National infection control manual

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Man has known infections for a very long time. During the medieval ages the toll of various infections had its serious impact on mankind. Those infections included plague, Tuberculosis, Anthrax and many others. With the improvement of socioeconomic conditions, the advances in medicine and the discovery of new drugs; many of those serious infections have been controlled and checked.

Recently, a new order of infections has emerged causing serious threats to patients inside healthcare facilities, known as Healthcare associated infections. In the year 2002, the WHO recognized that the magnitude of this problem is enormous and in the year 2004, the World Health Alliance was formed in order to improve the situation of Healthcare associated infections. In the year 2005, the Global Patient Safety Challenge was formed. It recognized that the main threat to Patient Safety in health facilities was infection. The Global patient’s safety challenge decided to urge all countries to combat these infections in order to reduce and prevent them. I have signed on behalf of the FMOH this pledge which’s elements are:

- Recognize the importance of HAI.
- Use WHO strategies and guidelines to reduce HAI.
- Develop/enhance ongoing campaigning actions to promote hand hygiene.
- To make available reliable information of HAI to foster appropriate action.
- To share experiences in data.
- To work in close collaboration with local and international organizations to put this in effect.

The FMOH has established the structural framework and policy for a national infection control program to be implemented at all levels of health institutions all over the country. This manual has been developed by an expert committee to act as a reference and guidance to all those who are dealing with infection control. I herewith urge all parties involved at the various levels of health institutions all over the country to adhere to this manual so as to reach our ultimate goal of controlling and preventing Healthcare associated infections hence provide a safer care for all patients.

Dr. Tabita Botrus Shokai
Federal Minister of Health
Sudan
Forward

Health care associated infection is a global public health problem. According to the WHO, healthcare associated infections are the main threat to patient safety for patients admitted to healthcare institutions. It is estimated that at any one time, more than 1.4 million people worldwide are suffering from infections acquired from hospitals.

Sudan is no exception, therefore, it has become of paramount importance to develop the necessary plan and action to control these infections in order to achieve the ultimate goal of preventing them. The FMOH has looked seriously into this problem hence the framework within which these activities was established, the strategy of hand hygiene was adopted and finally the infection control manual which encompasses all these activities was developed. To translate this manual into action, a road map has also been developed, defining the responsibilities of the leadership of the organizations and the different bodies and personnel involved in the implementation of the national infection control program. Effective implementation of this manual requires the cooperation of all those involved and the co-ordination of their activities.

Finally, I would like to extend any thanks to the dedicated group of doctors who have worked hard to make it reality and my deep appreciation and gratitude goes to the WHO country office and in particular Dr. E. Tarin for his advise, immense and technical support.

I hereby urge all the managers of the healthcare organizations and all those involved to strictly adhere to this manual and the road map by both fulfilling their roles and supervising the role of others so we can achieve our set goals, and I am sure that we can succeed.

Dr. Kamal AbdelGadir Ahmed
Undersecretary FMOH
Sudan
Introduction

Healthcare-Associated infections (HAI), also referred to as nosocomial infections are defined as “infections occurring in patients during the process of care in a hospital or other healthcare facility and which were neither present nor incubating at the time of admission. They are a major safety issue affecting hundreds of millions of hospitalized patients every year. The magnitude of the problem is enormous in both developed and developing countries. The consequences include increased morbidity, disability, mortality and economic cost.

In Sudan returns from hospital statistics reveal that (HAI) are one of the major causes of mortality, besides a recent study has shown that 5.5% of inpatients develop adverse event; 37% develop disability but 83% of them were preventable. For this reason the federal ministry of health is engaged in intense efforts to develop national service standards to improve the quality of health care. There for a national infection control policy has been developed, the strategy of hand hygiene to reduce and prevent (HAI) has been adopted and finally the national infection control manual which serves as a guide for all the infection control activities in the country has been developed.

For the purpose of developing the infection control manual a multidisciplinary committee was formed. The committee agreed on the contents and chapters of the manual; which were divided between the members for writing. A Situation analysis was conducted, the literature reviewed and the individual chapters written and then reviewed by each member of the committee before finalization. The manual was then presented to the national infection control committee which endorse it, and later was endorsed by other stakeholders. I trust that all healthcare workers will religiously adhere to this manual in order to achieve our goal of reducing and preventing (HAI) and thus insure patient’s safety.

