions	Additional information
		compromised	within 6 days when available. Place exposed susceptible patients on Airborne Precautions and exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine
Meningitis			
<ul style="list-style-type: none"> Aseptic (nonbacterial or viral; also see enteroviral infections) 	S		Contact for infants and young children
<ul style="list-style-type: none"> Bacterial, gram-negative enteric, in neonates 	S		
<ul style="list-style-type: none"> Fungal 	S		
<ul style="list-style-type: none"> Haemophilus influenzae, type b known or suspected 	D	U 24 hrs	
<ul style="list-style-type: none"> Listeria monocytogenes (See Listeriosis) 	S		
<ul style="list-style-type: none"> Neisseria meningitidis (meningococcal) known or suspected 	D	U 24 hrs	See meningococcal disease below
<ul style="list-style-type: none"> Streptococcus pneumoniae 	S		
<ul style="list-style-type: none"> M. tuberculosis 	S		Concurrent, active pulmonary disease or draining cutaneous lesions may necessitate addition of Contact and/or Airborne Precautions; For children, airborne precautions until active tuberculosis ruled out in visiting family members (see tuberculosis below)
<ul style="list-style-type: none"> Other diagnosed bacterial 	S		
Meningococcal disease: sepsis, pneumonia, meningitis	D	U 24 hrs	Postexposure chemoprophylaxis for household contacts, HCWs exposed to respiratory secretions; postexposure vaccine only to control outbreaks.
Monkeypox	A,C	A-Until monkeypox confirmed and smallpox excluded C-Until lesions crusted	Use See www.cdc.gov/ncidod/monkeypox for most current recommendations. Transmission in hospital settings unlikely. Pre-and post-exposure smallpox vaccine recommended for exposed HCWs
Mumps (infectious parotitis)			
	D	U 9 days	After onset of swelling; susceptible HCWs should not provide care if immune caregivers are available. Note: (Recent assessment of outbreaks in healthy 18-24 year olds has indicated that salivary viral shedding occurred early in the course of illness and that 5 days of isolation after onset of parotitis may be appropriate in community settings; however the implications for healthcare personnel and high-risk patient populations remain to be clarified.)
Mycobacteria, nontuberculosis (atypical)			Not transmitted person-to-person
<ul style="list-style-type: none"> Pulmonary 	S		
<ul style="list-style-type: none"> Wound 	S		
Mycoplasma pneumoniae	D	DI	
Necrotizing enterocolitis	S		Contact Precautions when cases clustered temporally.
Norovirus (see gastroenteritis)			

Infection/condition	Type of precautions	Duration of precautions	Additional information
Norwalk agent gastroenteritis (see gastroenteritis)			
Parainfluenza virus infection, respiratory in infants and young children	C	DI	Viral shedding may be prolonged in immunosuppressed patients. Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.
Parvovirus B19 (Erythema infectiosum)	D		Maintain precautions for duration of hospitalization when chronic disease occurs in an immunocompromised patient. For patients with transient aplastic crisis or red-cell crisis, maintain precautions for 7 days. Duration of precautions for immunosuppressed patients with persistently positive PCR not defined, but transmission has occurred.
Pediculosis (lice)	C	U 24 hrs after treatment	
Pertussis (whooping cough)	D	U 5 days	Single patient room preferred. Cohorting an option. Post-exposure chemoprophylaxis for household contacts and HCWs with prolonged exposure to respiratory secretions. Recommendations for Tdap vaccine in adults under development.
Plague (<i>Yersinia pestis</i>)			
• Bubonic	S		
• Pneumonic	D	U 48 hrs	Antimicrobial prophylaxis for exposed HCW.
Pneumonia			
• Adenovirus	D, C	DI	Outbreaks in pediatric and institutional settings reported. In immunocompromised hosts, extend duration of Droplet and Contact Precautions due to prolonged shedding of virus
• Bacterial not listed elsewhere (including gram-negative bacterial)	S		
• <i>B. cepacia</i> in patients with CF, including respiratory tract colonization	C	Unknown	Avoid exposure to other persons with CF; single room preferred. Criteria for D/C precautions not established. See CF Foundation guideline
• Chlamydia	S		
• Fungal	S		
• Haemophilus influenzae, type b			
- Adults	S		
- Infants and children	D	U 24 hrs	
• Legionella spp.	S		
• Meningococcal	D	U 24 hrs	See meningococcal disease above
• Multidrug-resistant bacterial (see multidrug-resistant organisms)			
• Mycoplasma (primary atypical pneumonia)	D	DI	
• Pneumococcal pneumonia	S		Use Droplet Precautions if evidence of transmission within a patient care unit or facility
• Pneumocystis jiroveci (<i>Pneumocystis carinii</i>)	S		Avoid placement in the same room with an immunocompromised patient
• Staphylococcus aureus	S		For MRSA, see MDROs

Infection/condition	Type of precautions	Duration of precautions	Additional information
• Streptococcus, group A			
- Adults	D	U 24 hrs	See streptococcal disease (group A streptococcus) below Contact precautions if skin lesions present
- Infants and young children	D	U 24 hrs	Contact Precautions if skin lesions present
• Varicella-zoster (See Varicella-Zoster)			
• Viral			
- Adults	S		
- Infants and young children (see respiratory infectious disease, acute, or specific viral agent)			
Poliomyelitis	C	DI	
Pressure ulcer (decubitus ulcer, pressure sore) infected			
• Major	C	DI	If no dressing or containment of drainage; until drainage stops or can be contained by dressing
• Minor or limited	S		If dressing covers and contains drainage
Rabies	S		Person to person transmission rare; transmission via corneal, tissue and organ transplants has been reported. If patient has bitten another individual or saliva has contaminated an open wound or mucous membrane, wash exposed area thoroughly and administer postexposure prophylaxis.
Resistant bacterial infection or colonization (see multidrug-resistant organisms)			
Respiratory infectious disease, acute (if not covered elsewhere)			
• Adults	S		
• Infants and young children	C	DI	Also see syndromes or conditions listed in Table 2
Respiratory syncytial virus infection, in infants, young children and immunocompromised adults	C	DI	Wear mask according to Standard Precautions. In immunocompromised patients, extend the duration of Contact Precautions due to prolonged shedding). Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.
Rhinovirus	D	DI	Droplet most important route of transmission. Outbreaks have occurred in NICUs and LTCFs. Add Contact Precautions if copious moist secretions and close contact likely to occur (e.g., young
Ritter's disease (staphylococcal scalded skin syndrome)	C	DI	See staphylococcal disease, scalded skin syndrome below
Rotavirus infection (see gastroenteritis)			
Rubella (German measles) (also see congenital rubella)	D	U 7 days after onset of rash	Susceptible HCWs should not enter room if immune caregivers are available. No recommendation for wearing face protection (e.g., a surgical mask) if immune. Pregnant women who are not immune should not care for these patients. Administer vaccine within three days of exposure to non-pregnant susceptible individuals. Place exposed susceptible patients on Droplet Precautions; exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine.

Infection/condition	Type of precautions	Duration of precautions	Additional information
Rubeola (see measles)			
Salmonellosis (see gastroenteritis)			
Scabies	C	U 24	
Scalded skin syndrome, staphylococcal	C	DI	See staphylococcal disease, scalded skin syndrome below)
Schistosomiasis (bilharziasis)	S		
Severe acute respiratory syndrome (SARS)	A, D,C	DI plus 10 days after resolution of fever, provided respiratory symptoms are absent or improving	Airborne Precautions preferred; D if AIRR unavailable. N95 or higher respiratory protection; surgical mask if N95 unavailable; eye protection (goggles, face shield); aerosol-generating procedures and “supershedders” highest risk for transmission via small droplet nuclei and large droplets. Vigilant environmental disinfection (see www.cdc.gov/ncidod/sars)
Shigellosis (see gastroenteritis)			
Smallpox (variola; see vaccinia for management of vaccinated persons)	A,C	DI	Until all scabs have crusted and separated (3-4 weeks). Non-vaccinated HCWs should not provide care when immune HCWs are available; N95 or higher respiratory protection for susceptible and successfully vaccinated individuals; postexposure vaccine within 4 days of exposure protective.
Staphylococcal disease (S aureus)			
• Skin, wound, or burn			
• Major	C	DI	No dressing or dressing does not contain drainage adequately
• Minor or limited	S		Dressing covers and contains drainage adequately
• Enterocolitis	S		Use Contact Precautions for diapered or incontinent children for duration of illness
• Multidrug-resistant (see multidrug-resistant organisms)			
• Pneumonia	S		
• Scalded skin syndrome	C	DI	Consider healthcare personnel as potential source of nursery, NICU outbreak.
• Toxic shock syndrome	S		
Streptococcal disease (group A streptococcus)			
• Skin, wound, or burn			
• Major	C,D	U 24 hrs	No dressing or dressing does not contain drainage adequately
• Minor or limited	S		Dressing covers and contains drainage adequately
• Endometritis (puerperal sepsis)	S		
• Pharyngitis in infants and young children	D	U 24 hrs	
• Pneumonia	D	U 24 hrs	
• Scarlet fever in infants and young children	D	U 24 hrs	
• Serious invasive disease	D	U24 hrs	Outbreaks of serious invasive disease have occurred secondary to transmission among patients and healthcare personnel Contact Precautions for draining wound as above; follow rec. for antimicrobial prophylaxis in selected conditions

Infection/condition	Type of precautions	Duration of precautions	Additional information
Toxic shock syndrome (staphylococcal disease, streptococcal disease)	S		Droplet Precautions for the first 24 hours after implementation of antibiotic therapy if Group A streptococcus is a likely etiology
Tuberculosis (M. tuberculosis)			
<ul style="list-style-type: none"> Extrapulmonary, draining lesion) 	A,C		Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are three consecutive negative cultures of continued drainage. Examine for evidence of active pulmonary tuberculosis.
<ul style="list-style-type: none"> Extrapulmonary, no draining lesion, meningitis 	S		Examine for evidence of pulmonary tuberculosis. For infants and children, use Airborne Precautions until active pulmonary tuberculosis in visiting family members ruled out
<ul style="list-style-type: none"> Pulmonary or laryngeal disease, confirmed 	A		Discontinue precautions only when patient on effective therapy is improving clinically and has three consecutive sputum smears negative for acid-fast bacilli collected on separate days (MMWR 2005; 54: RR-17 http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e)
<ul style="list-style-type: none"> Pulmonary or laryngeal disease, suspected 	A		Discontinue precautions only when the likelihood of infectious TB disease is deemed negligible, and either 1) there is another diagnosis that explains the clinical syndrome or 2) the results of three sputum smears for AFB are negative. Each of the three sputum specimens should be collected 8-24 hours apart, and at least one should be an early morning specimen
<ul style="list-style-type: none"> Skin-test positive with no evidence of current active disease 	S		
<ul style="list-style-type: none"> Multidrug Resistant TB MDR/XDR 			Precautions are as for the categories above
Typhoid (Salmonella typhi) fever (see gastroenteritis)			
Vaccinia (vaccination site, adverse events following vaccination) *			
<ul style="list-style-type: none"> Vaccination site care (including autoinoculated areas) 	S		Vaccination recommended for vaccinators; for newly vaccinated HCWs: semi-permeable dressing over gauze until scab separates, with dressing change as fluid accumulates, ~3-5 days; gloves, hand hygiene for dressing change; vaccinated HCW or HCW without contraindication to vaccine for dressing changes
<ul style="list-style-type: none"> Eczema vaccinatum 	C	Until lesions dry and crusted, scabs separated	For contact with virus-containing lesions and exudative material
<ul style="list-style-type: none"> Fetal vaccinia 	C	Until lesions dry and crusted, scabs separated	
<ul style="list-style-type: none"> Generalized vaccinia 	C	Until lesions dry and crusted, scabs separated	
<ul style="list-style-type: none"> Progressive vaccinia 	C		
<ul style="list-style-type: none"> Postvaccinia encephalitis 	S		
<ul style="list-style-type: none"> Blepharitis or conjunctivitis 	S/C		Use Contact Precautions if there is copious drainage

Infection/condition	Type of precautions	Duration of precautions	Additional information
• Iritis or keratitis	S		
• Vaccinia-associated erythema multiforme (Stevens Johnson Syndrome)	S		Not an infectious condition
• Secondary bacterial infection (e.g., <i>S. aureus</i> , group A beta hemolytic streptococcus)	S/C		Follow organism-specific (strep, staph most frequent) recommendations and consider magnitude of drainage
Varicella Zoster	A,C	Until lesions dry and crusted	Susceptible HCWs should not enter room if immune caregivers are available; no recommendation for face protection of immune HCWs; no recommendation for type of protection, i.e. surgical mask or respirator for susceptible HCWs. In immunocompromised host with varicella pneumonia, prolong duration of precautions for duration of illness. Post-exposure prophylaxis: provide post-exposure vaccine ASAP but within 120 hours; for susceptible exposed persons for whom vaccine is contraindicated (immunocompromised persons, pregnant women, newborns whose mother's varicella onset is \leq 5days before delivery or within 48 hrs after delivery) provide VZIG, when available, within 96 hours; if unavailable, use IVIG, Use Airborne Precautions for exposed susceptible persons and exclude exposed susceptible healthcare workers beginning 8 days after first exposure until 21 days after last exposure or 28 if received VZIG, regardless of post exposure vaccination.
Variola (see smallpox)			
Vibrio parahaemolyticus (see gastroenteritis)			
Viral hemorrhagic fevers due to Lassa, Ebola, Marburg, Crimean-Congo fever viruses	S, D, C	DI	Single-patient room preferred. Emphasize: 1) use of sharps safety devices and safe work practices, 2) hand hygiene; 3) barrier protection against blood and body fluids upon entry into room (single use gloves and fluid-resistant or impermeable gown, face/eye protection with masks, goggles or face shields); and 4) appropriate waste handling. Use N95 or higher respirators when performing aerosol-generating procedures. Largest viral load in final stages of illness when hemorrhage may occur; additional PPE, including double gloves, leg and shoe coverings may be used, especially in resource-limited settings where options for cleaning and laundry are limited. Notify public health officials immediately if Ebola is suspected Also see Table 3
Viral respiratory diseases (not covered elsewhere)			
• Adults	S		
• Infants and young children (see respiratory infectious disease, acute)			
Whooping cough (see pertussis)			
Wound infections			
• Major	C	DI	No dressing or dressing does not contain drainage adequately
• Minor or limited	S		Dressing covers and contains drainage adequately
<i>Yersinia enterocolitica</i> gastroenteritis (see gastroenteritis)			
Zoster (varicella-zoster) (see herpes zoster)			

KEY:

Type of Precautions:

A, Airborne;

C, Contact;

D, Droplet;

S, Standard;

when A, C, and D are specified, also use S.

Duration of precautions:

CN, until off antimicrobial treatment and culture-negative;

DI, duration of illness (with wound lesions, DI means until wounds stop draining);

DE, until environment completely decontaminated;

U, until time specified in hours (hrs) after initiation of effective therapy;

4.9 Screening, Isolation and Notification

It is essential to continue the principles of screening, isolation, triage and notification introduced during the ebola outbreak. Infectious diseases are common in Sierra Leone and the tragic experiences of this outbreak underline the importance of being alert to any patient presenting with symptoms of an infectious disease or developing them whilst an inpatient.

All patients presenting to hospital should have their temperature taken and screened for symptoms consistent with ebola or other potential transmissible disease.

If they meet the criteria then they should be further assessed by a member of the clinical team and cared for in isolation pending further investigation and testing using appropriate transmission based precautions based on risk assessment.

In patients should be screened at some point during every shift. Changes in symptoms should be documented clearly and in the event they meet criteria for possible ebola or other infectious diseases they should be moved into isolation with appropriate transmission based precautions pending further clinical assessment, investigation and testing. It is always better and safer to test for infection and exclude than fail to test and miss a case.

All Healthcare workers should be screened and temperatures recorded at the start of each shift. Staff who become unwell at work with symptoms consistent with EVD or other possible infection should be observed in an area separate from staff and patients, assessed, tested, treated and followed up as appropriate.



► Appendix 1

The screening form used during the ebola outbreak is appended . Staff must remain vigilant in recognition of this or any other infectious disease.



Ebola Screening at Health Facilities during an Ebola Outbreak

1. IN OR ADJACENT TO A DISTRICT WITH ONGOING EBOLA TRANSMISSION (i.e. EBOLA CASE / DEATH CONFIRMED WITHIN PAST 42 DAYS), USE FULL SCREENING FORM FOR ALL PATIENTS

2. IN ALL OTHER DISTRICTS (NO EBOLA CASE / DEATH FOR > 42 DAYS) ASK EVERYONE:

A. Any travel*? No Yes -> **USE FULL SCREENING FORM**

B. Any contact with anyone who has travelled*? No Yes -> **USE FULL SCREENING FORM**

* Travel = travel to / from a district where there are / have been any Ebola cases / deaths in the last 21 days?

C. Do you think you may have any other risk of Ebola? No Yes -> **USE FULL SCREENING FORM**

D. PREGNANT / POSTPARTUM / UNSURE? No Yes -> **COMPLETE PATIENT DATA AND PART F OF SCREENING FORM**

IF ANSWERS TO A and B and C and D = NO -> SCREENING NOT REQUIRED

INSTRUCTIONS FOR COMPLETION OF EBOLA SCREENING FORM

Complete all patient data

Briefly describe why the patient has attended.

Complete part A of the form

Ask about a fever. Measure the temperature.

Answer Question A: Any acute fever in the past 2 days or is measured temperature > 38 C?

Complete Part B

Ask about symptoms. Check if present. If symptom has been present more than 3 weeks—check NO.

Answer Question B: What is the total number of symptoms answered Yes'?

Complete Part C

Ask about contact details.

Answer Question C If yes to any question 1 to 10, check yes- contact history.

Complete Part D

Decide if the patient meets any of the case definitions, and act accordingly.

Check yes or no to each Ebola case definition. If yes, circle disposition and act according to this.

If pregnant / postpartum / unsure complete Part F and assess if there is any possible increased risk of Ebola virus transmission.

If NO to all Ebola case definitions, check NO to "Does patient fit any Ebola case definition."

Answer Question D If NO – Complete Part E.

Cautionary Notes:

1. **Screenings still required for Ebola Survivor** s' because:
 - A. A person may mistakenly believe that they are an Ebola Survivor simply because they were admitted to and discharged from an ETC. In fact, they may have been a suspect case who tested negative. Unless you are certain the individual is definitely an EVD survivor, follow the recommended screening guidelines.
 - B. There are reports of confirmed cases of EVD who survived, tested negative and were discharged but subsequently presented with symptoms and tested positive again. Failure to test for EVD may put others at risk.
 - C. A person may claim to be a survivor in order to access a preferred mode of care or care pathway.
2. **Individuals may deliberately conceal or fail to disclose their status as an EVD survivor or as an EVD contact in order to access or avoid a particular care pathway.**

IF IN DOUBT, IT'S BEST TO TEST!

EBOLA SCREENING AND TRIAGE FORM



SIERRA LEONE GOVERNMENT
MINISTRY OF HEALTH & SANITATION

Date: _____

Facility: _____ Staff name: _____ Staff role: CHO/CHA / Nurse / Doctor / Other

Surname: _____ First name: _____ Gender: Male Female Pregnant? Yes No Not sure

Age: _____ (yrs or mths if under 2 years of age) Village/Address: _____ Chiefdom: _____

District: _____ Contact Number: _____ Occupation: _____ Location: _____

Reason for visit: Acute / New illness* Chronic illness Routine visit (e.g. Immunization, Antenatal visit)

*Number of days since start of illness |__|__| Case Number |__|__|__|__|__|__|

Part A: Fever Does person have a history of acute fever (in last 2 days): YES NO Current temperature: _____

Question A: History of any acute fever in the last 2 days OR temperature above or equal to 38°C? YES NO

Part B: Recent onset of symptoms of Ebola: (if any symptoms longer than 3 weeks, answer = no)

For adults and children 3 years and above	Yes	No	For children less than 3 yrs	Yes	No
Unexplained bleeding			Unexplained bleeding		
Intense fatigue (general body weakness)			Prostration / severe weakness		
Loss of appetite			Poor feeding/inability to suck		
Nausea or vomiting			Nausea or vomiting		
Diarrhoea			Diarrhoea		
Abdominal pain			Abdominal pain		
Muscle pain, joint pains, backache			Excessive crying/irritable/restless		
Sore throat or pain with swallowing			Drooling / Pain swallowing		
Hiccups			Hiccups		
Difficulty breathing			Difficulty breathing		
Conjunctivitis ('redeyes')			Conjunctivitis ('redeyes')		
Headache					

Question B: What is the total number of symptoms answered 'Yes'? ===== →

Part C. Contact – In the last 3 weeks (or at any time during pregnancy) did you/ patient / child: Yes No

1) stay with or visit anyone who has been sick with or died of Ebola*? (* = likely or confirmed)		
2) touch or care for anyone who was sick with or died of Ebola*?		
3) touch / care for anyone who was sick / died who had been in a district with Ebola?		
4) wash clothes of anyone who was sick or died of Ebola*?		
5) attend the funeral of someone who has died of Ebola*?		
6) go to see or receive treatment from a traditional healer?		
7) touch, prepare, or eat bush meat or bats?		
8) Are you / patient being followed by an Ebola contact-tracer or currently living in a quarantined home?		
9) Were you / patient admitted to an Ebola care facility or isolation ward for possible Ebola?		
10) Do you think you have any other risk of Ebola, for example sexual contact with a male survivor?		
11) <i>If child: Has the child been cared for or breastfed by someone sick with or who died of Ebola*?</i>		

If yes to 8 or 9 Give contact-tracer / health facility name & phone number:

Details of contact:

Question C: Does the person have any contact history? YES NO

Part D. Does the patient fit an Ebola case definition?