Dr. Elkhatiem Elias Mohamed, Chief Editor

Director of the Quality directorate

FMoH
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section 1

introduction to Health care associated infections
**Magnitude of the problem**

Healthcare-Associated Infections (HAI), also referred to as nosocomial infections are defined as "Infections occurring in patients during the process of care in a hospital or other healthcare facility and which were neither present nor incubating at the time of admission to the hospital. It also includes surgical site infections appearing 30 days after discharge from hospital, as well as occupational infections among staff of the facility.

**Other definition of HAI**: "Infections that occur among hospitalized patients and become manifest only after 48 hours of stay are called nosocomial. For surgical site infection till 30 days after operation or one year if there is any implant or prosthetic.

It is reported by the World Health Organization (WHO) and other authorities that hundreds of millions of patients worldwide are afflicted by HAIs each year and that more than 1.4 million people globally become seriously ill as a result of such infections at any particular time.

In the developed countries the overall prevalence of HAIs among hospitalized patients ranges between 5%-10% (5). The overall incidence in developing countries is 2-20 times higher and in some developing countries, the incidence can exceed 25%.

**Impact of HAIs**

The Impact of HAIs is enormous; it includes prolonged hospital stay, increased morbidity and disability, massive additional costs for patients and families alike, not to mention the horrid consequences of increased mortality and the increased incidence of microbial resistance to antibiotics.

**Present situation in Sudan**

Hospitalized patients are more at risk to develop infections for many reasons. These include surgery, invasive interventions, procedures and devices. The situation is made worse if the defences of the body are weakened as a result of certain diseases that weaken the immunity such as diabetes, malignancies or immuno-suppressive drugs.

A local survey was conducted in Sudan in an assessment of implementations of infection control program in 6 main federal Sudanese hospitals in the year 2006. The results were largely inconclusive and not reliable. In one of the hospitals pus was used as the sole indicator of surgical site infection and reported an infection rate of 12.5%. In the other 4 hospitals the reported infection rate was zero which probably meant that there was no active surveillance going on, and in one hospital the reported infection rate was 4.2% which was too good to be true in absence of an infection control programme with stringent surveillance going on. However, another study has reported an incidence of 9.6% which might not be far from the truth.
On the other hand in the annual statistical report of Sudanese federal ministry of health in the year 2006, septicaemia was reported as the 4th leading cause of death in hospitals and the 2nd cause in the year 2008, it’s highly probable that death due to septicaemia results from healthcare associated infections although it was not reported as such. It is also clear that comprehensive and accurate data from developing countries are scare. Sudan is no exception and in order to be able to deal with this problem effectively we will have to follow a dual tract; firstly to find the magnitude of the problem but more importantly to implement a sustained comprehensive infection control programme at all levels of health care. To do so, it is mandatory to develop a national infection control manual that sets the scene and acts as a fundamental tool for implementation which should be adhered to by all those concerned.

**Principles of infection control**

**Chain of infection**

Prior to start any measures designed to control infection one has to understand the links of infections which are:-

1. Causative agent
2. Infection reservoir
3. Portal of exist from the reservoir.
4. Mode of transmission
5. Portal of entry into the host
6. Susceptible host

Each link of these is necessary to be present in order for infection to proceed, and the aim of prevention or isolation is to interrupt these links in order to halt the progression of infection.

1. **Causative agent**
   
   Any micro-organism which is capable of producing disease whether bacteria, viruses, or fungi. These organisms may be acquired from outside (exogenous) or may be part of the patient flora which might flare up when the defences of the body are attenuated (endogenous).

2. **Reservoir of Infection**
   
   Environment or an object in which the organism can survive and multiply (human beings, or animals) for eg. HBV survives on the surface of haemodialysis machines but do not multiply on the surface and Pseudomonas survives in nebulisers.

   Infection reservoir in health facilities includes patients, staff, visitors, furniture, medical equipments, medication, food, water and blood. A human reservoir may be a case or a carrier who may have a sub-clinical or asymptomatic infection eg. HBV. Carriers of these categories usually pose a threat to patients because they may not be detected, while they continue to transmit infection, they may be described as the hidden pool of infection.
3- **Portal of exit**
This is the path by which the organism leaves the reservoir and it is usually where the organism grows eg. respiratory track, urinary track, Gastro intestinal track, mucus membranes, skin, etc.

4- **Mode of transmission**
This can be by inhalation into the respiratory track, by ingestion into the gastrointestinal track, by inoculation as a result of needle stick injuries or by contact through sexual intercourse or at times through the placenta. Of all the six links the mode of transmission is the easiest to break and is the most important in the control of cross infection in hospital.

**Contact Transmission**

**Direct contact**
The commonest mode of transmission in heath care facilities can be direct from person to person as from a health care worker to a patient during bathing, dressing, insertion of invasive devices; if the hand of the health care worker are contaminated eg. Scabies herpes simplex. Hand washing is the most effective way to prevent transmission by the contact route.

**Indirect Contact**
Occurs if a susceptible person comes into contact with contaminated objects like medical equipment. In this case, efficient cleaning, disinfection and sterilization are essential and necessary to interrupt and prevent infection acquired from contaminated objects.

**Droplet Transmission**
Results from droplets generated in aerosols from the respiratory tract as a result of forcible expiratory manoeuvres like coughing, sneezing and laughing. The droplet maybe large and can travel a distance of 1 metre but eventually settles to the ground and therefore a susceptible host has to be within short distance of the source in order to acquire the infection eg. Influenza, whooping cough.

**Airborne Transmission**
Occurs when smaller droplets remain suspended in the air for several hours and then inhaled by a susceptible person; a classical example being tuberculosis, measles and chicken pox.

5- **Portal of Entry**
This is usually the same as portal of exist eg. the portal of exist in a respiratory tract disease is the same as the portal of entry which is the respiratory tract.
6-Susceptible host

The human body has got several mechanisms of defence. In a normal person these defences work well and protect it against invading organisms but when these defences are weakened by diseases that affect the immunity adversely or by immunosuppressive drugs then it becomes at risk of acquiring the infection and subsequently becomes ill. It is worth mentioning that invasive procedure such as IV lines contribute to weakening the defence of the body, just like other diseases or immuno suppressive drugs albeit with varying degrees.

Strategies to Control Health Care Associated Infections:

These fall into three main strategies:

- Control or elimination of the infective agent
- Control of transmission
- Control of reservoir

Control or elimination of the infective agent:

This is achieved by placing patients or those who are suspected to have the disease under source isolation and apply barrier precautions. Infectious agents can be controlled or eliminated by effective cleaning, disinfection and sterilization of equipment and cleaning of environment.

Control of transmission

Achieved by hand washing, aseptic techniques and control of the health care environment. Proper hand washing has been shown to be the most effective strategy in preventing the spread of infection.

Control of reservoir:

Almost any piece of equipment used in health care facilities may harbour an organism and therefore act as a reservoir. Interventions directed at controlling or destroying infection reservoirs in health care facilities include using disposable equipment, or decontaminating equipment as soon as possible after use. In addition both the patients and HCWs may act as reservoirs.
**Programme Policy statement**

**Definition:** To describe the scope, services and core processes of the infection control programme.

- The organization utilises a well coordinated process in order to achieve the required objectives of reducing and preventing infection.
- A well functioning surveillance system based on case finding according to service, site and organism.
- Establishment of good recording and reporting system to the hospital management and to FMOH.
- The hospital takes action to prevent infections in patients, staff and visitors.
- The hospital infection control process in general focuses on reducing the risk and rates of HAIs in a sustained manner.

**A- Purpose of developing the infection control manual**

1. To describe the scope of the infection control programme, its elements, resources and process required to achieve its goals.
2. Describe the organizational structure at the different levels, the role of each and the definition of responsibilities of its members.
3. Serve as the fundamental tool of the programme to be distributed and adhered to by all concerned.

**B- Objectives of the infection control programme:**

The provision of an effective infection control programme is a key to quality; it services as a reflection of the standard of care provision so it aims at achieving the following objectives:

- Establish an organizational structure at all levels of health care to ensure that all activities of infection control are effectively carried out, well co-ordinated and monitored.
- Implementation of the hand hygiene as the main strategy to reduce and prevent HAIs.
- Monitor wards and clinics for infection incidence and develop adequate strategies for early detection and intervention for serious infection.
- Develop the appropriate surveillance system and isolation policies and implement when appropriate.
- Maintain a good standard of cleanliness and hygiene within the hospital.
• Monitor standards of medical and nursing care to ensure sound sterile and aseptic technique and adherence to other infection control practices.
• Monitor the health of HCWs and ensure the appropriate actions when necessary as well as developing and implementing an immunization policy.
• Conduct educational programmes to hospital staff on regular basis.
• Address any issue in the hospital that is related to or might influence control of infections.