PROBABLE CASE: ACTION → Isolate, treat, use comprehensive PPE + IPC, call 117 → ETC

1. Fever **AND** contact No Yes

2. Contact **AND** 1 or more symptoms No Yes

3. Unexplained bleeding **AND** fever No Yes

SUSPECT CASE: ACTION → Isolate, treat, use comprehensive PPE + IPC, Test for EVD or call 117

4. Fever **AND** 3 or more symptoms No Yes

If the patient **DOES NOT** fit any Ebola case definition above complete Part E

IS WOMAN PREGNANT / POSTPARTUM / UNSURE No Yes IF YES SEE RISK ASSESSMENT PART F on next page.

Part E. If Patient Does NOT Fit Case Definition: Tick department they are attending and allow into hospital

OPD paediatrics adult ward Maternity /ANC other (specify)

TRIAGE ALL PATIENTS: emergency signs → (Call for help) ← priority signs No emergency/priority signs



PART F: SPECIAL EBOLA TRANSMISSION RISK ASSESSMENT IN PREGNANT AND POSTPARTUM WOMEN (OR IF PREGNANCY STATUS UNSURE)

During the Ebola outbreak, all pregnant or postpartum women who satisfy Ebola Suspect or Probable case definitions, or who survived Ebola during their current pregnancy, or who present with Ebola-associated complications (abortion; pre-labour ruptured membranes; pre-term labour or birth; antepartum, intrapartum or postpartum hemorrhage; fetal death, stillbirth or neonatal death) must be managed as if they are potentially infectious until proven negative by blood PCR test from mother and, where appropriate, swabs obtained from products of conception or baby (amniotic fluid, foetus / stillbirth / neonate, any surface on the inside of the amniotic sac).¹

Ebola Transmission Risk Assessment in Pregnant and Postpartum Women

Assess the pregnant or postpartum woman:

QF1 Ask, have you had Ebola? If yes:

- Did you have Ebola during this pregnancy? OR
- Did you have Ebola before and became pregnant after you recovered from Ebola? (Ebola survivor who became pregnant after recovery – make sure she is DEFINITELY a survivor)

QF2 Are there any Ebola-associated complications: abortion; pre-labour ruptured membranes; pre-term labour or birth; antepartum, intrapartum or postpartum hemorrhage; fetal death, stillbirth or neonatal death?

QF3 Any history of CONTACT at any time during this pregnancy? (use Part C overleaf)

QF4 Does the pregnant or postpartum woman satisfy the Probable or Suspect Ebola case definition? (see Part D overleaf)

Use your assessment of the pregnant or postpartum woman to decide what row in the Risk Assessment Table the woman belongs in. Start from the top row and circle if positive: this gives you the risk category. After you circle a positive assessment and risk category—stop. Each woman is in only one row.

Use your assessment of the Pregnant or Postpartum Woman:	Risk Category	Actions:
History of Ebola during <u>this</u> pregnancy?	Definite risk	If NOT in labour/ post-partum/ Ebola-related complication: Provide antenatal care with standard IPC. Counsel the woman to seek care early at a facility that can provide appropriate obstetric clinical care and Ebola IPC precautions. N.B. Ebola testing currently not recommended in routine ANC.
Any history of CONTACT (see Part C) but does not satisfy 'Probable' case definition	Greatly increased risk	If in labour/ post-partum/ any Ebola-related complication: ➤ Manage initially in an appropriate isolation facility ➤ Adhere to comprehensive PPE and IPC recommendations for Ebola ➤ Transfer as soon as possible to an appropriate ETC for isolation and testing.
Satisfies the 'Probable' case definition (see Part D)	Greatly increased risk	➤ Manage initially in an appropriate isolation facility ➤ Adhere to comprehensive PPE and IPC recommendations for Ebola ➤ Transfer as soon as possible to an appropriate ETC for isolation and testing.
NO history of CONTACT (see Part C) but has Ebola-associated complications (see QF2)? OR Satisfies the 'Suspect' case definition (see Part D)	Increased risk	➤ Manage as a suspect Ebola case in an appropriate isolation facility ➤ Adhere to comprehensive PPE and IPC recommendations for Ebola ➤ Test for Ebola according to protocol or refer to an appropriate ETC for isolation and testing.
Definite Ebola survivor who became pregnant after recovery from Ebola OR Any other pregnant / postpartum woman with <u>NO</u> Ebola-associated complications	Standard risk	If NOT in labour / post-partum / obstetric complication*: Provide antenatal care with standard IPC. N.B. Ebola testing currently not recommended in routine ANC. If in labour / post-partum / (or if *obstetric complication in Ebola survivor who became pregnant after recovery) ➤ Manage according to standard PPE and IPC guidelines for care of pregnant women. ➤ Complete Part E on front page and triage

¹ For detailed guidelines see: Ebola virus disease in pregnancy - Interim guidance for screening and managing Ebola cases, contacts and survivors WHO August 2015

SPECIAL AREAS OF THE HOSPITAL

Introduction

Some areas of a healthcare facility require very specific Infection Prevention Control measures because of heightened risk of infection or because of the specific nature of the work undertaken.

This section covers:

- **Operating Theatres**
- **Laboratories**
- **Maternity units – labour suites**
- **Mortuaries**

The following preconditions for prevention of healthcare-associated infections (HAIs) should be addressed by health-care facility (HCF) leaders and managers, informed by the evidence based information provided:

- **Infrastructure/system change:** Appropriate design and layout of the department to minimise risk of infection, access to the right equipment, safe and appropriate decontamination and sterilisation of equipment and materials, necessary PPE, supplies and an environment that facilitates safe practise
- **Training and education:** a program of routine training and education and periodic retraining for all HCWs responsible for the services covered highlighting the risks associated with the activity and necessary IPC precautions to reduce that risk
- **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place
- **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters displayed at the point of care).
- **Safety culture:** managers and leaders at every level of the HCF show their visible support for safe practise and patient and staff safety

5.1 Operating Theatres

Operating theatres should be located away from areas of the healthcare facility that are heavily travelled by staff and patients. Enclose the operating theatre to minimize dust, eliminate insects, and facilitate sterility and an environment conducive to the prevention of patient and healthcare worker infections. Surgical site infections are common and can be prevented based on standards of pre-, intra-, and post-operative care. Healthcare worker infections such as the acquisition of blood borne viruses can be prevented by safe practices in the operating theatre. Operating theatre safety can also be addressed through the use of the WHO surgical safety checklist and Integrated Management for Emergency and Essential Surgical Care (IMEESC) toolkit.



For more information refer to the WHO Surgical Safety Checklist <http://www.who.int/patientsafety/safesurgery/checklist/en/>

and the Integrated Management for Emergency and Essential Surgical Care (IMEESC) toolkit <http://www.who.int/surgery/publications/imeesc/en/>

- ▶ The following preconditions for the prevention of healthcare-associated infections (HAI) should be addressed by healthcare facility (HCF) leaders and managers, informed by the evidence-based information provided:
 - Infrastructure/system change: access to the right equipment and supplies including PPE, and an operating theatre environment that is designed and planned to facilitate patient and healthcare (HCW) worker safety
 - Training and education: a program of routine training and education and periodic retraining for all personnel involved in operating theatre work that is in line with the recommendations presented in this chapter
 - Personnel should receive initial and ongoing education and competency validation as applicable to their roles
 - Monitoring, evaluation and feedback: a program of regular monitoring, supervision, and feedback is in place
 - Awareness raising/promotion: the practices described in the chapter are reinforced through awareness raising (e.g. use of posters displayed in the theatre areas)
 - Safety culture: managers and leaders at every level of the HCF show their visible support for operating theatre safety to help develop and reinforce a culture of patient safety
 - Policies and procedures should be developed, reviewed periodically, revised as necessary, and readily available in the practice setting

The presence of humans and their activities generates dispersal of microorganisms in the environment and increases the risk of potential pathogen transmission and subsequently infections. Thus it is essential that the number and flow of visitors, patients, clients, and staff should be regulated and kept to absolute minimum in the following areas of healthcare facilities:

- Preoperative and Recovery rooms i.e. areas where patients wait and where healthcare workers (HCW) examine and treat patients prior to and after being operated
- Operating theatres
- Procedure rooms where minor operations are performed, including their preoperative and recovery rooms
- Sterile Service Departments or areas designated for the decontamination of surgical instruments
- Storage areas for clean items/equipment and sterile instruments

Other standards are vital for safe operating environments and optimum patient outcomes, these include; personal protective equipment (PPE), hand decontamination (scrubbing), cleaning schedules, , appropriately trained staff, storage and lay up of sterile equipment, ventilation (air flow), designated zones in the operating theatre area, and reporting systems for any incidents.



Refer also to Standard Precautions, Chapter 4, for further information on PPE, hand hygiene, sharps safety, and waste management

Minor Operation, the following applies to areas where HCWs perform minor medical procedures on patients:

- Permit only the patient and the staff performing and assisting with procedures in the procedure room
 - The number of trainees should be kept to a maximum of two trainees per room (This should depend on the size of the class and the available space in the procedure room)
- Patients should wear clothing provided by the health-care facility if not available they may wear their own clean clothing (freshly laundered)
- Procedures should be performed adhering to the same sterility standards as operating theatres for optimal patient outcome and HCW safety
- Environmental cleanliness and equipment sterility should be ensured (see subsequent sections)



► 5.1.1 Operating Theatres areas

The Operating theatre is routinely divided into four designated areas according to its descending order of cleanliness (see Fig 1 and Table 1): i.e. the principle of from clean to dirty.

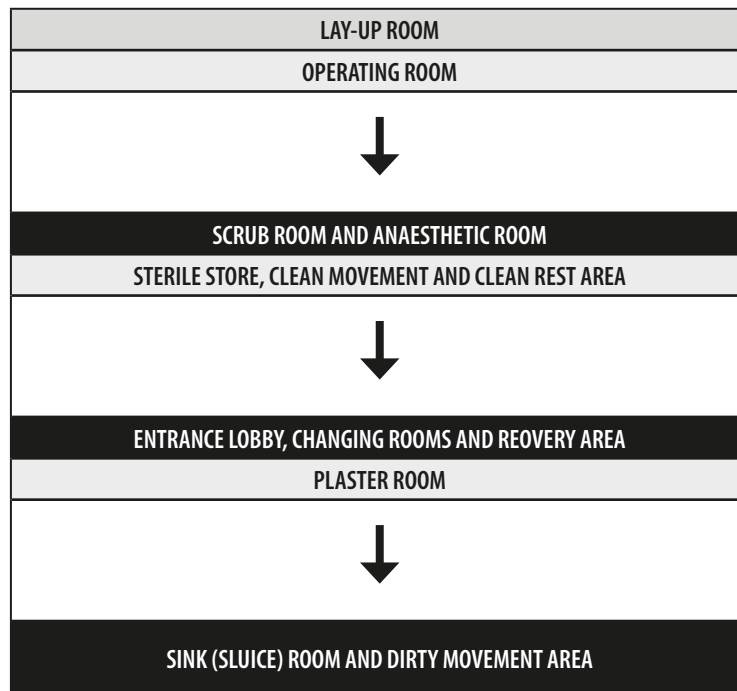


Fig.1. Operating suite areas in the descending order of cleanliness.

(Source: Damani NN. Manual of Infection Prevention and Control. Oxford: Oxford University Press, 2012.)

The absolute minimum requirement for safe operating is; an area to scrub in preparation for surgery, this should be separated by a partition from the main theatre. The main theatre must be a well ventilated clean, clutter free, only essential operating and resuscitation equipment, with clear designated areas of work to reduce contamination in critical (clean) areas of the theatre.

There should be clearly demarcated, separate areas for instrument cleaning and sterilisation and stored sterile instruments.

Environmental controls and the use of surgical attire increase as staff move from unrestricted to restricted areas. Staff with respiratory or skin infections or uncovered open sores should never be allowed to work in any area of the surgical unit.

Table 1: Theatre Layout and Examples of Room Locations

UNRESTRICTED	SEMI-RESTRICTED AREA	RESTRICTED AREA	DIRTY
<ul style="list-style-type: none"> • Patient reception • This area includes a central control point for designated personnel to monitor the entrance of patients, personnel, and materials 	<ul style="list-style-type: none"> • The peripheral support areas of the surgical suite 	<ul style="list-style-type: none"> • Accessible only through a semi-restricted area • Operating theatres 	<p>Disposal area</p> <ul style="list-style-type: none"> • All utilized materials and linen are gathered, packaged, and sent to appropriate areas • Excised/ amputated human parts/organs are gathered packaged and sent to appropriate area
<ul style="list-style-type: none"> • Locker rooms • Lounges • Offices 	<ul style="list-style-type: none"> • Clean storage and equipment rooms • Scrub areas • Recovery room 	<ul style="list-style-type: none"> • Sterile supply • Storage area (ex. clean) • Linen, anaesthesia work room 	





Consider displaying a signboard in the local language to limit the entry of unauthorized persons

5.1.2 Theatre Environment

- **Ventilation and temperature controls:**
 - Maintain operating theatres at positive pressure so that air flows from the cleanest areas to the least clean areas
 - Maintain positive pressure ventilation with respect to corridors and adjacent areas
 - Maintain a good ventilation
 - Keep the temperature of the operating theatre between (68°F–75°F [20°C–23°C])
 - Design operating theatres to introduce air at the ceiling with the exhaust near the floor
 - If the operating theatre is not equipped with a positive-pressure system, focus on less expensive strategies, such as:
 - **Keeping doors and windows closed**
 - **Keeping personnel to a minimum during a procedure and restrict personnel once the operation has started (unless it is absolutely essential)**
 - **Absolutely minimizing talking, moving, and opening and closing of doors**
- **Cleaning:**
 - Clean the operating theatre between each patient, and at the beginning and end of each day
 - **Always keep operating theatres clean, dry and dust free**
 - **Avoid unnecessary cutter to aid cleaning**
 - Do not clean any instruments in the operating theatre after an operation but rather send it to the designated decontamination area or the Sterile Supply Department
 - Keep floors smooth, slip resistant and robust enough to withstand frequent washings and harsh cleaning/scrubbing
 - Ensure that walls are water-impermeable, scrub able, and resistant to cracks
 - **Walls should also be protected from impact by gurneys and other equipment coming to and from the operating theatre department**
 - Ensure that ceilings in operating theatres are smooth, washable, and made of a solid surface free from cracks and crevices
 - Seal all ceiling-mounted lights or fixtures so that dust and contaminants cannot enter through these openings and so that there is no compromise to the ventilation system
 - It is permissible to use lay-in ceilings in semi-restricted and unrestricted areas, including recovery and holding areas; however, lay-in ceilings are not permitted in operating theatres
 - The theatre should be free of all items other than the equipment necessary to perform the surgical procedures. There should be no clutter

Instrument sterilisation and storage

The decontamination unit should be one way flow from dirty to disinfected / sterile

The clean and dirty areas should be clearly demarcated

Decontaminated instruments should be stored in a clean dry area, appropriately packaged and sealed to prevent contamination prior to use.



Refer also to Chapter 4 section 4.2.3 environmental decontamination/management, for further information on cleaning

► 5.1.3 Preparation of the patient

Surgical antibiotic prophylaxis: It is essential that each healthcare facility develop local surgical antibiotic prophylaxis policy based on international guidelines. Antibiotic prophylaxis should be considered for:

- clean surgery involving the placement of a prosthesis or implant
- clean-contaminated surgery
- contaminated surgery
- surgery on a dirty or infected wound (requires antibiotic treatment in addition to prophylaxis)

See Annexe 1 for classification of surgical wounds

The antibiotics selected for prophylaxis must cover the expected pathogens for that operative site. Narrow spectrum, less expensive antibiotics should be the first choice for prophylaxis during surgery. A single dose of intravenous antibiotic with a long enough half-life to achieve activity throughout the operation is recommended and this should be given within 60 minutes before the skin is incised. Prolonging of antibiotic prescription should be avoided during the post-operative period in the absence of an infection.

- **Preoperative shaving:** Hair should not be removed at the operative site unless the presence of hair will interfere with the operation. Preoperative **shaving especially with a razor should be avoided** because shaving can cause small nicks and breaks, leaving the skin bruised and traumatized, increasing the risk of colonization and infection. If hair is to be removed from the operative site, only the area needing to be incised should be shaved. If hair removal is necessary, use clippers: use of a razor must be avoided. Removal of hair, if necessary, should be done immediately before surgeons perform the incision, not the night before surgery.
- **Preoperative showers:** It is preferable that the patient has been instructed to shower or bathe the night before an operative procedure.
- Sterile drapes should be applied after proper asepsis which must be maintained throughout the surgical procedure.
- The patient identity (e.g. name and date of birth) and allergy status should be confirmed, along with any other risk factors (e.g. risk of significant bleeding), and the site of the surgery should be marked.

5.1.4 Preparation of the surgical team

5.1.4.1 Surgical Hand Decontamination (Scrub)

Introduction

- It is important to reduce to a minimum the level of resident and transient flora on the hands and forearms prior to performing any surgical procedure. The purpose of antiseptic solutions such as Chlorhexidine gluconate or iodophores is to reduce the microbial load significantly and suppress regrowth for as long as possible thus reducing the risk of contamination at the operating site
- Proper surgical hand scrubbing for 3-5 minutes and the wearing of sterile gloves and a sterile gown provide the patient with the best possible barrier against pathogenic bacteria in the environment and against bacteria from the surgical team
- A surgical hand decontamination (scrub) should be undertaken before every invasive procedure



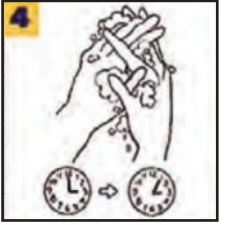



To ensure effective surgical hand decontamination (scrub);

- Hands must be well cared for, any abrasions covered with water resistant dressings and nails must be clean and kept short. False nails or nail polish should not be worn. Nail brushes should not be used, they can actually raise the bacterial count
- All Jewellery should be removed before entering the scrub area. Wearing of jewellery, including earrings, watches, and rings, encourages persistence of high bacterial counts on skin surfaces
- Staff should wear short sleeved shirts / scrubs to allow thorough decontamination of the forearms



- **Surgical hand scrub - antiseptic solution (chlorhexidine gluconate or iodophors) and water.** If antiseptic solution is not available, antiseptic soap should be used (see Fig 2 for procedure). Running water is preferred; however, when no running water is available, use a bucket with a tap that can be turned off, to lather hands, and turned on again (by a buddy) for rinsing, or use a buddy to pour the water with a scoop.

Figure 2: Surgical hand scrub procedure (antiseptic solution and water).