**Hospital Infection Control Committee:**

<table>
<thead>
<tr>
<th>General Director of the Hospital - Chairman</th>
<th>Director of Quality Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection Control Coordinator</td>
<td>Head Department of Microbiology</td>
</tr>
<tr>
<td>Chief of Medical Services</td>
<td>Head Department of Medicine</td>
</tr>
<tr>
<td>Head Department of Surgery</td>
<td>Head of Department of Obstetrics and Gynaecology</td>
</tr>
<tr>
<td>Head Department of Theatre</td>
<td>Head Department of Intensive care Unit</td>
</tr>
<tr>
<td>Head Department of anaesthesia</td>
<td>Head Department of Accident and Emergency</td>
</tr>
<tr>
<td>Head of Support Services</td>
<td>Head of CSSD Department</td>
</tr>
<tr>
<td>Head of Nursing Services</td>
<td>Head of Pharmacy</td>
</tr>
<tr>
<td>Infection Control Team</td>
<td></td>
</tr>
</tbody>
</table>

The scope of the committee includes care of patients, personnel health as well as the environment.

**Major Responsibilities**

I- Review and approve the infection control policies developed by the infection control team.

II- Revise and evaluate on continuous basis the mechanisms and procedures developed by the infection control team to achieve standards.
III- Review the reports of HAIs surveillance submitted each month by the infection control team, suggest and suggest the appropriate actions to be taken.

IV- Review and approve the yearly plan submitted by the infection control team and make necessary modifications, empower implementation and give necessary support.

V- Each member of the committee should act as an advocate of infection control in his/her department, try to promote its principle and insure application of its role.

VI- Resource allocation of all materials and matters related to infection control.

VII- Implement the infection control policies.

**Infection control team**

The infection control team is comprised of an infection control doctor, a microbiologist and infection control nurses. The team is responsible for the day to day running of the infection control programme. Every acute hospital should have an infection control team. Smaller hospitals may liaise for infection control service with the nearest large hospital if they lack all necessary resources for it.

The role of the infection control team is to ensure that an effective infection control programme has been planned, it's implementation co-ordinated and it's impact evaluated. When some parts of the programme are under direct responsibilities of others, the team should provide advice, direction and co-ordination to ensure that all tasks have been accomplished successfully.

**Responsibilities of the infection control team**

- Production of an annual infection control plan with clearly defined objectives.
- Production of written policies and procedures of infection control including regular evaluation and updating.
- Surveillance of infections and detection of outbreaks at an early stage and provision of data that should be studied and evaluated to allow for any provision and allocation of resources or change in practices in order to control and prevent HAIs.
- Education of all categories of hospital staff on infection control policies, procedures and practice.
- Provide advice to all grades of staff on matters related to prevention of infection on day to day basis.
- Participate in the auditing activities related to infection control.
- Report to the hospital infection control committee.
**Roles and responsibilities of the infection control doctor (officer):**

- Responsible for the infection control activities of the quality directorate and a member of the infection control committee and team.
- Follow up the implementation of the infection control policies in all hospital departments.
- Evaluation of the infection control activities to find out the gaps and short comings in order to take corrective actions.
- Liaise and co-ordinate with the microbiologist and infection control nurse in technical matters related to infection control.
- Co-ordination with the appropriate department and personnel to ensure effective implementation of all policies and procedures.
- Develop with the microbiologist and the infection control nurse an annual infection control plan and submit it to the infection control committee.
- Submitting annual, periodic and monthly reports to ICC and Quality director of Federal Ministry of Health about incidence of infection, activity and progress of the implementation of the infection control programme of the hospital.
- Participation in setting educational programmes about infection control to hospital staff.
- Membership of relevant committees when infection control input is required.
- Participates in research projects addressing infection control issues.

**Roles and responsibilities of the infection control nurse:**

- A registered nurse with extra experience in general specialized nursing.
- A member of the infection control team and infection control committee.
- Report directly to the infection control doctor and microbiologist.
- Performs surveillance of HAIs in assigned units according to agreed definitions and criteria.
- Identify, investigate and monitor infections as well as hazardous practice and procedures.
- Initiate isolation measures for transmissible diseases and discontinue when indicated in consultation with the infection control doctor and the microbiologist.
- Provide recommendations to the nursing and medical staff on appropriate isolation precautions for known and suspected diseases.
• Document employees and patients exposure to infectious diseases for which protocols exist and follow them as required.
• Implement the immunization program for the HCWs.
• Participate in the development of the infection control plan with infection control doctor and microbiologist.
• Identify problems and issues related to infection control and consults with the infection control doctor and the microbiologist to find solutions for the problem.
• Participate in a new employee orientation and nursing service orientation to the infection control programme.
• Participate in the educational programmes about infection control.
• Membership of relevant committees when infection control input is required.
• Participate in research projects addressing infection control issues.
• Document diseases to be reported for meetings at the Federal Ministry of Health.

Roles and responsibilities of the infection control microbiologist:

• Head of the infection control team and member of the infection control committee.
• Serves as the specialist advisor and takes an active role in the infection control committee.
• Participates in developing the infection control plan with other members of the infection control team.
• Participates with other members of the infection control team in setting quality standards, surveillance, education and auditing in regard to hospital infection.
• Provide surveillance for unusual organisms and pattern of antibiotic sensitivity.
• Co-ordination of the infection control data collection within the lab.
• Participates in the preparation and approval of tender materials and documents for the support services.
• Participates in education and research programmes related to infection control.
• Supervision of the infection control doctor and nurse.
The Patient Safety Challenge

The Global Patient Safety Challenge has identified HAI as the main threat to patient safety inside hospital and recommended the adoption of hand hygiene as the main strategy to prevent and reduce HAI, wrapping up the previous four strategies;

- Safe clinical procedures
- Safe immunization and injection
- Safe blood transfusion procedures
- Safe sanitation and clean water supply

Constraints against prevention of HAI

- Lack of trained staff
- Poor facilities
- Inadequate training in life saving
- Inadequate emergency procedures and equipments
- Limited supply of drugs
- In addition surgical procedures carry an extra risk
- Lack of or non adherence to infection control policies particularly hand hygiene.

Common sites for HAI

- Urinary tract infections
- Respiratory infections
- Surgical site infections
- Blood infections

Risk factors for urinary tract infections

- Urinary catheters
- Urinary invasive procedures
- Advanced age
- Severe underlying disease
- Urolitiasis
• Pregnancy
• Diabetes
• Gender (female)

**Risk factors for respiratory infections**
• Prolonged hospital stay
• Aspiration
• Nasogastric tube
• Mechanical ventilation
• Advanced age
• Immunodeficiency
• Surgery
• Malnutrition

**Risk factors for surgical site infections**
• Incorrect surgical skin preparation
• Surgical intervention duration
• Type of wound
• Inappropriate wound care
• Poor surgical asepsis
• Diabetes
• Nutritional state
• Immunodeficiency
• Lack of training and supervision

**Risk factors for blood infections**
• Vascular catheter
• Neonatal or advanced age
• Severe underlying disease
• Neutropenia
• Immunodeficiency
• New invasive technology
• Critical care
• Lack of training and supervision.
Going hand in hand with the prevention strategies, we have to be able to diagnose the different HAIs early and treat them promptly and rationally. To be able to achieve this, one should abide by the following CDC criteria for diagnosing nosocomial infections prior to selecting the appropriate action or starting the specific treatment.

**CDC Definitions of Nosocomial Infections**

**Definitions of Nosocomial Infections**

The ability of data collectors to define infections as nosocomial and identify their sites consistently is of paramount importance. Use of uniform definitions is critical if data from one hospital are to be compared with those of another hospital or with an aggregated database. However, because the incubation period varies with the type of pathogen and to some extent with the patient’s underlying condition, each infection must be assessed individually for evidence that links it to the hospitalization.

**Special situations in which an infection is considered nosocomial:**

(a) infection that is acquired in the hospital but does not become evidence until after hospital discharge.

(b) infection in a neonate that results from passage through the birth canal.