	<ol style="list-style-type: none"> 1. Remove jewelry and watch. Wedding rings harbour bacteria and must be removed when scrubbing, whenever possible 2. Hold hands above the level of the elbow and wet hands thoroughly
	<ol style="list-style-type: none"> 3. Keep short nails at all the time <u>DO NOT use scrubbing brush</u>
	<ol style="list-style-type: none"> 4. Holding your hands up above the level of your elbow, apply the antiseptic liquid. 5. Wash following the 7 steps for hand hygiene 6. Thoroughly wash the wrists and forearms moving from the hand to the elbow <p>Continue washing in this way for 3-5 minutes</p>
	<ol style="list-style-type: none"> 7. Rinse each arm separately, fingertips first, holding your hands above the level of your elbow. Do not let rinse water flow over clean area. Water should flow from area of least contamination to area of most contamination
	<ol style="list-style-type: none"> 8. Using a sterile towel, dry your hands and arms thoroughly– from fingertips to elbow - using a different side of the towel on each arm <p>Surgical hand antiseptics - antiseptic handwash or antiseptic handrub</p>
	<ol style="list-style-type: none"> 9. Keep your hands above the level of your waist and do not touch anything before putting on sterile gown and gloves <ul style="list-style-type: none"> • Contact with soiled objects contaminates clean hands. The area below the level of the waist is considered unclean • Handwashing - action of performing hand hygiene for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms

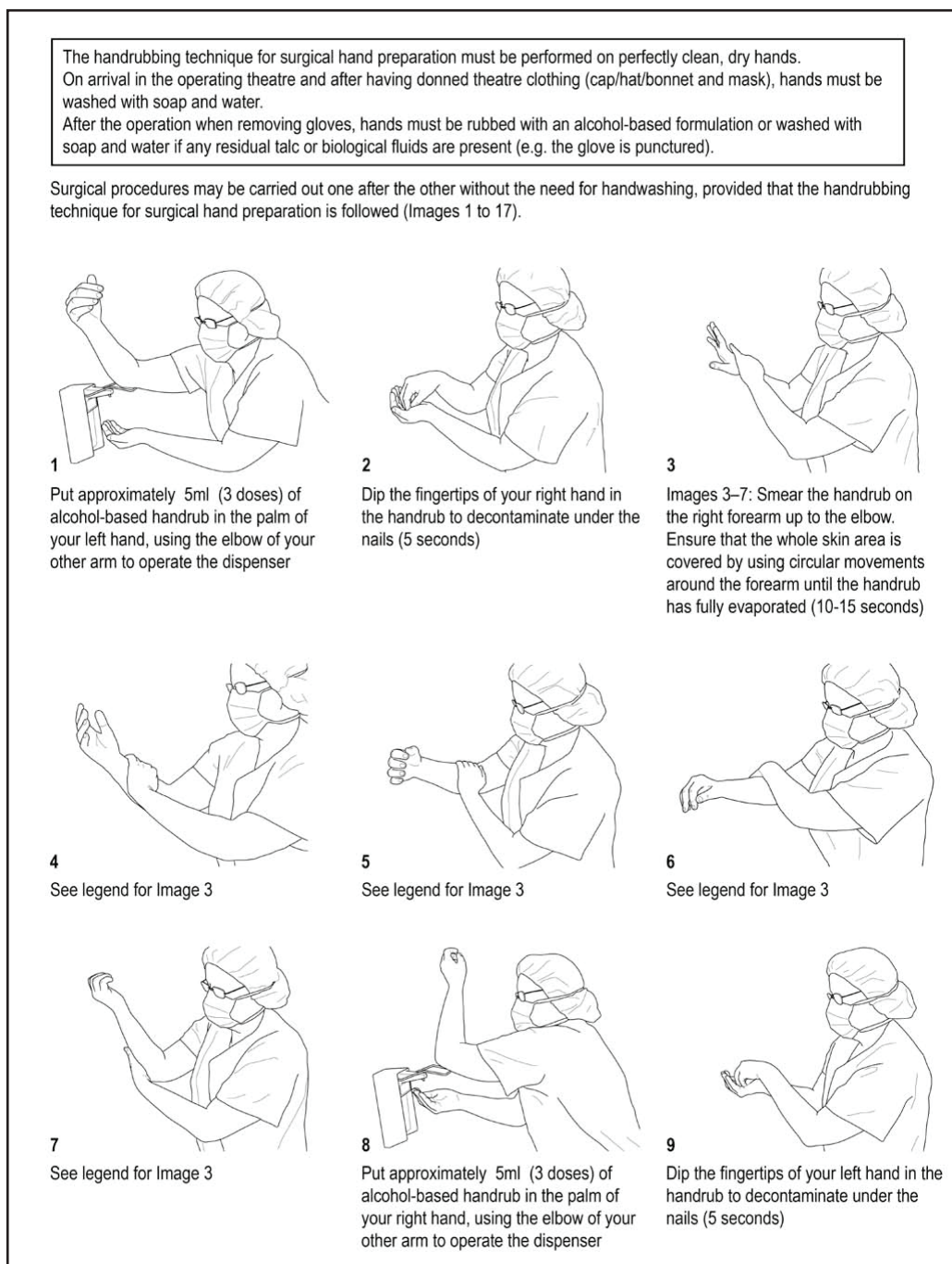
► Surgical hand scrub - Alcohol based hand-rubs

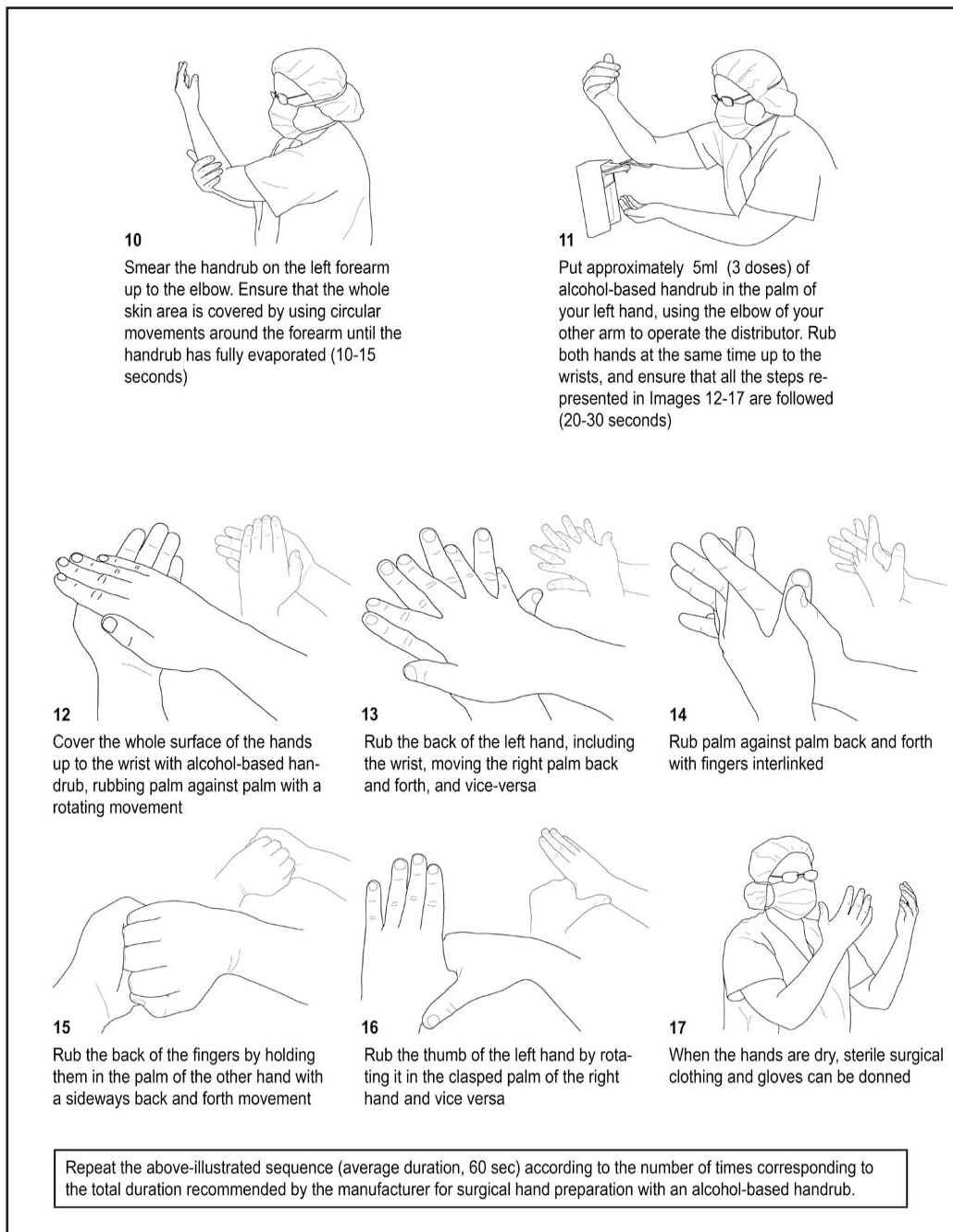
Several alcohol-based hand rubs (ABHR) have been licensed for use as preoperative surgical hand preparations. The antimicrobial efficacy of ABHR formulations is superior to all other currently available products. It is essential that before applying ABHR, the hands of the surgical team should be cleaned upon entering the operating theatre by washing the hands with soap and running water. To optimise the efficacy of ABHR for surgical scrub it is essential that;

- Before applying ABHR, hands must be completely dry (See Fig. 3).
- When applying ABHR, hands should be wet from the alcohol based rub during the whole procedure, which requires approximately 15 mL (depending on the size of the hands) and requires a total of 3 minutes

Use of an ABHR for surgical hand disinfection has several advantages over antiseptic solution and water which include; rapid action, time saving, fewer side effects, and no risk of recontamination by rinsing hands with water.

Figure 3: Surgical hand preparation technique with an ABHR





5.1.4.2 Personal Protective Equipment (Theatre Attire)

- PPE is designed to minimize the transfer of microorganisms from the mucous membranes, skin and hair of the surgical team to the patient
- PPE provides the surgical team with some protection from the patient
- It is recommended that perioperative personnel in the semi-restricted and restricted areas wear facility-provided, clean, freshly laundered, or disposable surgical scrub attire
- When in the restricted areas, all non-scrubbed personnel should completely cover their arms with a long-sleeved scrub top or jacket (facility may require this in semi-restricted area as well)
- Perioperative personnel should change into surgical attire in designated dressing areas to decrease the possibility of cross-contamination
- Scrub attire and cover apparel (e.g., lab coats) should be laundered as per facility guidelines after each daily use and when contaminated
- Personnel should change back into street clothes if they need to leave the facility or travel between buildings in order to prevent contaminating the surgical attire through contact with the external environment

- ▶ • **Gloves:** Sterile gloves of good quality and the correct fit/size must be worn
- **Disposable hats/hoods:** Should completely cover the hair (including facial hair and sideburns) and must be worn when entering the semi-restricted and restricted area
 - This is particularly important for arthroplasty/prosthetic implant surgery
- **Masks:** Scrub team must wear surgical masks to completely obscure the mouth and nose. They should be removed by the tapes and discarded at the end of each case
 - Masks must be removed prior to leaving the theatre suite
 - High efficiency masks eg N-95 masks (Fluid repellent) must be available in theatre for procedures where there is a risk of exposure to TB or other airborne pathogens
- **Eye Protection:** Full face shields/visors or protective goggles must be available for all staff and must be worn during invasive procedures that potentially generate splashing
 - Face shields/visors, goggles should either be disposable or decontaminated according to manufacturer's instructions after use
 - If magnifying loupes are available, visors cannot be used
 - Loupes should, therefore, be fitted with side shields
- **Scrub gowns:** The scrub team should either wear disposable fluid repellent gowns or reusable gowns that are provided by the organization and returned for laundering
- **Footwear:** Staff should wear closed toe non-slip footwear
 - Boots should be worn if there is a high risk of heavy blood/body fluid loss
 - Staff should not leave the operating theatre wearing shoes that are visibly stained
- **Use of Cover gowns:** Use of cover gowns can be determined using a risk assessment
 - Cover gowns have been found to have little or no effect on reducing contamination of surgical scrubs but if used, should be laundered daily

5.1.5 Before Surgical Procedures (also see preparation of the patient section)



All sterile supplies should be transported into operating theatres in closed sterile containers. Case carts, when used, should be transported in covered, enclosed units and should not follow a route from the point of assembly to the operating theatre that traverses thoroughfares

Before surgical procedures, set up the operating theatre as follows:

- Organize Mayo and ring-stand tables side by side in an area away from the traffic pattern and at least 45 centimetres from walls, cabinets, and other non-sterile surfaces
- Cover the Mayo stand and other non-sterile surfaces that are to be used during the procedure with a sterile towel or cloth
- Check and set up suction, oxygen, and anaesthesia equipment
- All theatre personnel should be clear on their roles and responsibilities
- Make sure that a clean sheet, a canvas, and arm-board covers are available, if required (place them on the operating theatre table)
- Make sure that supplies and packages that are ready to open are placed on the tables (not on the floor)
- Ensure that the operating theatre has:
 - A leak-proof covered waste container with appropriate bin liner for contaminated waste items
 - A puncture-resistant container for the safe disposal of sharps at the point of generation that does not contaminate the sterile field
- A leak-proof covered container for soiled linen away from sterile items
- **Handling of sterile items:**
 - All sterile items to be used during an operative procedure must be opened in a manner so as to avoid any possible contamination to prevent surgical infections
 - Sterile items must be covered with sterile drape when not in use to avoid contamination



► 5.1.6 During Surgical Procedures

- Scrubbed staff should wear full surgical attire i.e., scrub suits, plastic aprons, clean caps and masks, protective eyewear, clean and closed theatre shoes, and sterile surgical gloves
- Scrubbed staff should keep their arms and hands within the operative field at all times
- Non-scrubbed staff should wear surgical attire (i.e. caps, clean and closed theatre shoes), protective eyewear; and mask
- Non-scrubbed staff should stay at the periphery of the operating theatre
- Blood or body fluid spillages should be absorbed with towels, preferably disposable, and cleaned using the correct dilution of chlorine see section 4.6.3



Refer also to Chapter 4 section 4.2.3 environmental decontamination/management, for further information on cleaning

- Maintain the patient's temperature above 36o C (excluding cardiac surgery)
- Patients who are diabetic should have their blood glucose levels at <11mmols/l
- Patients' haemoglobin (Oxygen) saturation should be maintained above 95%
- At the end of the surgery, the wound site should be covered by a sterile dressing
- Accurate records must be kept of the surgical proceedings, (e.g., instruments/equipment used, medications administered)

5.1.6.1 Creating and maintaining a sterile field

- A sterile field is an area created by placing sterile towels or surgical drapes around the procedure site and on the stand that will hold sterile instruments and other items needed during the procedure
- Only sterile objects and personnel dressed in sterile attire should be allowed within the sterile field
- A properly gowned and gloved provider's sterile area extends from the chest to the level of the sterile field
- Areas below the level of the draped patient are considered non-sterile
- Only sterile items are free of potentially harmful microorganisms
- Once a sterile object comes in contact with a non-sterile object, person, dust, or other airborne particles, the object is no longer considered sterile
- If even one non-sterile object or person enters the sterile field, the field is no longer sterile (e.g., sterile objects become contaminated if the object is touched with a bare hand, if the object comes in contact with dust or other airborne particles, or if the object is held below the level of the sterile field) - See figure 4

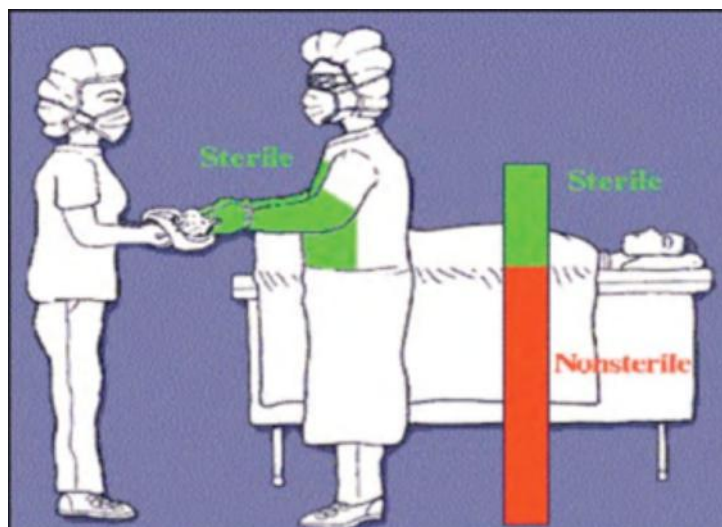


Fig 4: Maintaining a Sterile Field



- ▶ • Place only sterile items within the sterile field
- The edges of a package containing a sterile item are considered unsterile
- Do not contaminate sterile items when opening, dispensing, or transferring them
- Consider items located below the level of the draped patient to be unsterile
- Do not allow non-sterile personnel to reach across the sterile field or to touch sterile items
- Open, dispense, and transfer items without contaminating them
- Do not place sterile items near open windows or doors
- Recognize and maintain the service provider's sterile area
- If a sterile barrier has been wet, cut, or torn, consider it contaminated
- Be conscious of where your body is at all times, and move within or around the sterile area
- When in doubt about whether something is sterile, consider it contaminated

If your gloves become contaminated

- Stop whatever you are doing and step away from the sterile field
- Promptly change a glove punctured during an operation and rinse your hand with antiseptic or re-scrub if the glove has leaked during the puncture
- If your ungloved hands are soiled with blood or other matter, perform surgical hand scrub and put on new sterile gloves and new sterile gown



Patient safety is of primary concern; do not compromise it. Change gloves only when it is safe for the patient

To avoid contaminating solutions

- Never leave cotton balls, cotton wool, or gauze sponges soaking in antiseptic solutions
- Repeated dipping of forceps or fingers into the container to pick up the items will contaminate the solution and the items
- Never dip cotton or gauze into the main antiseptic container- instead either:
 - Pour the amount of antiseptic needed into a small container and dip the cotton or gauze into it
 - Discard any antiseptic remaining in this container after use for each patient, or
 - Pour the antiseptic from the container directly onto the cotton or gauze, making sure not to touch the lip of the container with the cotton or gauze

Avoid administering the wrong solution/medication during a procedure

- Label the solution container (e.g., if pouring a solution into a basin, label the basin with name and concentration of solution, if indicated)
- Dispose of solution at end of the case; do not save any contaminated solution for the next case
- Any medication to be delivered to the sterile field should be identified verbally by the circulator nurse with the label shown to the scrubbed person for confirmation
- Verifying medications includes:
 - Name of medication
 - Strength or dosage
 - Expiration date
 - Expiration time, if it expires in < 24 hours
- Only one medication can be added to the field at a time

► Management of Sharps

- Sharps handling should be absolutely minimized (establish a neutral or hands free zone when passing sharp objects)
- An appropriate instrument/device for the careful application and removal of surgical blades to and from a handle must be used
- To prevent needle stick injuries, blades must never be removed by hand
- A disposable device/container should be used to contain needles and sharps
- The container must be disposed of safely at the end of the procedure



Refer to chapter 4 section 4.5 Injection Safety and prevention of Sharps Injuries for further information

5.1.7 Theatre cleaning

Preparation of the Operating theatre before the first case

- All horizontal surfaces (e.g., furniture, surgical lights, equipment) should be damp-dusted with a clean, lint-free cloth moistened with 0.05% hypochlorite solution
- Equipment from areas outside of the operating theatre should be cleaned (e.g. with lint free cloth moistened in 0.05% hypochlorite solution before being brought into the operating theatre
- Equipment that cannot be cleaned should not be brought into the operating theatre

Between Case Cleaning

- After the procedure ends and the patient has exited the room, the following personnel and areas are considered contaminated:
 - Members of the sterile team, all furniture, anaesthesia equipment, the floor immediately surrounding the focus area or patient area, and patient transport carts
 - Furniture and equipment that are visibly soiled should be cleaned with soap and water followed by disinfection with 0.05% hypochlorite solution following each procedure
 - Walls, doors, and surgical lights and ceilings should be cleaned if soiled with blood, tissue, or body fluids
- Anaesthesia equipment should be cleaned according based on the good practice international guidelines
- Floors that are visibly soiled must be cleaned using a new or freshly laundered mop head with soap and water followed by 0.05% hypochlorite solution
- Mechanical friction should be used when cleaning, the efficacy of the cleaning is dependent on the scrubbing action

Terminal Cleaning

- At the end of each day, thoroughly clean operating theatres- even if they have been cleaned between cases
- Terminally clean operating theatres in which procedures may be performed, regardless of use, every 24-hour period during the regular work week
- Terminally clean scrub/utility areas daily during the regular work week
- Clean and disinfect all exposed surfaces, including wheels and casters, of all equipment (e.g., foot pedals, kick buckets, telephones, light switches, push plates, Mayo stands, handles on cabinets, vents, walls, etc.)
- Place a special emphasis on cleaning and disinfecting high/hand touch surfaces
- Clean and disinfect the floor with a wet vacuum or single-use mop, moving equipment around the room to clean the floor underneath



Refer also to Chapter 4 section 4.2.3 environmental decontamination/management, for further information on cleaning

► 5.1.8 Maintenance staff and other visitors

- Any visitors to the operating theatre must report to reception or the person in charge prior to entering the operating theatre complex
- Theatre staff will advise on the appropriate dress code required, per hospital policy

5.1.9 Waste

- All clinical waste should be placed in biohazard waste bags
- Biohazard waste bags should not be filled greater than 3/4 full and should be secured/tied to ensure an effective seal
- Heavily contaminated waste should be placed in double biohazard waste to prevent leakage
- Human body parts should be placed in an approved receptacle
- Sharps boxes must be used for all metal wear
- All suction equipment including liners must be changed in-between patients to prevent cross infection and fluid loss volume management in the container



Refer to chapter 4 section 4.7 Waste Management for further detailed guidance

5.1.10 Linen

- Contaminated linen must be placed in approved receptacle and sent for laundering
- Contaminated theatre clothes must be changed at the end of the case, bagged and sent to the laundry



Refer to chapter 4 section 4.6.2 Safe handling of linen and laundry for further detailed guidance

5.1.11 Strategy for managing TB patients and preventing airborne transmission in operating theatres

- Elective surgery on infectious TB patients should be postponed until such patients have received adequate drug therapy
- If emergency surgery is indicated, schedule the TB patient as the last surgical case to provide maximum time for adequate ACH (ventilation of the theatre), and allow terminal cleaning of the operating theatre
- Operating theatre personnel should use a fluid repellent respirator mask (e.g., N-95)
- Keep the operating theatre door closed after the patient is intubated, and allow adequate time for sufficient ACH to remove 99% of airborne particles (for rooms with 15 ACH, 18 minutes are required to achieve 99% removal of airborne particles)
- Extubate the patient in the operating theatre or allow the patient to recover in an airborne infection isolation (All) room rather than in the regular open recovery facilities
 - If All room is not available, recover the patient in a well ventilated private room.
- Breathing circuit filters with 0.1–0.2 µm pore size (if available) can be used as an adjunct infection-control measure



Refer to chapter 4 section 4.6 Transmission based precautions and isolation for further information



► **5.1.12 After Surgical Procedures**

After each surgical procedure, staff wearing utility gloves should clear the operating theatre:

- Collect all waste in closed, leak-proof containers and remove them from the room
- Close and remove puncture-resistant containers when they are three-quarters full
- Remove soiled linen, soiled instruments and equipment, and supplies that have been opened, but not used, in an enclosed cart for reprocessing

Annexe 1: Surgical Wound Classification

CLASS I/CLEAN:	An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.
CLASS II/CLEAN-CONTAMINATED:	An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.
CLASS III/CONTAMINATED:	Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.
INFECTED	Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

Garner JS1 and Simmons BP [2].