**Special situations in which an infection is not considered nosocomial:**

(a) infection that is associated with a complication or extension of infection already present on admission, unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection,

(b) in an infant, an infection that is known or proved to have been acquired transplacentally (e.g., toxoplasmosis, rubella, cytomegalovirus, or syphilis) and becomes evident at or before 48 hours after birth.

**Conditions that are not considered to be infections:**

1) **colonization**, which is the presence of microorganisms (on skin, mucous membranes, in open wounds, or in excretions or secretions) that are not causing adverse clinical signs or symptoms, and

2) **inflammation**, which is a condition that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals.
The information that follows contains the criteria that comprise the definitions of nosocomial infections.

**Listing of Major and Specific Site Codes and Descriptions**

**UTI - Urinary Tract Infection**
- SUTI Symptomatic urinary tract infection
- ASB Asymptomatic bacteriuria
- OUTI Other infections of the urinary tract

**SSI- Surgical Site Infection**
- SKIN Superficial incisional site, except after CBGB
- SKNC After CBGB, report SKNC for superficial incisional infection at chest incision site
- SKNL After CBGB, report SKNL for superficial incisional infection at leg (donor) site
- ST Deep incisional surgical site infection, except after CBGB
- STC After CBGB, report STC for deep incisional surgical site infection at chest incision site
- STL After CBGB, report STL for deep incisional surgical site infection at leg (donor) site

**PNEU- Pneumonia**
- PNEU Pneumonia

**BSI- Bloodstream Infection**
- LCBI Laboratory-confirmed bloodstream infection
- CSEP Clinical sepsis

**CVS- Cardiovascular System Infection**
- VASC Arterial or venous infection

**EENT Eye, Ear, Nose, Throat, or Mouth Infection**
- CONJ Conjunctivitis
- EYE, other than conjunctivitis
- ORAL cavity (mouth, tongue, or gums)

**GI- Gastrointestinal System Infection:** HEP Hepatitis
Definitions of Infection Sites

INFECTION SITE: Symptomatic urinary tract infection

CODE: UTI-SUTI

DEFINITION: A symptomatic urinary tract infection must meet at least one of the following criteria:

Criterion 1: Patient has at least one of the following signs or symptoms with no other recognized cause: fever (.38°C), urgency, frequency, dysuria, or suprapubic tenderness and patient has a positive urine culture, that is, $10^5$ microorganisms per cm$^3$ or urine with no more than two species of microorganisms.

Criterion 2: Patient has at least two of the following signs or symptoms with no other recognized cause: fever (.38°C), urgency, frequency, dysuria, or suprapubic tenderness and at least one of the following:

a. positive dipstick for leukocyte esterase and/or nitrate

b. pyuria (urine specimen with >10 wbc/mm$^3$ or >3 wbc/high power field of un spun urine)

c. organisms seen on Gram stain of un spun urine

d. at least two urine cultures with repeated isolation of the same uropathogen (gram-negative bacteria or S. saprophyticus) with >10^2 colonies/ml in non voided specimens

e. >10^5 colonies/ml of a single uropathogen (gram-negative bacteria or S. saprophyticus) in a patient being treated with an effective antimicrobial agent for a urinary tract infection

f. physician diagnosis of a urinary tract infection

g. physician institutes appropriate therapy for a urinary tract infection.

Criterion 3: Patient <1 year of age has at least one of the following signs or symptoms with no other recognized cause: fever (.38°C), hypothermia (.37°C), apnea, bradycardia, dysuria, lethargy, or vomiting and patient has a positive urine culture, that is, $10^5$ microorganisms per cm$^3$ of urine with no more than two species of microorganisms.

Criterion 4: Patient <1 year of age has at least one of the following signs or symptoms with no other recognized cause: fever (.38°C), hypothermia (.37°C), apnea, bradycardia, dysuria, lethargy, or vomiting and at least one of the following:

a. positive dipstick for leukocyte esterase and/or nitrate
b. pyuria (urine specimen with >10 wbc/mm3 or .3 wbc/high power field of un spun urine)

c. organisms seen on gram stain or un spun urine

d. at least two urine cultures with repeated isolation of the same uropathogen (gram-negative bacteria or S. saprophyticus) with >102 colonies/ml in non voided specimens

e. >105 colonies/ml of a single uropathogen (gram-negative bacteria or S. saprophyticus) in a patient being treated with an effective antimicrobial agent for a urinary tract infection

f. physician diagnosis of a urinary tract infection

g. physician institutes appropriate therapy for a urinary tract infection.