► 5.2 Clinical Laboratory

5.2.1 Introduction

Laboratory workers who handle blood or potentially infected body fluids are at risk of accidental injury or exposure to infectious material. Individuals working in clinical laboratories or research units that isolate or handle pathogenic microorganisms, such as microbiology, biochemistry, haematology, and histopathology/tissue pathology laboratories, are at risk of exposure to pathogens that may cause infection. Dependant on the microorganisms involved, this may range from asymptomatic or mild infection to life-threatening illness. The World Health Organization classifies infective microorganisms into four groups, depending on the level of risk they pose to humans (see Table 1).

Laboratory personnel and health care facility managers must be aware of the importance of laboratory safety. Adherence to standard precautions, primary barriers and secondary barriers are necessary to minimize the risk of laboratory-acquired infections and to promote a safe environment for all workers in the laboratory and elsewhere. This section covers specific IPC activities and is not a substitute for a laboratory hand book and detailed laboratory SOPs

The following preconditions for prevention of healthcare-associated infections (HAIs) should be addressed by health-care facility (HCF) leaders and managers, informed by the evidence based information provided:

- **Infrastructure/system change:** Primary barriers range from simple measures, e.g., the availability and use of gloves, availability and use of other appropriate Personal protective equipment (PPE) and sealed centrifuge buckets, to more complex equipment, e.g. Biosafety cabinets. Good laboratory design and access to proper equipment is key. Access to occupational health support is also an important component in ensuring protection of laboratory personnel. Hazardous materials which may be harmful if handled improperly include equipment (e.g. needles, glass), chemical agents (e.g. acids, alkalis), and biological agents (e.g. clinical samples, microbial cultures).
- **Training and education:** a program of routine training and education and periodic retraining for all workers involved in laboratory work.
- **Monitoring, evaluation and feedback:** a program of regular monitoring and feedback is in place.
- **Awareness raising/promotion:** the practices described in the chapter are reinforced through awareness raising (e.g., use of posters displayed at the point of care).
- **Safety culture:** managers and leaders at every level of the HCF show their visible support for injection and phlebotomy safety and sharps injury prevention and reinforce a culture of patient safety.

5.2.2 Routes of Infection in the Clinical Laboratory

In order to appreciate and implement infection prevention and control recommendations in the work place, laboratory staff need to be aware of routes of transmission within the laboratory (refer to chapter 3 – The Chain of Infection for additional information).

Inhalation: Laboratory staff are at risk of infection from pathogens spread by aerosols generated by mechanical procedures such as mixing, grinding, blending/sonicating, centrifuging and pipetting.

Ingestion: Infection via ingestion may occur when laboratory staff inadvertently place contaminated articles in the mouth, e.g. pens or pencils or fingers, consume food within the laboratory, and fail to adhere to good hand hygiene prior to eating or smoking, or mouth-pipette.

Inoculation: Needles and sharps used in the laboratory pose both an injury risk (via direct inoculation of needle and laceration using sharps) and an infection risk (via inoculation). Scalpel blades used in histopathology/tissue pathology and microbiology laboratories and broken glassware may also transmit infections.

Skin and mucous membrane: Splashing of skin from mechanical procedures and hand-to-face contact (e.g. rubbing eyes, biting nails) may result in transmission of pathogens via the mucous membranes of eyes, mouth, and nasal cavity.



► 5.2.3 General Recommendations for Laboratory Safety

All material of human origin (e.g. blood and body fluids, secretion/excretions and tissues) should be treated as potentially infectious. Laboratory workers should adhere to the following general safety practices:

- Access to the lab **must be limited** or restricted at all times. Use international Biohazard sign for Laboratory door to restrict unauthorised visitors to the lab (Fig 2)
- Children **must not** be authorized or allowed to enter laboratory working areas
- Do not store food or drinks in refrigerators that are used for reagents and clinical or research specimens. It is prohibited to wear protective laboratory clothing outside the laboratory, e.g. in canteens, coffee rooms, offices, libraries, staff rooms and toilets. Laboratory coats should be left in the lab when going on breaks, to lunch, or when leaving at the end of a shift and laundered per facility guidelines
- Eating, drinking, smoking, applying cosmetics and handling contact lenses is prohibited in the laboratory working areas
- Labels must not be licked
- Protective clothing such as laboratory coats should be worn at all times in the laboratory
- Open-toed footwear must not be worn in laboratories
- Wear appropriate gloves when handling and processing specimens, change gloves between tasks and do not touch “clean” surfaces (telephones, door handles, office desks, stationery, computer keyboards, etc.) with gloved hands. Once the task is finished, remove gloves carefully and discard in a designated laboratory waste and wash hands after removal of gloves. Use proper mechanical devices, such as suction bulbs or pipette for manipulating all liquids in the laboratory. **No mouth pipetting is permitted**
- Centrifuge **all** materials in sealed tubes inside a sealed centrifuge and do not open a centrifuge while it is in motion
- Always cover the end of blood-collection tubes with a cloth or paper towel, or point them away from anyone’s face when opening
- Clean and decontaminate work surfaces (0.05% ppm available chlorine) daily or when they become contaminated, such as after spills (0.5% chlorine)
- Wear facial and eye protection (face mask and goggles or face shield) if splashes and sprays of blood, body fluids, or fluids containing infectious agents are possible
- Wear heavy-duty or utility gloves when cleaning laboratory glassware
- Minimize use of sharps as much as possible. If used then handle sharps with care and dispose of them immediately after use in puncture-resistant, leak proof sharps containers located close to work areas.
- Do not re-sheath needles after use, this is the most common cause of needle stick injury
- Place infectious waste materials in designated plastic bags or containers as per local guidelines
- Do not perform any procedures that generate aerosols in the open laboratory. Use appropriate biosafety cabinet for containment (see Table 2)
- Adhere to appropriate laboratory standard operating procedures (SOPs)
- Immediately report any injury or accident (e.g. sharps) to supervisor (**after first aid**) for medical attention
- Vaccinate all laboratory staff members against hepatitis B vaccine (HBV) and other vaccine preventable disease as per local policy

5.2.4 Hand Hygiene

Hand hygiene is the most important procedure for preventing and controlling the spread of contamination. Laboratory workers must perform hand hygiene throughout their shift, including:

- Before going on duty
- Immediately after coming in contact with contaminated objects or surfaces
- After contact with patient specimens containing blood and body fluids, secretion/excretions and tissues
- After removing gloves
- Before eating and before and after using the restroom
- Before going off duty





Refer chapter 4 section 4.2 for additional information on hand hygiene

5.2.5 Biosafety Practices

- Use appropriate prohibition sign in the lab on the wall as reminder to enforce to safe practice (Fig 3)
- Doors to laboratory must be kept closed when infectious materials are in use to alert non lab personnel not to enter the laboratory
- Treat all specimens from all patients as potentially infectious
- All laboratories must make hand-washing facilities available (**at the entrance/s and**) in each procedure room
- Collect all specimens for laboratory examination carefully using standard precautions
- Transport **all specimens** to the laboratory in a well-constructed robust leak proof containers with a secure lid to prevent breakage, leakage and/or spillage during transport
- A requisition form issued by the department that is requesting testing must accompany all specimens submitted to the laboratory
- Tightly seal the caps of all containers and place them in a plastic bag and the requisition forms must be kept separately. Don't wrap requisition forms around the specimen container. This separation will prevent the forms from getting contaminated. Do not staple request form to the plastic bag
- Clinical team or departments **must** complete requisition forms properly and provide all of the data required by the headings on the forms
- Supply all additional information relevant to the nature of the specimen, time of collection, and treatment regimen of the patient that might affect the testing and reporting
- Transport specimens to the laboratory under conditions that preserve the specimen's integrity and that protect the HCW
- All specimens transported to the laboratory from field research, clinical hospitals or laboratory must be accompanied by a chain of custody form
- Wear gloves when handling and processing specimens
- Minimize splashing, spattering, and generating droplets while performing laboratory procedures
- Laboratory workers should follow mechanical pipetting procedures
- All laboratory staff **must strictly** adhere to local standard operating procedures (SOPs)
- Decontaminate work areas after spills of blood, body fluids, or other potentially infectious material and after completing work as per lab SOPs
- Prior to servicing or repair, contaminated equipment must be decontaminated externally and internally as per manufacturer's instructions or if this is not available, they should be decontaminated as per lab SOP



Fig 2: Biohazard sign for Laboratory door

(From: *Laboratory biosafety manual* (3rd edition). Geneva: World Health Organization: 2004)



Fig 3: Prohibition sign for wall display

From. Cheesbrough M. *District Laboratory Practice in Tropical Countries* (Part 1). Cambridge: Cambridge University Press, 1998.

5.2.6 Working with Specimens

Personnel who work with specimens in the lab must take these precautions:

- Put on gloves prior to handling the specimens
- Wear face and eye protection for procedures that are likely to generate splashes or sprays of blood or other potentially infectious material. Splashguards are an alternative to eye and face protection. These can be mounted on a cabinet and pulled down in front of the face for protection
- Use care when opening specimens. Open all specimen gently
- **Do not** use mouth pipette
- **Change reusable lab coats after splashes or on a daily basis, or use disposable coats/gown while working in the lab**

- ▶ • Wash hands whenever they are soiled, following removal of gloves, prior to leaving the laboratory, and at the end of each day (see above)
- An eyewash station should be readily available in case of accidental splashes to the eye

5.2.7 Phlebotomy

- Blood drawing is a high-risk procedure given risk of accidental exposure to blood and sharps injury (e.g. needle stick)
- Laboratory workers collecting blood (e.g. phlebotomy or transfusion services) should follow good infection prevention and control practices (i.e. hand hygiene and glove use, and sharp safety devices if available) to minimize risk of accidental exposure
- In order to avoid sharps injuries, laboratory staff should exercise caution when drawing blood and disposing of sharps/needles in designated robust sharps containers
- Consult 'Injection Safety and Prevention of Sharps Injury' chapter for further guidance
- Detailed guidance on how to collect samples is covered under section 4.5 annexe 2

5.2.8 Sputum Specimens

- Laboratory procedures involving Mycobacterium tuberculosis pose a risk to laboratory workers from possible exposure to aerosols containing live M. tuberculosis
- Any laboratory personnel working with sputum specimens should protect themselves from possible exposure by performing work in Class I Bio Safety Cabinets (BSC) to prevent discharge of contaminated aerosols into the laboratory
- In the absence of a BSC, laboratory staff must employ appropriate respiratory protection and good laboratory technique to prepare sputum smears in a well-ventilated, separate area of the laboratory

5.2.9 Decontamination and Sterilization

Cleaning and disinfection of work surfaces and spills and sterilization of laboratory equipment are critical to protecting laboratory workers from occupational exposure. At the end of each day, work surfaces in laboratories should be cleaned and decontaminated as per local standard operating procedures using 0.05%.

Spills in the laboratory may occur on work surfaces (laboratory bench, BSC) or involve accidental spills or contamination on skin or clothing. Laboratories should have procedures in place to respond to spills. Blood and body fluid spillages should be dealt with as in section 4.6.3

Disposal Containers

- Waste disposal jars, should be washed with soap and water then decontaminated with 0.5% chlorine and rinsed in clean water before reuse
- specimen containers and samples not being kept should be autoclaved before incineration

5.2.10 Packaging of Specimens and Etiologic Agents

Shippers of infectious substances must comply with regulations and prepare shipments in such a manner that they arrive at their destination in good condition and present no hazards to persons or animals during shipment. The packaging must include both inner and outer packaging. For detail please consult WHO document 'Laboratory Biosafety Manual' (3rd edition). Geneva: World Health Organization: 2004).

5.2.11 Laboratory Occupational Health

Since laboratory workers are at risk of occupational injury and accidental exposure to microorganisms during laboratory procedures, an occupational health program should be in place to ensure laboratory workers receive appropriate vaccinations. Consult Occupational Health chapter for further information on protecting healthcare workers from occupational exposure.



► ANNEX 1**1. Setup of Laboratory**

All laboratories should be located in the same area, preferable away from public areas, and divided into separate entities. Details guidelines are outlined in the WHO publication 'Laboratory Biosafety Manual' (3rd edition). Geneva: World Health Organization:

The following setup should be used for all laboratories:

- Samples should be collected in a special receiving area located next to the lab
- Dedicated toilets for the patients should be located next to the receiving area
- Samples should be transported to the lab by a trained HCW or porter. Samples should be placed in closed tubes for transportation (see above)
- A separate room should be affiliated with the lab for reprocessing glassware and instruments. An autoclave should always be available in this area
- Laboratories should be set up according to the following guidelines
- Design the laboratory so that it can be easily cleaned. Spaces between benches, cabinets, and equipment must be accessible for cleaning. Carpets and rugs in laboratories are inappropriate
- Provide lockable doors for facilities that house restricted microbiologic agents
- Provide separate sinks for hand washing and for disposing of body fluids or chemicals
- Bench tops should be impervious to water and should be resistant to moderate heat and organic solvents, acids, alkalis, and chemicals that will be used to decontaminate the work surfaces and equipment
- Laboratory furniture should be capable of supporting anticipated loading and uses
- Cover chairs and other furniture used in laboratory work with a non-fabric material that can be easily decontaminated
- Install BSCs in such a manner that air flow into the room or expelled via an exhaust system do not interfere with the airflow within the
- Locate BSCs away from doors, windows that can be opened, heavily travelled areas, and other potentially disruptive equipment so as to maintain the BSCs airflow parameters for containment
- Illumination should be adequate for all activities and should not cause reflections and glare that could impede vision
- Mechanical ventilation systems should provide an inward flow of air without recirculation to spaces outside of the laboratory. Fit windows with fly screens if they open to the exterior

2. Preventing Complications and HAIs in Patients and HCWs

To prevent complications and HAIs in patients:

- Avoid unnecessary transfusions
- Screen donors for serious blood-borne infections (HIV, HBV, HCV, syphilis, etc.)
- Collect the donor's blood aseptically into a closed system to minimize contamination
- Perform all steps in processing the blood within this closed system
- HCWs should wear gloves while collecting, testing, and transfusing blood
- HCWs should handle sharps carefully and dispose of them immediately in a puncture-resistant container
- HCWs should wear PPE at all times

► 5.3 Antenatal and Labour suite IPC

Pregnant women require appropriate clinical and obstetric care at all stages of their pregnancy whilst preventing potential exposure of others to infection. It is important to assess the risk of possible infection transmission at each stage of pregnancy and wear appropriate PPE for the activities being undertaken. Standard precautions as set out in the various sections of chapter 4 should always be adhered to with rigorous attention to hand hygiene, waste, sharps and laundry management, environmental cleaning and decontamination at all times. In addition it is important that all pregnant women should be screened to determine contact risks for infections such as ebola, HIV and hepatitis B.

A higher level of suspicion for Ebola infection should apply to women with the following EVD associated pregnancy complications:

- Spontaneous abortion
- Prelabour rupture of membranes
- Preterm rupture of membranes
- Preterm labour/preterm birth
- Antepartum or postpartum haemorrhage
- Intrauterine fetal death
- Stillbirth
- Maternal Death
- Neonatal Death

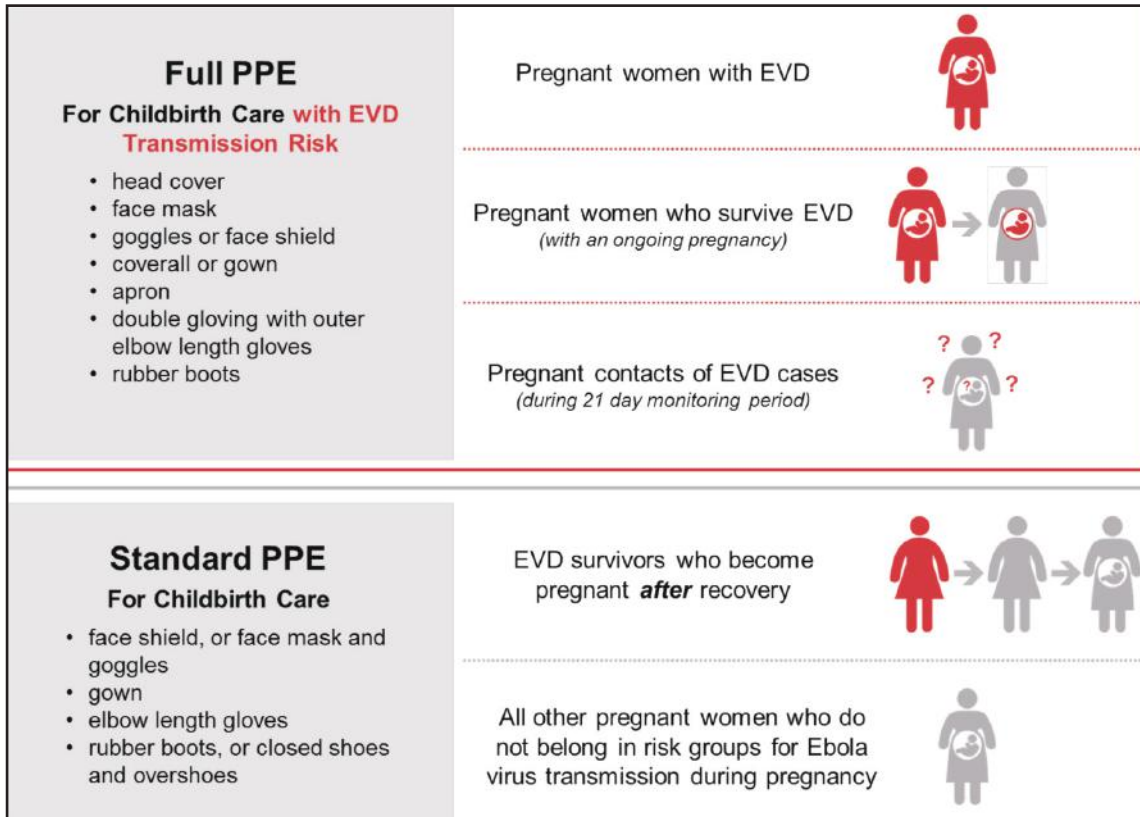
5.3.1

ASSESSMENT OF PREGNANT OR POST PARTUME WOMAN	RISK CATEGORY	ACTIONS
History of Ebola during THIS pregnancy	Definite Risk	<p>Actions</p> <p>If not in labour/delivery/Ebola related complication: provide antenatal care with standard IPC precautions Counsel woman to seek care early at a facility that can provide appropriate obstetric clinical care and Ebola IPC precautions.</p> <p>If in labour, delivery or any Ebola-related complication</p>
Any History of contact but does not satisfy probable case definition	Greatly increased risk	<ul style="list-style-type: none"> • Manage initially in appropriate isolation facility • Adhere to comprehensive PPE and IPC recommendations for Ebola • Transfer as soon as possible to an appropriate ETC for isolation and testing • If in labour, delivery or any Ebola-related complication • Manage initially in appropriate isolation facility • Adhere to comprehensive PPE and IPC recommendations for Ebola
Satisfies the probable case definition	Greatly increased risk	<p>Transfer as soon as possible to an appropriate ETC for isolation and testing</p>
NO history of CONTACT but has Ebola-associated complications OR satisfies the suspect case definition	Increased Risk	<ul style="list-style-type: none"> • Manage as a suspect Ebola case in appropriate isolation facility • Adhere to comprehensive PPE and IPC recommendations for Ebola • Test for Ebola according to protocols or refer to an appropriate ETC for isolation and testing
Definite Ebola survivor who became pregnant after recovery from Ebola OR Any other pregnant / postpartum woman with NO Ebola associated complications	Standard Risk	<p>If NOT in labour / delivery / obstetric complication: Provide antenatal care with standard IPC NB Ebola testing currently not recommended in routine ANC</p> <p>If in labour / delivery</p> <ul style="list-style-type: none"> • Manage according to standard PPE and IPC guidelines for care of pregnant women



- ▶ Additional IPC precautions for pregnant women at risk of EVD transmission during childbirth and complication management based on screening assessment and presence of pregnancy complications:

Full personal Protective PPE including Head cover, face mask or gown, apron, goggles or face shield, boots, coverall, double gloving with outer elbow length gloves.



► 5.4 Infection Prevention Control Standards in the Mortuary Setting

Personal care of a body should honour the spiritual or cultural wishes of the deceased person. However if the body has been in contact or has been diagnosed as an infection risk or has an unknown cause of death, including death on arrival at hospital certain standard precautions are required to safeguard the health care worker, mortuary attendant and funeral director.

It is essential that the management of dead bodies be handled with extreme sensitivity and a sensible approach. An individualized approach assists with the relationship between the families and carers at a time of probable distress.

It is unusual for organisms in a dead body to infect healthy people with intact skin, but there are other ways infection may be spread.

- Needle stick injuries from a contaminated instrument or sharp fragment of bone (refer to Sharps and Inoculation Management Appendix 10 Infection and Prevention Policy)
- Intestinal pathogens from anal and oral orifices
- Leaking body fluids
- Through abrasions, wounds and sores on the skin
- Contaminated aerosols from body openings or wounds e.g. tubercule bacilli , ebola virus
- when condensation could possibly be forced out of the mouth
- Splashes and/or aerosols onto the eyes

The risks of infection are usually prevented by the use of standard precautions . Occasionally additional precautions are required as in the handling of a known or possible case of Ebola.

IPC Standard Precautions should be adhered to at all times in the mortuary and include:

- Hand Hygiene
- Appropriate use of protective clothing i.e. water repellent aprons and gloves when handling a body or decontaminating the environment (either disposable or heavy duty reusable)
- Use of body bags when indicated (see below)
- Appropriate cleaning of the environment.
- Appropriate decontamination of equipment
- Body Fluid Spillage management.
- Waste disposal as per Waste Management Policy
- Sharps & Inoculation Management

Plastic body bags are used for cadavers thought to be infective to handlers, or likely to leak in transit, or otherwise offensive bodies. The SOP on safe burials for Sierra Leone should be used as a guide for how and when body bags should be used.

- Body Bag required :Someone with positive Ebola virus laboratory results that died or other confirmed infectious disease
- Body bag required : Any death that is unexplained OR any person who died with symptoms that meet the Ebola case definition (fever plus 3 or more Ebola symptoms) or other infection risk
- Body bag required : The death of any person who cared for someone with Ebola or attended the funeral of someone with Ebola or other potentially infectious disease.
- No body bag required: Any death with an obvious cause (such as a car accident, burns, or other pre-existing medical condition), no link to an Ebola case, and no signs or symptoms of Ebola

Most dead bodies with a known or suspected infection would be classed in categories, either A-D or 1-4 depending on the process adopted locally. Categories 1 (D) or 2 (C) are low risk and DO NOT require a body bag.

- ▶ There may still be occasions when a body bag is required because the body is leaking body fluids or exudates, because the cause of death is unexplained or the individual was dead on arrival at hospital not met in the criteria above.

If a body is likely to leak or cause of death is unknown then it must be placed in a body bag regardless of their infectivity status.

If the person had a known infectious disease or an unexplained cause of death you must inform anyone else coming into contact with that body e.g. Funeral Directors.

Chapter 6

OCCUPATIONAL SAFETY AND EMPLOYEE HEALTH

Although healthcare workers (HCWs) are essential to the health of the world's population, they, themselves, are often put in physical jeopardy. Globally, HCWs are exposed each day to a variety of health and safety hazards, including:

- Biological, (e.g., pathogens such as Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus, (HCV), Ebola, Mycobacterium Tuberculosis (MTB), SARS virus and Neisseria Meningitis)
- Sharp's injuries
- Ergonomic, (e.g., heavy lifting)
- Physical, (e.g., slips, trips and falls)
- Psychosocial, (e.g., violence and stress)
- Chemical, (e.g., chlorine, glutaraldehyde, ethylene oxide)
- Radiological and nuclear

Safe work leads to worker well-being and retention, increased productivity and economic best outcomes. Risks and hazards are fluid and need monitoring and adjustments made to the appropriate safety plans and processes.

The following preconditions support the minimization of risk of bodily injury and/or infection in HCWs, and should be addressed by HCF leaders and managers, to ensure that all HCWs adhere to the evidence based guidelines in this chapter:

1. **Infrastructure/system change:** access to the right equipment and supplies including PPE, and an environment that is designed and planned to facilitate patient and health worker safety. This includes Immunization programs.
2. **Training and education:** a program of routine health and safety education and training and periodic retraining for all personnel.
3. **Monitoring, evaluation and feedback:** Pre-placement health evaluation of HCWs and the establishment of protocols for surveillance and management of job-related illnesses and exposures to infectious diseases.
4. **Awareness raising/promotion:** the practices, including the Waste Management Plan described in the chapter are reinforced through awareness raising e.g. use of posters displayed across the HCF.
5. **Safety culture:** managers and leaders at every level of the HCF show their visible support for occupational health and safety to help develop and reinforce a culture of patient safety. This includes counseling services for personnel regarding infection risks related to employment or special conditions and the development, review and revision of policies and procedures and their ready availability in the HCF. Maintenance of confidential employee health and injury records is important.

Local Public Health and/or Ministry of Health and Sanitation policies for HCW activity restrictions who have, or may have been exposed to an infectious disease should be followed.

In the absence of Local or National Guidelines a summary of suggested activity restrictions (adapted from the Advisory Committee on Immunization Practices {ACIP} can be found in Annex 1).

Employer Duties and responsibilities:

- Ensure a healthy and safe working environment for all employees
- Provide employees appropriate orientation, training and supervision on safety procedures
- Have safety and employee health standard operating procedures readily available to staff
- Assess and manage any identified risks (e.g., investigate accidents and illnesses)
- Document and report worker injury or illness



- ▶ • Ensure best practices for HCW safety and infection prevention and Control (IPC)
- Have a process for worker feedback on safety issues

The following recommendations are intended to improve compliance with procedures and eliminate the risk of occupational injuries or healthcare-associated infections (HAIs):

- Establish appropriate engineering controls (controls used to remove/reduce a hazard or place a barrier between the worker and the hazard in health care facilities)
- Make available and use appropriate supplies and equipment
- Readily accessible hand-washing facilities and materials
- Puncture-resistant, leak-proof, labelled or colour-coded sharps containers that are located as close as possible to their places of use
- Leak-proof containers for specimens and other regulated wastes that are properly labelled or colour-coded
- An easily accessible first-aid kit in all departments
- Implement controls for work practices:
 - Prohibit eating, drinking, smoking, applying cosmetics, and handling contact lenses in the work areas and on work surfaces that carry an inherent potential for contamination
 - Do not store food and drink in refrigerators, freezers, or cabinets where blood or other potentially infectious material is stored. Such storage equipment should be clearly labelled to prevent this possibility
 - Wash hands and other skin surfaces that become contaminated with blood or other potentially infectious materials immediately and thoroughly with soap and running water
 - Thoroughly wash (flush) with water mucous membranes that become contaminated
 - Prohibit HCWs with open wounds or weeping skin rashes from all direct patient-care, potentially hazardous laboratory procedures, and handling patient-care equipment until recovery
 - Cuts or abrasions should be protected with a waterproof dressing and gloves prior to performing any procedure that involves contact with blood and other potentially infectious material
- Adequately staff healthcare facilities
- Provide information and training
- Record and monitor exposures to blood and body fluids
- Monitor and maintain surveillance of work practices

Note: Other strategies to prevent hazards in the workplace are also discussed later in the chapter



For more information on Standard Precautions, Personal Protective Equipment and Injection Safety and the Prevention of Sharps injuries refer to chapter 4. For information on clinical laboratories refer to chapter 5

Healthcare workers should practice the following:

- Follow safe work practices at all times
- Be familiar with employer's written departmental policies
- Know the potential health and safety hazards of the job and protective measures by participating in appropriate occupational health and safety training programs
- Use personal protective equipment (PPE) as trained and report any changes in personal medical condition that would require a change in status as to wearing PPE
- Know how to report unsafe working conditions
- Report any work-related injury or illness to supervisor
- Participate in accident and injury investigations
- Know what to do in an emergency
- Participate in health and safety committees (when available) can be an important way to improve conditions on the job such as:
- Provide a forum for employees and management to work together to solve health and safety problems





- Help prevent injury and illness on the job i.e. conduct regular walk-a-round inspections to identify potential health and safety hazards
- Increase awareness of health and safety issues among employees, supervisors, and managers i.e. analyze injury data, accident reports and report trends
- Develop strategies to make the work environment safe and healthy

Pre-placement Health Evaluations

When personnel are initially appointed or are reassigned to different jobs or areas, a pre-placement evaluation can be used to ensure that persons are not placed in jobs that would pose undue risk of infection to them, other personnel, patients, or visitors. A health inventory is an important part of this evaluation. This inventory, can include:

- Determining a health worker's immunization status, and obtaining a history of any conditions that may predispose the health worker to acquiring or transmitting infectious diseases such as:
 - Chickenpox (varicella)
 - Measles (rubeola)
 - History of exposure to or treatment for tuberculosis (TB)
 - History of hepatitis
 - Dermatologic conditions
 - Chronic draining infections or open wounds
 - Conditions with immunodeficiency such as HIV
- Physical examinations may be useful to detect conditions that may increase the likelihood of transmitting disease to patients, or unusual susceptibility to infection, and to serve as a baseline for determining whether any future problems are work-related
- Physical examination may also include baseline vital signs, hearing and visual screening

Personnel Health and Safety Education

- Personnel are more likely to comply with an infection control program if they understand the rationale; thus staff education should be a central focus of the Infection Prevention and Control program
- Clearly written policies, guidelines, and procedures are needed for uniformity, efficiency, and effective coordination of activities
- All healthcare facilities should develop and implement appropriate orientation and in-service training programmes for new employees, as well as, in-service refresher training (e.g., yearly) for existing employees
- Training should be designed to cover all cadres of staff, including doctors, nurses, clinical officers, laboratory workers, nonmedical workers, and support staff and should be matched to the roles/responsibilities of each group
- Health and safety training should ensure that workers know and understand the potential risks that are associated with waste from health care facilities, the value of immunization against vaccine preventable diseases such as, HBV and the importance of appropriate use of PPE

Immunization

- Since hospital personnel are at risk of exposure to and possible transmission of vaccine-preventable diseases because of their contact with patients or material from patients with infections, maintenance of immunity is an essential part of a hospital's occupational health and Infection Prevention and Control program
- Optimal use of immunizing agents will serve to safeguard the health of personnel and also protect patients from becoming infected by personnel
- Following a consistent program of immunizations could eliminate the problem of susceptible personnel and avoid unnecessary activity restrictions
- Immunizations should be free of charge and at least include the followings:



- ▶ – Hepatitis B vaccine (for **HCWs whose occupational tasks place them at risk of exposure to blood or other potentially infectious material**)
 - MMR (Measles, mumps, rubella)
 - Influenza (flu)
 - Chickenpox (varicella)
 - Tdap (Tetanus, Diphtheria, Pertussis)
 - Meningococcal Meningitis



*Refer to Annex 2 for more detailed recommendations for immunization of HCWs.
Note: Certain vaccines may not be available in some countries*

Pregnant employees can also take steps to prevent both exposure and illness. Vaccination is the single best way to prevent influenza illness. As soon as possible, all pregnant women should get seasonal flu vaccination. In addition, everyday precautions such as hand washing and covering your mouth and nose when you cough or sneeze, and encouraging others to do so, are important ways to stay healthy and to not spread germs that cause illness. Pregnant women with signs or symptoms of influenza-like illness need to call their healthcare provider right away, because they may require prompt treatment with antiviral medications (if medication is available in-country).

Health Counseling (Reference Annex 1 for HCW Activity Restrictions)

Access to health counseling about illnesses they may acquire from or transmit to patients is especially important for all HCWs, but particularly for women of childbearing age and persons with special clinical conditions including immunosuppression. All personnel should know about infection risks related to employment.

- All supervisors should be responsible for informing HCWs of any special precautions (including hazardous chemicals) pertinent to their areas of work
- All HCWs should adhere to Standard Precautions and Transmission-Based Precautions as necessary
- All healthcare facilities should have post exposure prophylaxis (PEP) procedures in place in the event of body fluid exposure
- All HCWs should immediately report exposures to other risks as noted above that are sustained during the course of occupational duties, according to the PEP procedures
- Susceptible workers, including pregnant women, should not care for patients with chickenpox, herpes zoster (shingles), Rubella, or Measles (rubeola)
- Re-assignment of a pregnant employee is indicated if a patient has parvovirus B19 or receiving Ribavirin aerosol
- Responsibility for compliance with IPC policies and guidelines, including PEP, rest with the supervisor and individual employee

Job-related Illnesses and Management of Exposures and Injuries

- Major functions of the HCW employee health service include arranging for prompt diagnosis, management of job-related injuries/ illnesses, providing prophylaxis for certain preventable diseases to which personnel may be exposed and maintaining confidential health records. A job related illness is one that develops as a direct consequence of work undertaken at the place of employment although it might only present outside the workplace environment.

In the event of a job-related injury the injured party should follow facility guidelines when obtaining first aid (as needed), notifying the supervisor immediately. The incident should be documented at the time along with measures taken to mitigate risk. Follow up with occupational health regarding the incident should be as soon as feasible and definitely within 72 hours. If susceptible personnel contract a serious infection that is potentially transmissible or are exposed to an illness that leads to a period during which infection may be spread, the hospital's responsibility to prevent the spread of infection to patients and other personnel may sometimes require that these persons be restricted from direct patient contact.

- All health care facilities should institute engineering and work practice controls whenever possible to eliminate or minimize employees' exposure to blood, body fluids, and other potentially infectious materials. Most exposures are preventable



► Managing Sharps Injuries

Following an exposure to blood or body fluids the HCW should:

- Wash sharps injury sites and cuts with soap and water
- Do not squeeze the injury site
- Irrigate eyes with copious amount of clean water, or saline
- Report to a designated person to be evaluated for baseline HIV testing and (if deemed necessary) receive the first dose of Anti-Retroviral (ARVs) drugs
- Visit the designated clinician for initial assessment and counselling for follow-up testing and appropriate treatment
- Assess the serological status of the source patient, if known
- Obtain Post Exposure Prophylaxis (PEP) based on HIV and hepatitis B status



There is No scientific evidence shows that using antiseptics or squeezing the wound will reduce the risk of transmission of a blood-borne pathogen. Using a caustic agent such as bleach is not recommended

Refer to chapter 4 for more information on Injection Safety and the Prevention of Sharps injuries

Note: Successful implementation of these strategies requires an effective quality improvement or infection prevention and control committee (IPCC) with support from the hospital management team.

Exposure to HIV

The risk of occupational transmission of HIV to medical personnel has been recognized since 1984. Correct estimation of the likelihood of transmission following occupational exposure is limited by the relative infrequency with which HIV transmission to HCWs is reported. The estimated risk of HIV transmission following a single needle-prick exposure is about 0.3 %.

Type and Risk of Exposure to HIV

There is a risk of exposure whenever non intact skin (through percutaneous sharps injury or skin abrasion) or mucous membranes (through splashes to the eyes, nose, or oral cavity) come in contact with a potentially infected body fluid from a source that is HIV-positive or has unknown HIV status. Body fluids that can transmit HIV include blood; genital secretions; and cerebrospinal, amniotic, peritoneal, and pleural fluids.

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

- Type of contact—intact skin or broken skin
- Quantity of blood
- Disease status of source patient and if the patient is compliant with taking prescribed anti-viral treatment
- Disease status of person injured (terminal illnesses and acute or recent infections)
- Host defences
- Access to PEP

► **Degree of risk of HIV-infection after occupational exposure**

	LOW RISK	MEDIUM RISK	HIGH RISK
Type of Exposure	Intact skin	Mucous membrane/non-intact skin	Percutaneous injury
Source	HIV negative (possibly in window period i.e. a period of time <i>after</i> a person is infected during which they won't test positive. This is called the "HIV window period"	HIV status unknown: Clinical well/unwell	HIV positive with advanced disease, or confirmed drug resistance (consider treatment history)
Material	Saliva, tears, sweat, faces, urine, sputum, vomitus	Semen, vaginal secretions, pleural, pericardial, peritoneal, amniotic fluid	Blood and body fluids: cerebral spinal fluid (CSF); viral cultures in labs, and amniotic fluid

PEP

Health care workers should have immediate access to PEP, 24 hours a day, 7 days a week to be freely dispensed by any hospital (private or public), regardless of the location or type of work they do. The minimum care following potential exposure to HIV should be risk assessment and, if deemed necessary, the first dose of PEP medication.

Assess the following to evaluate eligibility for HIV PEP:

- The timing of the potential exposure
- The HIV status of the person exposed
- The nature and risk of the exposure (i.e. needle stick injury, mucous membrane exposure or intact skin exposure)
- The HIV status of the source of the potential exposure

Post-exposure prophylaxis is not indicated under the following circumstances:

- If the source patient is infected with HIV-1 and exposed healthcare worker is positive for HIV-2
- If the exposure does not pose a risk of transmission:
 - Exposure of intact skin to potentially infectious body fluids
 - Exposure to non-infectious body fluids (such as faeces, saliva, urine, and sweat)
 - Exposure to body fluids from a person known to be HIV-negative, unless this person is identified as being at high risk for recent infection.
- If the exposure occurred more than 72 hours previously



A starter pack (or a first dose) of PEP drugs should be offered to individuals who are determined to be at risk as soon as possible, within one hour and not later than 72 hours, after exposure. Do not offer PEP to anyone more than 72 hours after exposure. An HIV test should normally not be a condition of initiating PEP, nor should PEP be delayed until the results of a HIV test become available

Counselling the HCW for PEP

- At the time that the HCW first presents after exposure, counselling should be provided about their risk, the need for PEP, and its specific aspects, and the need for HIV testing to rule out the possibility that they might already be infected with HIV. Counselling should be provided before seeking informed consent for post-exposure prophylaxis. **Note: Informed consent for PEP services need not be in writing**
- The counselling should include information about, duration and course of medication (28 days), importance of adherence to the regimen, the possibility of side effects or toxicity, possible resistance to antiretroviral (ARV) drugs, and the risk of transmission
- The counsellor should assess the HCW's understanding of the dosing instructions
- Risk-reduction counselling should be reinforced in later visits with appropriate follow-up support services to maximize adherence to the PEP regimen and to manage any side effects
- Counselling to reduce risk is also necessary to prevent the transmission of HIV



► **Exposed persons should be counselled as follows:**

- Use condoms or other protective preventive measures with sexual partners until an HIV test after confirmatory test to the exposure event is negative
- Discontinue breastfeeding (if applicable)
- Do not donate blood

People already living with HIV should be referred to an appropriate clinic for treatment of their infection, and if they had started PEP, the medication will be discontinued if their initial HIV test is positive, because this medication does not work for people living with HIV and could increase the risk of drug resistance among people already infected.

Counselling women of childbearing age about the use of condoms and getting pregnant during PEP is critical. Whereas most drugs that are prescribed for PEP are safe during pregnancy, women should be informed of the possible risk of transmitting HIV to the baby during pregnancy, especially at the initial stage of infection. Women who are breastfeeding should be told that although taking PEP is not harmful, if a woman gets infected by HIV while breastfeeding, the risk of transmitting HIV through breastfeeding is higher at the early stage of infection. Appropriate counselling should include a discussion of safe alternatives to breastfeeding if they are acceptable, feasible, affordable, safe, and sustainable. Exclusive breastfeeding is strongly recommended for babies less than six months of age whenever alternatives are not possible. Discussing the risk of HIV transmission associated with consensual sex after a person has been occupationally exposed could be difficult given the sensitive nature of the issue, but this dialogue is essential. HCWs need to be aware that some of the exposed people might not welcome the prospect of having to talk to sexual partners about the need to use a condom, and this can create barriers to follow-up and PEP adherence. Offering exposed individuals assistance in talking to their sexual partners about using condoms might be appropriate. People who have been exposed to HIV require emotional support in the period following the exposure.



*Note: Reference Annex 3 for Post Exposure PEP for HIV exposure
May need to adapt treatment to available PEP medications

PEP Side Effects

The most commonly reported side effects are nausea and fatigue. Side effects can be reduced, for example, by taking prescription drugs (such as antiemetic for nausea) and by taking medicines with food. It is important for the person to anticipate and understand the side effects to avoid confusing them with symptoms of HIV seroconversion.

Duration of PEP

The recommended duration of PEP for HIV infection is 28 days. The first dose of it should always be offered as soon as possible after exposure and the full PEP should be taken, unless there are specific reasons to stop. Starter packs with an incremental, full 28 days of dosing can be used.

Laboratory Evaluation: Baseline HIV Testing

Baseline testing for HIV antibodies should be done to establish serologic status of the HCW at the time of exposure. This allows identification of HCWs who are already living with HIV, thereby avoiding the use of PEP for such people. Rapid HIV testing is the preferred option for testing both the exposed and source person. It also helps prevent giving PEP to an exposed person unnecessarily, that is, when the source person tests negative for HIV infection or is unlikely to be in the window period.

If delays in testing of HIV are common, first dose of PEP should be provided based on the risk evaluation and the likelihood that the source person is HIV positive. Further evaluation should be made as soon as possible after the test results are known. A positive rapid test should be confirmed with a second, different rapid test.

If rapid testing is not available, offer pre-test counselling. People who have a positive rapid test result should be referred to a comprehensive care clinic for management and further follow up. Follow-Up HIV Testing Follow-up HIV testing should be performed at 6 and 12 weeks and six months post-exposure, regardless of the use of PEP. Additional



- ▶ laboratory testing should be offered on an individual basis:
 - Test haemoglobin level when AZT is used for PEP. AZT should be avoided if anaemia is confirmed
 - Test for other blood-borne diseases such as HBV and hepatitis C virus (HCV), depending on the nature of the risk and the local prevalence

Record-Keeping PEP services need to be documented at several levels. A national registry should be maintained to document the extent and outcomes of PEP use. Data are also needed to evaluate PEP services and identify trends, to make comparisons across services and over time, to guide future service planning and resource allocation, to support operational studies, and to demonstrate accountability to donors. This can often be facilitated by using a set of programme indicators. At the local level, incident reports are critical for reviewing when and how exposure occurs and for identifying safety concerns and possible preventive measures.

The quality of data will be compromised if reporting requirements are excessively time-consuming, complicated, or too difficult. Thus, record-keeping systems should be kept as simple as possible. Data should be collected and analysed based on existing collection mechanisms whenever possible. The data collected as part of the record-keeping system also need to be reviewed and reported. The results of any data analysis should be shared with service providers and stakeholders. Maintaining the confidentiality of client data is of paramount importance. Written records of risk assessments, HIV tests, and PEP prescriptions should be subject to the same rigorous confidentiality controls as any other medical records. Secure systems for storing data and controls on access to medical records should be developed.

Clinical Follow-Up

Follow-up and clinical monitoring to determine adherence and to identify and manage side effects should be provided. All available methods of communication should be considered.

Follow-Up Counselling

In addition to the counselling outlined above, appropriate psychosocial support and further treatment assistance should be offered to all people who have received PEP, as available and when required. Exposed individuals should be made aware of the support services available and how to access them until the entire process—including all testing—is completed. This could be achieved by using a wider range of communication methods or by partnering with other local services to provide support during extended hours.

Summary of Clinical Management of PEP for HIV Exposure

ITEM	RECOMMENDED ACTION AND NOTES
Eligibility	Exposure was within 72 hours Exposed person is not known to be infected with HIV Significant exposure occurred Source patient tested negative for HIV but is still in the window period
Informed consent for PEP	Inform HCW about risks and benefits Consent may be given verbally
Medicine	First line of ARV medicine to be dispensed by a qualified person
Time to initiation	The initial dose of ARV medicines should be given as soon as possible but no later than 72 hours after exposure
Duration of therapy	Medicine should be taken for 28 days
HIV testing with informed consent and pre and post counselling according to protocols	Conduct baseline HIV testing in exposed person Follow up HIV testing at 6 weeks, 12 weeks and 6 months after exposure Conduct rapid HIV test on the source patient if feasible and informed consent is obtained. Use Standard Operating Procedures



Additional laboratory evaluations	Pregnancy test if deemed necessary
Counselling	Stress the need for adherence and discuss side effects of medications, risk reduction, trauma or mental health problems, social support and safety
Referral	Make referrals as appropriate
Record keeping	Maintain accurate confidential records
Clinical follow-up	Assess and manage side effects Assess and support adherence

Hepatitis B

HBV infection is a well-recognized occupational risk for HCWs and can be transmitted via exposure to bodily fluids. In addition to percutaneous injury, contact of mucous membranes or non-intact skin with blood, fluids containing blood, tissue or other potentially infectious bodily fluids pose an infectious risk. HBV is highly infectious, can be transmitted in the absence of visible blood, and may remain infectious on environmental surfaces for up to 7 days. It is well established that the seroconversion after needle stick or sharp injuries contaminated with an infected source is 10–30% for HBV.

Blood from persons with HBV infection contains the highest HBV titers of all body fluids and is the most important vehicle of transmission in the health-care setting. The following body fluids also are considered potentially infectious: cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid. Although studies have documented HBV in saliva and tears, these body fluids have generally not represented an occupational risk for HBV infection unless they contain blood. Semen and vaginal secretions have been implicated in the sexual transmission of HBV, but they have not been implicated in occupational transmission from patients to HCWs. The presence of hepatitis B surface antigen (HBsAg), usually an indicator of active HBV infection, also is found in other body fluids (e.g., breast milk, bile, feces, nasopharyngeal washings, and sweat). However, most body fluids are not efficient vehicles of transmission (unless they contain blood) because they contain low quantities of infectious HBV. Sputum, urine, and vomitus are not considered potentially infectious unless they contain blood.

All HCWs whose work-, training-, and volunteer-related activities involve reasonably anticipated risk for exposure to blood or body fluids should be vaccinated with a complete >3 dose hepatitis B vaccine series. Antibodies for hepatitis B surface antigen (Anti-HBs) testing should be performed 1–2 months after administration of the last dose of the vaccine series when possible.

- Antibodies for hepatitis B surface antigen (Anti-HBs) testing should be performed 1–2 months after administration of the last dose of the vaccine series when possible
- If anti-HBs is at least 10 mIU/mL (positive), the vaccinee is immune. No further serologic testing or vaccination is recommended
- If anti-HBs is less than 10 mIU/mL (negative), the vaccinee is not protected from hepatitis B virus (HBV) infection, and should receive 3 additional doses of HepB vaccine on the routine schedule, followed by anti-HBs testing 1–2 months later
- A vaccinee whose anti-HBs remains less than 10 mIU/mL after 6 doses is considered a “non-responder”
- HCP who are non-responders should be considered susceptible to HBV and should be counseled regarding precautions to prevent HBV infection and the need to obtain HBIG prophylaxis for any known or probable parenteral exposure to hepatitis B surface antigen (HBsAg)-positive blood or blood with unknown HBsAg status

Managing Exposure to HBV:

The suggested steps for managing a body fluid exposure or injury are as follows:

- Treat the exposure site appropriately
- Assess the risk of HBV exposure and determine the immune status of the patient (history of jaundice, hepatitis, or previous immunization with hepatitis B vaccine)
- If possible, collect a specimen from the HCW and from the patient for HBsAg testing
- Give the first dose of HBV vaccine, which should be repeated at one and six months. If hepatitis B immunoglobu-

- ▶ lin (HBIG) is available, give 5 ml intramuscularly for passive immunization as soon as possible, but within seven days of exposure



Note: Reference Annex 4 for HBV post-exposure management

Exposure to HCV

There is no post-exposure vaccine or drug prophylaxis for HCV (immunoglobulin is ineffective). Prevention of exposure is the only effective strategy for preventing HCV. The following steps should be considered for follow-up of HCWs who become exposed to HCV-positive blood or other body fluids.

Management Of employee after HCV Exposure

At time of exposure:

- Determine the type of exposure and assess the associated risk
- Wash wounds with soap and water; flush mucous membranes with water
- No post-exposure prophylaxis (immune globulin or antiviral medications) is recommended
- Counsel the exposed person regarding hepatitis C transmission risk
- Test source and exposed individual for hepatitis C virus antibody and liver enzymes for exposed individual
- If source is not available or refuses testing, treat exposed person as if source has active hepatitis C infection
- If source is hepatitis C virus antibody positive, or is antibody negative and is immunocompromised, test source for qualitative HCV RNA
- If source is negative for hepatitis C antibody (and HCV RNA, if indicated), no further testing is necessary and no further action beyond initial HCV testing, is necessary for the exposed person
- If source is positive for hepatitis C antibody and HCV RNA, and exposed person is negative, follow up of exposed person should be done

Follow Up of exposed HCW to HCV positive source:

- Perform baseline testing for anti-HCV and ALT activity; and Perform follow-up testing at 3 and 6 months for anti-HCV antibodies and ALT activity – if earlier diagnosis of HCV infection is desired, testing for HCV RNA (viral load) may be performed at 4 and 12 weeks

Mycobacteria Tuberculosis (MTB)

All health-care settings need a tuberculosis (TB) infection-control program designed to ensure prompt detection, initiation of airborne precautions and treatment of persons who have suspected or confirmed MTB disease (or prompt referral of persons who have suspected MTB disease for settings in which persons with MTB disease are not expected to be encountered). HCWs, including nurses, doctors, clinical officers, nursing and medical students, housekeeping staff, and others are vulnerable to tuberculosis (TB) exposure, infection, and disease. HCWs are at even greater risk in the following circumstances:

- Aerosol-generating or aerosol-producing procedures, including bronchoscopy, endotracheal intubation, suctioning, other respiratory procedures, open abscess irrigation, autopsy, sputum induction, and aerosol treatments that induce coughing
- When they are working with difficult-to-treat TB such as relapses, treatment failure, multi-drug resistant (MDR), and extensively drug-resistant (XDR) TB

- ▶ In addition to performing work that involves diagnosis and treatment of TB, other risk factors for HCWs include the following:
 - Prolonged contact with patients with unrecognized TB disease who are not promptly handled with appropriate airborne precautions or patients moved from an airborne infection isolation (AII) room too soon (e.g., patients with unrecognized TB, patients with MDR or XDR TB)
 - Longer duration of employment
 - Working without following IPC procedures
 - Having HIV infection

Administrative Measures

The first and most important level of TB control is the use of administrative measures to reduce the risk for exposure to persons who might have TB disease. Administrative controls consist of the following activities:

- Assigning responsibility for TB infection control in the setting
- Conduct initial and ongoing evaluations of the risk for transmission of TB regardless of whether or not patients with suspected or confirmed TB disease are expected to be encountered in the setting
 - The TB risk assessment determines the types of administrative, environmental, and respiratory-protection controls needed for a setting and serves as an ongoing evaluation tool of the quality of TB infection control and for the identification of needed improvements in infection-control measures
 - The risk assessment will help determine the facility's risk classification (low, medium, potential transmission of TB)
 - Risk classification should be used as part of the risk assessment to determine the need for a TB screening program for HCWs and the frequency of screening
- Training and educating HCWs regarding TB, with specific focus on prevention, transmission, and symptoms
- Screening and evaluating HCWs who are at risk for TB disease or who might be exposed to TB (e.g., TB screening program)
- Ensuring the timely availability of recommended laboratory processing, testing, and reporting of results to the ordering physician and infection-control team
- Implementing effective work practices for the management of patients with suspected or confirmed TB disease

Sierra Leone - Incidence of tuberculosis Incidence of tuberculosis (per 100,000 people) (10)

Definition: Incidence of tuberculosis is the estimated number of new and relapse tuberculosis cases arising in a given year, expressed as the rate per 100,000 population. All forms of TB are included, including cases in people living with HIV. Estimates for all years are recalculated as new information becomes available and techniques are refined, so they may differ from those published previously.

- The latest value for Incidence of tuberculosis (per 100,000 people) in Sierra Leone was 313.00 as of 2013. Over the past 23 years, the value for this indicator has fluctuated between 318.00 in 2009 and 252.00 in 1990 (Source: World Health Organization, Global Tuberculosis Report)
- This data most likely reflects (without individual facility data available) medium to potential for ongoing transmission

Recommendation TB Screening Procedures for Settings (or HCWs) Classified as Medium Risk

- All HCWs should receive baseline TB screening upon hire, using two-step tuberculin skin test (TST) or a single BioMedical Admissions Test (BAMT) to test for infection with TB
- After baseline testing for infection with TB, HCWs should receive TB screening annually (e.g., symptom screen for all HCWs and testing for infection with TB (for HCWs with baseline negative test results)
- HCWs with a baseline positive or newly positive test result for TB infection or documentation of previous treatment for latent TB infection (LTBI) or TB disease should receive one chest radiograph result to exclude TB disease



- ▶ – Instead of participating in serial testing, HCWs should receive a symptom screen annually
- This screen should be accomplished by educating the HCW about symptoms of TB disease and instructing the HCW to report any such symptoms immediately to the occupational health unit
- Treatment for LTBI should be considered in accordance with CDC Guidelines

TB Screening Procedures for Settings (or HCWs) Classified as Potential Ongoing Transmission

- Testing for infection with TB might need to be performed every 8–10 weeks until lapses in infection control have been corrected, and no additional evidence of ongoing transmission is apparent
- The classification of potential ongoing transmission should be used as a temporary classification only. It warrants immediate investigation and corrective steps. After a determination that ongoing transmission has ceased, the setting should be reclassified as medium risk. Maintaining the classification of medium risk for at least 1 year is recommended

HCWs with active TB

HCWs with TB disease should be allowed to return to work when they:

- Have had three negative AFB sputum smear results collected 8–24 hours apart, with at least one being an early morning specimen because respiratory secretions pool overnight
- Have responded to anti-tuberculosis treatment that will probably be effective based on susceptibility results
- In addition, HCWs with TB disease should be allowed to return to work when a physician knowledgeable and experienced in managing TB disease determines that HCWs are noninfectious
- Consideration should also be given to the type of setting and the potential risk to patients (e.g., general medical office versus HIV clinic)
- HCWs with active TB should be provided with sick leave (with pay) during the period of the illness



** TB disease is a high risk factor of HIV infection. All staff must be made aware of the significant risk of developing TB if they are HIV-positive. Voluntary testing and counseling should be offered to all staff in contact with TB*

SARS coronavirus (SARS-CoV, or SARS)

The healthcare facility should have a clear set of guidelines for preventing staff members exposure to SARS. Healthcare workers in contact with suspected or probable SARS patients should be monitored daily for signs and symptoms of SARS, particularly for changes in temperature. If HCWs indicate any signs or symptoms of SARS, they should be assessed by the clinician as to the appropriateness of home isolation.

SARS may be initially missed due to the non-specific nature of presenting symptoms, the possibility of absence of fever on initial measurements, atypical presentations, co-morbidities masking SARS and the recognized difficulties of clinically diagnosing an atypical pneumonia.

Table 1: Clinical evidence for SARS for surveillance purposes for SARS

Clinical case of SARS is an individual with:

A history of fever, or documented fever $\geq 38^{\circ}\text{C}$ (100.4°F).

AND

One or more symptoms of lower respiratory tract illness (cough, difficulty breathing, shortness of breath)

AND

Radiographic evidence of lung infiltrates consistent with pneumonia or ARDS or findings consistent with the pathology of pneumonia or ARDS without an identifiable cause.

AND

No alternative diagnosis can fully explain the illness

Note: SARS is transmitted by symptomatic individuals and that asymptomatic infection poses no significant public health-risk. Accordingly, WHO requests that countries report only symptomatic cases of SARS.



► Meningococcal Meningitis

- Employers should provide adequate infection-control training to staff members, (e.g., use of appropriate PPE-mask when caring for suspect patients), PEP to exposed workers, and report notifiable diseases promptly to the local public health department
- Symptoms of meningococcal disease are usually sudden onset of fever, headache, and stiff neck. It can start with symptoms similar to influenza (flu), and will often also cause nausea, vomiting, increased sensitivity to light, rash, and confusion
- HCWs in close respiratory contact (e.g., suctioning, intubation) with such cases should receive PEP with ciprofloxacin or an effective alternative agent

Musculoskeletal Disorders (MSDs):

MSDs are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs when the event or exposure leading to the disorder is bodily reaction (e.g., bending, climbing, crawling, reaching, twisting), overexertion, or repetitive motion. MSDs do not include disorders caused by slips, trips, falls, or similar incidents. Examples of MSDs include (but are not limited to):

- Sprains, strains, and tears
- Back pain
- Carpal tunnel syndrome

Seven steps to address Workplace Musculoskeletal Disorders (WMSDs):

- Look for signs of a potential WMSD in the workplace, such as frequent worker reports of aches and pains or tasks requiring repetitive forceful exertions and act to reduce them
- Show management commitment by addressing possible problems and encouraging worker involvements in problem-solving activities
- Offer training to expand management and worker ability to evaluate potential WMSDs
- Gather data to identify jobs or work conditions that are most problematic, using sources such as injury and illness reports, medical records, and job analyses
- Identify effective controls for tasks that pose a risk of WMSD and evaluate these approaches once they have been instituted to see if they have reduced or eliminated the problem
- Emphasize the importance of early detection and treatment of WMSDs for preventing impairment and disability
- Minimize risk factors for WMSDs when planning new work processes and operations
- Provide training in appropriate lifting techniques

Slip, Trip, and Fall Prevention for Healthcare Workers

Work-related slip, trip, and fall incidents can frequently result in serious disabling injuries that impact a healthcare employee's ability to do his or her job, often resulting in:

- lost workdays
- reduced productivity
- diminished ability to care for patients

Hazards in the workplace (examples)

- Contaminants on the floor, e.g., water, other fluids, food
- Clutter including equipment, electrical cords, boxes, wire, medical tubing
- Broken tiles/uneven walkways



► Prevention Strategies

- Use barrier products or caution tape to prevent employees from entering an area being cleaned or from stepping on a spill
- Bundle the cords near equipment or place on a hook
- Organize storage areas to prevent boxes from accumulating in open areas
- Repair broken tiles and walkways
- Provide good lightening
- Report any unsafe condition to the appropriate safety person or supervisor

Chemical-related occupational hazards:

- Healthcare professionals, especially those working in surgical services, environmental services, and sterile processing are exposed to a significant number of chemicals including those used to clean and disinfect the healthcare environment and those used to disinfect and sterilize surgical instruments and medical device
- Other hazards include bloodborne pathogen transmissions caused by sharps injuries, as well as, respiratory dangers associated with the inhalation of surgical smoke and other particulates
- Harmful health effects of chemical exposures to HCWs have been the focus of a number of studies
 - Follow the necessary disinfection procedures in the cases when disinfection is necessary
 - Provide hazard communication training
 - Address the physical and health hazards of the chemicals in the work area and the measures for workers to use to protect themselves from these hazards
 - Develop and communicate methods for reporting any symptoms that workers and patients experience when environmental cleaning products are in use
 - Medical evaluation and treatment should be provided as necessary
 - Address the physical and health hazards of the chemicals in the work area and the measures for workers to use to protect themselves from these hazards

Workplace violence (WPV):

- WPV is a recognized hazard in the healthcare industry
- WPV is any act or threat of physical violence, harassment, intimidation, or other threatening disruptive behavior that occurs at the work site or as a result of a HCWs status in the community as a healthcare provider
- WPV can affect and involve workers, clients, patients and visitors
- WPV ranges from threats and verbal abuse to physical assaults and even homicide

Hazard Evaluation and Solutions:

- In most workplaces where risk factors can be identified, the risk of assault can be prevented or minimized if employers take appropriate precautions
- One of the best precautions healthcare employers can offer employees is to establish a zero tolerance policy toward workplace violence
- The policy should cover all workers, patients, clients, visitors, contractors, and anyone else who may come in contact with workers at the facility
- All claims of workplace violence should be investigated and remedied promptly



► **ANNEX 1: WORK RESTRICTIONS FOR HEALTHCARE WORKERS EXPOSED TO OR INFECTED WITH INFECTIOUS DISEASES**

Disease/problem	Work restriction	Duration	Category**
Conjunctivitis	Restrict from patient contact and contact with the patients' environment	Until discharge ceases	II
Cytomegalovirus infection	No restriction		II
Diarrheal diseases Acute stage (diarrhea with other symptoms)	Restrict from patient contact, contact with the patients' environment, or food handling	Until symptoms resolve;	1B
Convalescent stage (Salmonella spp.)	Restrict from care of high-risk patients, such as immunocompromised patients	consult with employee health	1B
Diphtheria	Exclude from duty	Until antimicrobial therapy is completed and 2 cultures obtained >24 hours apart are negative	IB
Enteroviral infections	Restrict from care of infants, neonates, and immunocompromised patients and their environments	Until symptoms resolve	II
Hepatitis A	Restrict from patient contact, contact with the patients' environment, and food handling	Until 7 days after the onset of jaundice	1B
Hepatitis B	Refer to specific MOH recommendation in policy		
Hepatitis C	Refer to specific MOH recommendation in policy		Unresolved issue
Herpes simplex Genital	No restriction		II
Hands (herpetic whitlow)	Restrict from patient contact and contact with the patients' environment	Until lesions heal	1A
Orofacial	Evaluate for need to restrict from care of high-risk patients	Consult with Employee Health	II
Measles Active	Exclude from duty	Until 7 days after the rash appears	1A
Post-exposure (susceptible personnel)	Exclude from duty	From the 5th day after the 1st exposure through the 21st	1B



		day after the last exposure and/or 7 days after rash appears	
Meningococcal meningitis	Exclude from duty	Until 24 hours after the start of antibiotic therapy	1A
Mumps			
Active	Exclude from duty	Until 9 days after the onset of parotitis	1B
Post-exposure (susceptible personnel)	Exclude from duty	From the 12th day after the 1st exposure through the 26th day after the last exposure or until 9 days after the onset of parotitis	II
Pediculosis	Restrict from patient contact	Until treated and observed to be free of adult and immature lice	1B
Pertussis			
Active	Exclude from duty	From the beginning of catarrhal stage through the 3rd week after onset of paroxysms or until 5 days after start of effective antimicrobial therapy	B
Post-exposure (asymptomatic personnel)	no restriction, prophylaxis recommended		II
Post-exposure (symptomatic personnel)	Exclude from duty	Until 5 days after the start of effective antimicrobial therapy	1B
Rubella			
Active	Exclude from duty	Until 5 days after rash appears	IA
Post-exposure (susceptible personnel)	Exclude from duty	From the 7th day after the 1st exposure through the 21st day after the last exposure and/or 5 days after rash appears	IB
Scabies	Restrict from patient contact	Until cleared by medical evaluation	IB
Staphylococcus aureus infection Active , draining skin	Restrict from contact with patients, the patients'	Until lesions have resolved	IB

lesions	environment, and food handling		
Carrier state	No restriction, unless personnel are epidemiologically linked to transmission of the organism		IB
Streptococcal group A infection	Restrict from patient care, contact with patients' environment, or food handling	Until 24 hours after adequate antimicrobial therapy	1B
Tuberculosis Active disease	Exclude from duty	Until proven noninfectious by physician	1A
Latent TB infection	No restriction	Treatment for latent TB infection	1A
Varicella Active	Exclude from duty	Until all lesions are dry and crusted over	1A
Post-exposure (susceptible personnel)	Exclude from duty	From the 10th day after the 1st exposure through the 21 st day (28th day if VZIG given) after the last exposure	1A
Zoster Localized , in a healthy person	Cover lesions; restrict from care of high-risk patients +	Until all lesions are dry and crusted over	II
Generalized or localized in an immunosuppressed person	Restrict from patient contact	Until all lesions are dry and crusted over	IB
Post-exposure (susceptible personnel)	Restrict from patient contact	From the 10th day after the 1st exposure through the 21 st day (28th day if VZIG given) after the last exposure or, if varicella occurs, until all lesions are dry and crusted over	IA
Viral respiratory infections, acute febrile	Consider excluding from the care of high-risk patients ++ or from contact with their environment during	Until acute symptoms resolve	IB

	community outbreaks of RSV and influenza		
<p>**</p> <p>Category IA: Strongly recommended for all hospitals and strongly supported by well-designed experimental or epidemiologic studies.</p> <p>Category IB: Strongly recommended for all hospitals and reviewed as effective by experts in the field and a consensus of Hospital Infection Control Practices Advisory Committee members on the basis of strong rationale and suggestive evidence, even though definitive scientific studies have not been done.</p> <p>Category II Suggested for implementation in many hospitals. Recommendations may be supported by suggestive clinical or epidemiologic studies, a strong theoretic rationale, or definitive studies applicable to some but not all hospitals.</p> <p>No recommendation; unresolved issue: Practices for which insufficient evidence or consensus regarding efficacy exists.</p> <p>Unless epidemiologically linked to the transmission of infection</p> <p>+ Those susceptible to varicella and those who are at increased risk of complications due to varicella, such as neonates and immunocompromised persons of any age</p> <p>++ High-risk patients as defined by the ACIP for complications due to influenza</p>			



► ANNEX 2: IMMUNIZATION OF HEALTHCARE WORKERS

Vaccines	Recommendations
Hepatitis B Vaccine	<p>If you don't have documented evidence of a complete blood test that shows you are immune to hepatitis B (i.e., no serologic evidence of immunity or prior vaccination) then you should</p> <ul style="list-style-type: none"> • Get the 3-dose series (dose #1 now, #2 in 1 month, #3 approximately 5 months after #2). • Get anti-HBs serologic tested 1–2 months after dose #3.
Flu (Influenza)	Get 1 dose of influenza vaccine annually.
MMR Measles Mumps Rubella	<p>If you were born in 1957 or later and have not had the MMR vaccine, or if you don't have an up-to-date blood test that shows you are immune to measles or mumps (i.e., no serologic evidence of immunity or prior vaccination), get 2 doses of MMR (1 dose now and the 2nd dose at least 28 days later).</p> <p>If you were born in 1957 or later and have not had the MMR vaccine, or if you don't have an up-to-date blood test that shows you are immune to rubella, only 1 dose of MMR is recommended. However, you may end up receiving 2 doses, because the rubella component is in the combination vaccine with measles and mumps.</p> <p>For HCWs born before 1957: Acceptable evidence of measles, rubella, and mumps immunity, health-care facilities should consider vaccinating unvaccinated personnel born before 1957 who do not have laboratory evidence of measles, rubella, and mumps immunity; laboratory confirmation of disease; or vaccination with 2 appropriately spaced doses of MMR vaccine for measles and mumps and 1 dose of MMR vaccine for rubella. Vaccination recommendations during outbreaks differ from routine recommendations for this group (see section titled Recommendations during Outbreaks of Measles, Rubella, or Mumps).</p>
Varicella (Chickenpox)	If you have not had chickenpox (varicella), if you haven't had varicella vaccine, or if you don't have an up-to-date blood test that shows you are immune to varicella (i.e., no serologic evidence of immunity or prior vaccination) get 2 doses of varicella vaccine, 4 weeks apart.
Tdap (Tetanus, Diphtheria, Pertussis,	<ul style="list-style-type: none"> • Get a one-time dose of Tdap as soon as possible if you have not received Tdap previously (regardless of when previous dose of Td was received). • Get Td boosters every 10 years thereafter. • Pregnant HCWs need to get a dose of Tdap during each pregnancy.
Meningococcal	Those who are routinely exposed to isolates of <i>N. meningitidis</i> should get one dose.
Healthcare workers include physicians, nurses, emergency medical personnel, dental professionals and students, medical and nursing students, laboratory technicians, pharmacists, hospital volunteers, and administrative staff.	

► ANNEX 3: IMMUNIZATION OF HEALTHCARE WORKERS

Summary of Post Exposure Management to HIV Recommendations	
<ul style="list-style-type: none"> • Post-Exposure Prophylaxis (PEP) is recommended when occupational exposures to HIV occur. • Determine the HIV status of the exposure source patient to guide need for HIV PEP, if possible. • Start PEP medication regimens as soon as possible after occupational exposure to HIV and continue them for a-4 week duration. • New Recommendation--- PEP medication regimens should contain 3 (or more) antiretroviral drugs for all occupational exposures to HIV. • Expert consultation is recommended for any occupational exposures to HIV and at a minimum for situations described in Box 1. • Provide close follow-up for exposed personnel that includes counseling, baseline and follow-up HIV testing, and monitoring for drug toxicity. Follow-up appointments should begin within 72 hours of an HIV exposure. • New Recommendation--- If a newer 4th generation combination HIV p24 antigen-HIV antibody test is utilized for follow-up HIV testing of exposed HCP, HIV testing may be concluded at 4 months after exposure (Box 2). If a newer testing platform is not available, follow-up HIV testing is typically concluded at 6 months after an HIV exposure. 	
Preferred HIV PEP Regimen	
<p>Raltegravir (Isentress, ®RAL) 400 mg PO Twice daily</p> <p>Plus</p> <p>Truvada™, 1 PO once daily</p> <p>[Tenofovir DF (Viread®; TDF) 300 mg + emtricitabine (Emtriva™; FTC) 200mg]</p>	
Alternative Regimes	
(May combine one drug or drug pair from the left column. Prescribers unfamiliar with these agents/regimes should consult physicians familiar with the agents and toxicities)	
Raltegravir (Isentress®; RAL)	Tenofovir DF (Viread®; TDF) + emtricitabine (Emtriva™; FTC); available as Truvada™
Darunavir (Prezista®; DRV) + ritonavir (Norvir®; RTV)	Tenofovir DF (Viread®; TDF) + lamivudine (EpiVir®; 3TC)
Etravirine (Intelence®; ETR)	Zidovudine (Retrovir™; ZDV; AZT) + lamivudine (EpiVir®; 3TC); available as Combivir®
Rilpivirine (Edurant™; RPV)	Zidovudine (Retrovir®; ZDV; AZT) + emtricitabine (Emtriva™; FTC)
Atazanavir (Reyataz®; ATV) + ritonavir (Norvir®; RTV)	
Lopinavir/ritonavir (Kaletra®; LPV/RTV)	
The following alternative is a complete fixed-dose combination regimen and no additional antiretrovirals are needed: Stribild™ (elvitegravir, cobicistat, tenofovir DF, emtricitabine)	

ALTERNATIVE ANTIRETROVIRAL AGENTS FOR USE AS PEP ONLY WITH EXPERT CONSULTATION^
Abacavir (Ziagen®; ABC)
Efavirenz (Sustiva®; EFV)
Enfuvirtide (Fuzeon™; T20)
Fosamprenavir (Lexiva®; FOSAPV)
Maraviroc (Selzentry®; MVC)
Saquinavir (Invirase®; SQV)
Stavudine (Zerit®; d4T)
ANTIRETROVIRAL AGENTS GENERALLY NOT RECOMMENDED FOR USE AS PEP
Didanosine (Videx EC® ddI)
Nelfinavir (Viracept® NFV)
Tipranavir (Aptivus®; TPV)
ANTIRETROVIRAL AGENTS CONTRAINDICATED AS PEP
Nevirapine (Viramune®; NVD)

► **ANNEX 4: POST-EXPOSURE MANAGEMENT OF HEALTH-CARE PERSONNEL AFTER OCCUPATIONAL PERCUTANEOUS AND MUCOSAL EXPOSURE TO BLOOD AND BODY FLUIDS, BY HEALTH-CARE PERSONNEL - HEPATITIS B VACCINATION AND RESPONSE STATUS**

Healthcare Personnel Status	Post Exposure Testing		Post Exposure Prophylaxis		Post-vaccination serologic testing†
	Source patient (HBsAg)	HCP testing (anti-HBs)	HBIG*	Vaccination	
Documented responder§ after complete series (≥3 doses)	No action needed				
Documented non-responder¶ after 6 doses	Positive/unknown	—**	HBIG x2 separated by 1 month	—	No
	negative	No action needed			
Response unknown after 3 doses	Positive/unknown	<10mIU/mL**	HBIG x1	Initiate revaccination	Yes
	Negative	<10mIU/mL	None		
	Any result	≥10mIU/mL	No action needed		
Unvaccinated/incompletely vaccinated or vaccine refusers	Positive/unknown	—**	HBIG x1	Complete vaccination	Yes
	Negative	—	None	Complete vaccination	Yes

Abbreviations: HCP = health-care personnel; HBsAg = hepatitis B surface antigen; anti-HBs = antibody to hepatitis B surface antigen; HBIG = hepatitis B immune globulin.

* HBIG should be administered intramuscularly as soon as possible after exposure when indicated. The effectiveness of HBIG when administered >7 days after percutaneous, mucosal, or nonintact skin exposures is unknown. HBIG dosage is 0.06 mL/kg.

† Should be performed 1–2 months after the last dose of the HepB vaccine series (and 4–6 months after administration of HBIG to avoid detection of passively administered anti-HBs) using a quantitative method that allows detection of the protective concentration of anti-HBs (≥10 mIU/mL).

§ A responder is defined as a person with anti-HBs ≥10 mIU/mL after ≥3 doses of HepB vaccine.

¶ A non-responder is defined as a person with anti-HBs <10 mIU/mL after ≥6 doses of HepB vaccine.

** HCP who have anti-HBs <10mIU/mL, or who are unvaccinated or incompletely vaccinated, and sustain an exposure to a source patient who is HBsAg-positive or has unknown HBsAg status, should undergo baseline testing for HBV infection as soon as possible after exposure, and follow-up testing approximately 6 months later. Initial baseline tests consist of total anti-HBc; testing at approximately 6 months consists of HBsAg and total anti-HBc.

THE IMPORTANCE OF SURVEILLANCE FOR INFECTION PREVENTION AND CONTROL



This annex summarizes general information and recommendations on surveillance and its important role in IPC. Each facility should develop a comprehensive surveillance plan, aligned with national priorities and protocols that include definitions, the type of HAIs to be monitored, how data is to be collected and roles and responsibilities.

7.1 Surveillance

IPC activities should respond to actual needs. In order to fulfil the objectives of IPC programmes, surveillance systems for HAI and for assessment of compliance with IPC practices should be in place. These will also contribute to the assessment of the impact of IPC interventions. The rate of HAI is an indicator of quality and safety of care. However, surveillance activities are time-consuming and need to be balanced with the time needed for prevention and control activities. More advanced surveillance systems also require good quality microbiological laboratory procedures and data for the identification of etiological agents and patterns of resistance to antimicrobials.

Surveillance, by itself, can therefore be an effective process to decrease the frequency of HAI. Surveillance also plays a critical role in detecting outbreaks. Health care facility (HCF) surveillance feeds into national surveillance and response systems.

Objectives

Surveillance should have clear objectives. Its ultimate general aim is the reduction of HAI and their costs.

The specific objectives of a surveillance programme include:

- To improve awareness of clinical staff and other health care workers (HCW) (including administrators) about HAI and antimicrobial resistance (AMR), so they appreciate the need for preventive action
- Identification of high-risk populations, procedures and exposures
- To monitor trends
- To identify possible areas for improvement in patient care, and for further epidemiological studies
- Early detection of outbreaks
- To assess the impact of interventions

Strategy

A surveillance system must be simple, promote involvement of all relevant HCWs, provide timely feedback, be flexible, acceptable to those who use it, consistent with agreed standardized definitions and sensitive and specific.

Sensitivity refers to the proportion of patients detected as being infected who actually are infected (true positive) among all infected patients. Specificity refers to the proportion of patients detected as “non-infected” who actually are non-infected (true negative) among all non-infected patients.

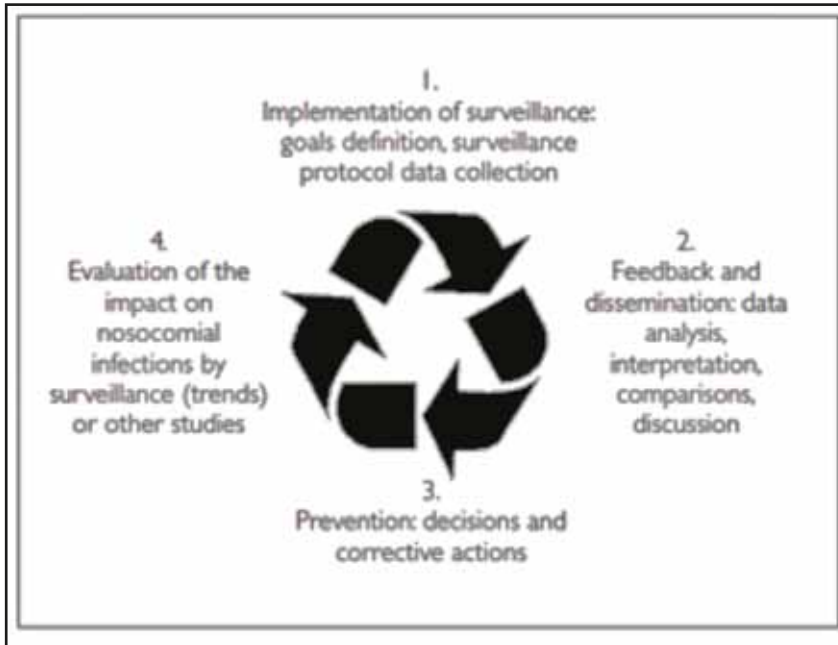
Surveillance at the HCF level

Ensuring a valid surveillance system is an important HCF function. There must be specific objectives across all levels of HCFs and defined time periods of surveillance for all partners: e.g. clinical units and laboratory staff, infection prevention and control (IPC) teams and hospital managers.

Initially, discussion should identify the information needs, and the potential for the chosen indicators to support implementation of corrective measures (what or who is going to be influenced by the data). This discussion will include: ►►

- The patients and units to be monitored (defined population)
- The type of infections and relevant information to be collected for each case (with precise definitions)
- The frequency and duration of monitoring
- Methods for data collection
- Methods for data analysis, feedback, and dissemination
- Confidentiality and anonymity

Figure 1: Surveillance is a circular process:



The optimal method (Figure 1) is dependent on HCF characteristics, the desired objectives, resources available (information technology (IT), investigators) and the level of support of the hospital staff (both administrative and clinical).

The surveillance programme must report to hospital administration, usually through the Infection Prevention and Control Committee (IPCC), and must have a dedicated budget to support its operation.

Table 1: Core components of surveillance of HAI and assessment of compliance with IPC practices at the national and HCF level are presented.

National-level authority	Health-care facility
Coordinates, gathers and documents the available data on HAI at the country level	Documents the situation of HAI and IPC processes in the health-care facility
Defines the national objectives of surveillance	Defines the local objectives of surveillance aligned with the national objectives
Establishes the priorities for surveillance of infections, pathogens and others	Establishes the priorities for surveillance according to the scope of care in the facility
Establishes what data should be provided to the health authority and how	Establishes the minimum registers necessary for medical records used for surveillance purposes and monitors compliance
Reports to interested parties on the national situation of HAI and special events	Conducts surveillance applying national standardized case definitions and methods of surveillance of infections
Standardizes: <ul style="list-style-type: none"> • case definitions • methods of surveillance. 	Detects outbreaks and coordinates the response
Promotes the assessment of IPC practices and other relevant processes in a blame-free institutional culture	Reports HAI and events to the local interested parties and the Public Health authorities as required by regulations
	Conducts the assessment of IPC practices and other relevant processes in a blame-free institutional culture



► **Methods**

Simply counting infected patients (numerator) provides only limited information which may be difficult to interpret. Further data are necessary to fully describe the problem.

“Passive surveillance” with reporting by individuals outside the IPC team (laboratory-based surveillance, extraction from medical records post discharge, infection notification by physicians or nurses) is of low sensitivity and should be discouraged. Therefore some form of active surveillance for infections (referred to as prevalence or incidence studies) is recommended (Table 2).

Table 2: Key points in the process of surveillance for HAI rates

- | |
|---|
| <ul style="list-style-type: none">• Active surveillance (prevalence and incidence studies)• Targeted surveillance (site, unit, priority-oriented)• Appropriately trained investigators• Standardized methodology• Risk-adjusted rates for comparisons |
|---|

Prevalence study

Infections in all patients hospitalized at a given point in time are identified (point prevalence) in the entire hospital, or on selected units. Typically, a team of trained investigators visits every patient of the hospital on a single day, reviewing medical and nursing charts, interviewing the clinical staff to identify infected patients, and collecting risk factor data. The outcome measure is a prevalence rate.

Prevalence rates are influenced by duration of the patient’s stay (infected patients stay longer, leading to an overestimation of patient’s risk of acquiring an infection) and duration of infections. Another problem is determining whether an infection is still “active” on the day of the study. In small hospitals, or small units, the number of patients may be too few to develop reliable rates, or to allow comparisons with statistical significance.

A prevalence study is simple, fast, and relatively inexpensive. The hospital-wide activity increases awareness of HAI problems among clinical staff, and increases the visibility of the infection control team. It is useful when initiating a surveillance programme to assess current issues for all units, for all kinds of HAI, and in all patients, before proceeding to a more focused continuing active surveillance programme. Repeated prevalence surveys can be useful to monitor trends by comparing rates in a unit, or in a hospital, over time.

Incidence study

Prospective identification of new infections (incidence surveillance) requires monitoring of all patients within a defined population for a *specified time period*.

Patients are followed throughout their stay, and sometimes after discharge (e.g., post-discharge surveillance for surgical site infections). This type of surveillance provides attack rates, infection ratio and incidence rates (Table 3). It is more effective in detecting differences in infection rates, to follow trends, to link infections to risk factors, and for inter-hospital and inter-unit comparisons.

This surveillance is more labour-intensive than a prevalence survey, more time-consuming, and costly. Therefore, it is usually undertaken only for selected high-risk units on an ongoing basis (i.e., in intensive care units), or for a limited period, focusing on selected infections and specialties (i.e., 3 months in surgery).



- ▶ Common priority areas can include:
 - Ventilator-associated pneumonia
 - Surgical site infections
 - Intravascular device-associated infections (high mortality)
 - Multidrug resistant bacteria (e.g., methicillin-resistant *Staphylococcus aureus*, *Klebsiella spp.* with extended-spectrum beta-lactamase)

This surveillance is primarily laboratory-based. The laboratory also provides units with regular reports on distribution of microorganisms isolated, and antibiotic susceptibility profiles for the most frequent pathogens.

- **Unit-oriented surveillance:** efforts can focus on high-risk units such as intensive care units, surgical units, oncology/haematology, burn units and neonatology
- **Priority-oriented surveillance:** surveillance undertaken for a specific issue of concern to a HCF

Table 3: Prevalence and incidence rates

Prevalence rate	Examples
$\frac{\text{Number of infected patients}^a \text{ at the time of study}}{\text{Number of patients observed at the same time}} \times 100$ <p>(*or number of infections)</p>	Prevalence (%) of nosocomial infections (NI) for 100 hospitalized patients Prevalence (%) of urinary tract infections (UTI) for 100 hospitalized patients
$\frac{\text{Number of infected patients at the time of the study}}{\text{Number of patients exposed at the same time}} \times 100$	Prevalence (%) of UTI for 100 patients with a urinary catheter
Attack rate (cumulative incidence rate)	
$\frac{\text{Number of new infections acquired in a period}}{\text{Number of patients observed in the same period}} \times 100$	Attack rate (%) of UTI for 100 hospitalized patients
$\frac{\text{Number of new infections acquired in a period}}{\text{Number of patients exposed in the same period}} \times 100$	Attack rate (%) of surgical site infections (SSI) for 100 operated patients
Incidence rate	
$\frac{\text{Number of new nosocomial infections acquired in a period}}{\text{Total of patient-days for the same period}} \times 1000$	Incidence of bloodstream infection (BSI) for 1000 patient-days
$\frac{\text{Number of new device-associated nosocomial infections in a period}}{\text{Total device-days for the same period}} \times 1000$	Incidence of ventilator-associated pneumonia for 1000 ventilation-days

Note, nosocomial (in table 3) is a term used to refer to HAI

Calculating rates

Rates are obtained by dividing a numerator (number of infections or infected patients observed) by a denominator (population at risk, or number of patient-days of risk). The frequency of infection can be estimated by prevalence and incidence indicators (Table 3).

For multidrug resistant bacteria surveillance, the three main indicators used are:

- Percentage of antimicrobial resistant strains within isolates of a species, e.g. percentage of *Staphylococcus aureus* resistant to methicillin (MRSA)
- Attack rate (i.e. number of MRSA/100 admissions)
- Incidence rate (MRSA/1000 patient-days)



- ▶ For both prevalence and incidence rates, either the global population under surveillance, or only patients with a specific risk exposure, may be the denominator.

Attack rates can be estimated by the calculation of a simplified infection ratio using an estimate of the denominator for the same period of time (i.e. number of admissions or discharges, number of surgical procedures).

Incidence rates are encouraged as they take into account the length of exposure, or the length of stay (and/or follow-up) of the patient; this gives a better reflection of risk and facilitates comparisons. Either patient-day rates or device-associated rates can be used.

Organization for efficient surveillance

HAI surveillance includes data collection, analysis and interpretation, feedback leading to interventions for preventive action, and evaluation of the impact of these interventions. It is important that all those involved in surveillance undergo training, including training of HCWs responsible for data collection. A written HCF protocol must describe the methods to be used, the data to be collected (e.g. patient inclusion criteria, definitions), the analysis that can be expected, and preparation and timing of reports as well as roles and responsibilities.

Data collection and analysis

Sources of information

Data collection requires multiple sources of information as no method, by itself, is sensitive enough to ensure data quality. Trained data extractors performing active surveillance will increase the sensitivity for identifying infections.

Techniques for case-finding include:

- **Ward activity:** looking for clues such as:
 - The presence of devices or procedures known to be a risk for infection (indwelling urinary and intravascular catheters, mechanical ventilation, surgical procedures)
 - Record of fever or other clinical signs consistent with infection
 - Antimicrobial therapy
 - Laboratory tests
 - Medical and nursing chart review
 - Patient interview
- **Laboratory reports:** isolation of microorganisms potentially associated with infection, antimicrobial resistance patterns, serological tests. Microbiology laboratory reports have low sensitivity because cultures are not obtained for all infections, specimens may not be appropriate, some infectious pathogens may not be isolated (e.g. virus), and the isolation of a potential pathogen may represent colonization rather than infection (e.g. for surgical site infections, pneumonia). Laboratory reports are, however, reliable for urinary tract infection, bloodstream infections, and multi-drug resistant bacteria surveillance, because the definitions for these are essentially microbiological
- Other diagnostic tests: e.g. white blood counts, diagnostic imaging, autopsy data
- Discussion of cases with the clinical staff during periodic ward visits

Continuing collaboration among IPC staff, the laboratory where in situ, and clinical units will facilitate an exchange of information and improve data quality. The patient is monitored throughout the hospital stay, and in some cases (e.g. for surgical site infections), surveillance includes the post-discharge period. The progressive reduction of the average length of stay with recent changes in health care delivery increases the importance of identifying post discharge infections.

Feedback/dissemination

To be effective, feedback must be prompt, relevant to the target group, i.e. the people directly involved in patient care, and with the potential for maximal influence on infection prevention (i.e. surgeons for surgical site infection, physicians and nurses in intensive care units). Reporting may include meetings for sharing of information and discussion, microbiological review, and summary or graphic presentations on a notice board in the unit. Dissemination of information is also organized through the IPCC to other units, management, and laboratories.



- ▶ Reports should not identify individual patients. Codes must also be assigned to hospitals, units and responsible physicians, to ensure anonymity. Reports must be returned or disposed of confidentially following established procedures.

Prevention and evaluation

An effective surveillance system must identify priorities for preventive interventions and improvement in quality of care. By providing quality indicators, surveillance enables the IPC programme, in collaboration with wards and departments, to improve practice, and to define and monitor IPC guidelines.

The final aim of surveillance is to decrease HAI infections, protect patients and HCWs and reduce costs. Surveillance is a continuous process which needs to evaluate the impact of interventions to validate the prevention strategy, and determine if initial objectives are attained.

Evaluation of the surveillance system

A surveillance system must be continuing if it is to be credible. Periodic contacts with staff will also help to maintain a high level of compliance. Once the surveillance system is functioning, a validation of the surveillance methods and data should be undertaken at regular intervals, considering the following criteria:

Evaluation of the surveillance strategy

Review whether the surveillance system meets the required characteristics:

- Simplicity/flexibility/acceptance
- Timeliness (is the feedback prompt enough to be useful?)
- Utility (in terms of priorities, impact, etc.)
- Efficacy/efficiency

Evaluation can be undertaken, for example, through a questionnaire study exploring how feedback is perceived and how results are used by different groups.



The four principal points for HAI infection surveillance:

- *Valid quality indicators (risk-adjusted rates, etc.)*
- *Effective, timely feedback (rapid, useful)*
- *Appropriate implementation of preventative interventions*
- *Evaluation of the impact of interventions by continued surveillance (trends), and other studies*

7.2 STANDARD PRECAUTIONS IN HEALTH CARE – A SUMMARY⁵

Background

Standard precautions are meant to reduce the risk of transmission of blood borne and other pathogens from both recognized and unrecognized sources. They are the first level of infection control precautions which are to be used, as a minimum, in the care of all patients.

Hand hygiene performed at the right times is a major component of standard precautions and one of the most effective methods to prevent transmission of pathogens associated with health care harm. Alongside appropriate use of **personal protective equipment (PPE)**, as described below, such actions can protect both patients and healthcare workers (HCWs) from avoidable harm.

In addition to all of the recommended standard precautions to be carried out by HCWs when providing care, described in Chapter 4 of the Infection Prevention and Control (IPC) Guidelines of Sierra Leone, all individuals (including patients and visitors) should be aware of and comply with all relevant policies on infection control practices in health-care settings. Given the importance of understanding precautions that address the “source” of known or unknown pathogens (as described in Chapter 3, section 3.1 The chain of Infection), **respiratory hygiene/cough etiquette**, promoted due to the prevalence of respiratory diseases, such as severe acute respiratory syndrome (SARS), is now also considered as part of standard precautions as described below.

Worldwide adoption of the use of standard precautions would reduce unnecessary health care-associated infections (HAIs). To achieve this, every health care facility (HCF) in every country needs to promote and adopt these precautions. The **Institutional safety climate i.e. a culture that supports patient and HCW safety in each HCF is critical to achieving this.** Provision of adequate staff and supplies, together with leadership, education of HCWs, patients, and visitors, as well as reminders in the workplace and feedback on adherence with IPC standards are all critical for patient and health worker safety.

Standard precautions checklist

Health policy (see chapter 1)

a. Promote a “safety climate” through leadership and demonstration of commitment to infection control precautions.	<input checked="" type="checkbox"/>
b. Provide infrastructure and resources to support, practice, remind, observe and supervise compliance to standard precautions. a. This includes; availability of hand-washing facilities with clean running water and alcohol-based handrub where possible (with a strategy to ensuring this is available if not already), PPE, tissues, clean safe injection equipment, sharps and waste disposal containers, laundry facilities, cleaning solutions/equipment.	<input checked="" type="checkbox"/>
c. Develop policies and procedures which facilitate the implementation of infection control precautions.	<input checked="" type="checkbox"/>
d. Provide education & training for staff on principles and practices to prevent of transmission of infection.	<input checked="" type="checkbox"/>

Hand hygiene (see chapter 4, section 4.1)

a. Promote a “safety climate” through leadership and demonstration of commitment to infection control precautions.	<input checked="" type="checkbox"/>
b. Provide infrastructure and resources to support, practice, remind, observe and supervise compliance to standard precautions. a. This includes; availability of hand-washing facilities with clean running water and alcohol-based handrub where possible (with a strategy to ensuring this is available if not already), PPE, tissues, clean safe injection equipment, sharps and waste disposal containers, laundry facilities, cleaning solutions/equipment.	<input checked="" type="checkbox"/>
c. Develop policies and procedures which facilitate the implementation of infection control precautions.	<input checked="" type="checkbox"/>
d. Provide education & training for staff on principles and practices to prevent of transmission of infection.	<input checked="" type="checkbox"/>

⁵ This summary document is based on the WHO Aide Memoire on Standard Precautions (2007)



► (See more information in the table below)

How to perform hand hygiene:	Technique:	Summary indications (WHO 'My 5 Moments for Hand Hygiene'):
Clean your hands by rubbing them with an alcohol-based formulation as the preferred mean for routine hygienic hand antiseptics if hands are not visibly soiled. It is faster more effective, and better tolerated by your hands than washing with soap and water.	Hand rubbing (20–30 sec): apply enough product to cover all areas of the hands; rub all surfaces hands until dry.	<p>M1: Before touching a patient: Clean your hands before touching a patient when approaching him/her</p> <p>M2: Before clean / aseptic procedure: Clean your hands immediately before accessing a critical site with infectious risk for the patient (e.g. a mucous membrane, non-intact skin, an invasive medical device)*</p> <p>M3: After body fluid exposure risk: Clean your hands as soon as the task involving an exposure risk to body fluids has ended (and after glove removal)*</p> <p>M4: After touching a patient: Clean your hands when leaving the patient's side after having touched the patient *</p> <p>M5: After touching patient surroundings: Clean your hands after touching any object or furniture when living the patient surroundings, without having touched the patient*</p> <p><i>*NOTE: Hand hygiene must be performed in all indications described regardless of whether gloves are used or not and remembering during patient care, when moving from a contaminated to a clean body site of the patient.</i></p>
Wash your hands with soap and water when hands are visibly dirty or visibly soiled with blood or other body fluids or after using the toilet. <i>If exposure to potential spore-forming pathogens is strongly suspected or proven, including outbreaks of Clostridium difficile, hand washing with soap and water is the preferred means.</i>	Hand washing (40–60 sec): wet hands and apply soap; rub all surfaces; rinse hands and dry thoroughly with a single use towel; use towel to turn off faucet.	

PPE (see chapter 4, section 4.3)

<p>a. Select PPE based on:</p> <ul style="list-style-type: none"> a. Assessing the risk of exposure to blood, body fluids, secretions, excretions, aerosol generating procedures, BEFORE any health-care activity is undertaken. b. Durability and appropriateness to the task c. Ensuring the right size and fit of the PPE 	☑
<p>b. Routine PPE selected for standard precautions, based on the assessment of risk, should consist of:</p> <ul style="list-style-type: none"> a. clean non-sterile gloves b. clean, non-sterile fluid-resistant gown/apron c. facial protection by a surgical mask and eye protection/goggles or a face shield 	☑
<p>c. Gloves:</p> <ul style="list-style-type: none"> a. Wear when touching blood, body fluids, secretions, excretions, mucous membranes, non-intact skin and contaminated items/instruments b. Change between tasks and procedures on the same patient after contact with potentially infectious material and immediately clean hands c. Remove after use, BEFORE touching other items and surfaces, and before going to another patient. Perform hand hygiene immediately after removal d. For other indications and additional information, please see the WHO Glove Use Information Leaflet http://www.who.int/gpsc/5may/Glove_Use_Information_Leaflet.pdf 	☑
<p>d. Gowns/aprons:</p> <ul style="list-style-type: none"> a. Remove gown/apron immediately after a task and perform hand hygiene b. Gowns/aprons should ideally be single-use disposable items, for one procedure or episode of patient care, and then discarded and disposed. It may be necessary to change aprons/gowns between tasks on the same patient to prevent contamination. Gowns/aprons should be removed using the ties at the back and contact with the sleeves or front should be avoided c. Note: regular corrective spectacles are not appropriate eye/face protection. d. Note: overshoes/shoe covers are not routinely recommended as part of standard precautions e. Head-wear is also not considered necessary for standard precautions 	☑

Respiratory hygiene and cough etiquette

<p>a. Persons with respiratory symptoms should be cared for under source control measures:</p> <ul style="list-style-type: none"> a. Cover their nose and mouth when coughing/sneezing preferably with a disposable tissue (or mask). Immediately dispose of used tissues (masks), and perform hand hygiene. 	☑
<p>b. Health-care facilities should:</p> <ul style="list-style-type: none"> a. Place acute febrile respiratory symptomatic patients at least 1 metre (3 feet) away from others including in common waiting areas, if possible. b. Consider making hand hygiene resources, tissues (masks) available in common areas (used for the evaluation of patients with respiratory illnesses). 	☑

► **Injection and Phlebotomy Safety and Sharps Injury Prevention (see chapter 4, section 4.5 and chapter 6 occupational safety and employee health)**

a. Staff performing invasive procedures should have health clearance and be offered immunization, e.g. Hepatitis B.	<input checked="" type="checkbox"/>
b. Use sterile, single-use, disposable needle & syringe for each injection/blood collection.	<input checked="" type="checkbox"/>
c. Do not recap, bend, break, or hand-manipulate used needles.	<input checked="" type="checkbox"/>
d. Use safety featured devices.	<input checked="" type="checkbox"/>
e. Practice extreme care when handling needles, scalpels, and other sharp instruments or devices.	<input checked="" type="checkbox"/>
f. Have a sharps disposal container available at the point of injection/blood collection. This should have no protruding needles and be changed if full or punctured.	<input checked="" type="checkbox"/>
g. An employee who receives a sharps injury at work must notify their employer as soon as practicable and wash/rinse the injured site with soap and water (not scrubbing), encouraging free bleeding where the situation allows. Employers must investigate the incident and take necessary actions (this might include Post Exposure Prophylaxis) for the injured employee and to prevent future recurrence.	<input checked="" type="checkbox"/>
h. Note: for blood collection, aseptic procedures must be followed including skin disinfection and hand hygiene.	<input checked="" type="checkbox"/>

Environmental decontamination and management practices (see chapter 4, section 4.2.3)

a. Regular cleaning on a scheduled basis should be performed. Staff responsibilities for cleaning should be clear and cleaning standards monitored.	<input checked="" type="checkbox"/>
b. PPE should be worn if risk of exposure to blood or body fluids is likely and hand hygiene performed as recommended in the WHO 'My 5 Moments for Hand Hygiene' taking note of Moments 3 & 5 in particular.	<input checked="" type="checkbox"/>
c. Fresh detergents and hot water are recommended for cleaning; disinfectants are not recommended routinely for standard precautions (besides sanitary fittings).	<input checked="" type="checkbox"/>
d. Sites of increased contamination such as frequently touched surfaces and items in the patient zone (immediate patient surroundings) require more frequent cleaning than other sites in the health-care setting.	<input checked="" type="checkbox"/>
e. Cleaning equipment should be clean and designated to hospital areas if possible.	<input checked="" type="checkbox"/>
f. It is recommended to work from "clean" to "dirty" sites.	<input checked="" type="checkbox"/>
g. Chlorine-releasing agents prepared to the right dilution are recommended for spillages (except urine).	<input checked="" type="checkbox"/>

Safe handling of linen and laundry (see chapter 4, section 4.2.2)

<p>a. Handle, transport, and process used linen in a manner which:</p> <p>a. Prevents skin and mucous membrane exposures and contamination of clothing, e.g. by not holding used linen against the body and wearing PPE if risk of exposure to blood or body fluids is likely. Hand hygiene should be performed after handling used linen, i.e. Moment 5 for Hand Hygiene.</p> <p>b. Avoids transfer of pathogens to other patients and or the environment by not shaking used linen or placing it on surfaces.</p> <p>c. Results in linen free from contamination, i.e. by washing at as hot a temperature as possible.</p>	<input checked="" type="checkbox"/>
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Waste Management (see chapter 4, section 4.4)

a. It is recommended to categorise waste, for example domestic waste bags colour coded differently from clinical and hazardous waste. Liquid waste should also be managed safely.	<input checked="" type="checkbox"/>
b. Treat waste contaminated with blood, body fluids, secretions and excretions as clinical waste, in accordance with local regulations.	<input checked="" type="checkbox"/>
c. Human tissues and laboratory waste that are directly associated with specimen processing should also be treated as clinical waste.	<input checked="" type="checkbox"/>
d. Discard single use items immediately after use into the appropriate container.	<input checked="" type="checkbox"/>
e. PPE should be worn if risk of exposure to blood or body fluids is likely and hand hygiene performed after handling of waste.	

Instrument decontamination and reprocessing (reusable patient care equipment) (see chapter 4, section 4.2.1)

a. Reusable equipment should be included in the regular cleaning schedule.	<input checked="" type="checkbox"/>
b. Equipment soiled with blood, body fluids, secretions, and excretions should be handled in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of pathogens to other patients or the environment, i.e. through use of PPE, performing hand hygiene and not placing dirty/contaminated equipment on clean surfaces.	<input checked="" type="checkbox"/>
c. Clean, disinfect, and reprocess equipment if soiled with blood/body fluids, before use with another patient and at regular scheduled intervals, as per guidelines with roles and responsibilities and use of PPE clear.	<input checked="" type="checkbox"/>

Patient Placement (see chapter 4 section 4.6)

a. If the number of single-patient rooms are limited, patients with the following conditions should be prioritized for isolation: <ul style="list-style-type: none"> a. Conditions that can facilitate infection transmission (e.g. uncontained secretions). b. High risk of acquisition or severe outcome of infection (e.g. immunocompromised) 	<input checked="" type="checkbox"/>
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Important reminders

Institutional safety climate, including a multi-modal approach to improvement and behaviour change, is a cornerstone of prevention of transmission of pathogens in health care.

Standard precautions should be the minimum level of precautions used when providing care for all patients.

Risk assessment should always be a part of safe health care delivery. Experienced and trained health workers should assess all health-care activities to determine the precautions, including personal protective equipment that is indicated.

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