COMMENTS:

• A positive culture of a urinary catheter tip is not an acceptable laboratory test to diagnose a urinary tract infection.

• Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization.

• In infants, a urine culture should be obtained by bladder catheterization or suprapubic aspiration; a positive urine culture from a bag specimen is unreliable and should be confirmed by a specimen aseptically obtained by catheterization or suprapubic aspiration.

INFECTION SITE: Asymptomatic bacteriuria

CODE: UTI-ASB

DEFINITION: An asymptomatic bacteriuria must meet at least one of the following criteria:

Criterion 1: Patient has had an indwelling urinary catheter within 7 days before the culture and patient has a positive urine culture, that is, >105 microorganisms per cm3 of urine with no more than two species of microorganisms and CDC Definitions of Nosocominal Infections patient has no fever (38° C), urgency, frequency, dysuria, or suprapubic tenderness.

Criterion 2: Patient has not had an indwelling urinary catheter within 7 days before the first positive culture and patient has had a least two positive urine cultures, that is, >105 microorganisms per cm3 of urine with repeated isolation of the same microorganism and
no more than two species of microorganisms and patient has no fever (.38° C), urgency, frequency, dysuria, or suprapubic tenderness.

**COMMENTS:**

- A positive culture of a urinary catheter tip is not an acceptable laboratory test to diagnose bacteriuria.
- Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization.

**INFECTION SITE:** Other infections of the urinary tract (kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric spaces)

**CODE:** SUTI-OUTI

**DEFINITION:** Other infections of the urinary tract must meet at least one of the following criteria:

**Criterion 1:** Patient has organisms isolated from culture of fluid (other than urine) or tissue from affected site.

**Criterion 2:** Patient has an abscess or other evidence of infection seen on direct examination, during a surgical operation, or during a histopathologic examination.

**Criterion 3:** Patient has at least two of the following signs or symptoms with no other recognized cause: fever (.38° C), localized pain, or localized tenderness at the involved site and at least one of the following:

  a. purulent drainage from affected site
  b. organisms cultured from blood that are compatible with suspected site of infection
  c. radiographic evidence of infection, e.g., abnormal ultrasound, CT scan, magnetic resonance imaging (MRI), or radionuclide scan (gallium, technetium)
  d. physician diagnosis of infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space
  e. physician institutes appropriate therapy for an infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space.

**Criterion 4:** Patient <1 year of age has at least one of the following signs or symptoms with no other recognized cause: fever (.38° C), hypothermia (.37° C), apnea, bradycardia, lethargy, or vomiting and at least one of the following:
a. purulent drainage from affected site

b. organisms cultured from blood that are compatible with suspected site of infection

c. radiographic evidence of infection, e.g., abnormal ultrasound, CT scan, magnetic resonance imaging (MRI), or radiolabel scan (gallium, technetium)

d. physician diagnosis of infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space

e. physician institutes appropriate therapy for an infection of the kidney, ureter, bladder, urethra, or tissues surrounding the retroperitoneal or perinephric space.

REPORTING INSTRUCTIONS:

• Report infections following circumcision in newborns as SST-CIRC.

INFECTION SITE: Surgical site infection (Superficial incisional)

CODE: SSI-(SKIN) except following the NNIS operative procedure, CBGBa. For CBGB only, if infection is at chest site, use SKNC (Skin-Chest) or if at leg (donor) site, use SKNL (Skin-Leg)

DEFINITION: A superficial SSI must meet the following criterion: Infection occurs within 30 days after the operative procedure and involves only skin and subcutaneous tissue of the incision and patient has at least one of the following:

a. purulent draining from the superficial incision

b. organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision

c. at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat, and superficial incision is deliberately opened by surgeon, unless incision is culture-negative

d. diagnosis of superficial incisional SSI by the surgeon or attending physician

REPORTING INSTRUCTIONS:

• Do not report a stitch abscess (minimal inflammation and discharge confined to the points of suture penetration) as an infection
• Do not report a localized stab wound infection as SSI, instead report as skin or soft tissue infection, depending on its depth.

• Report infection of the circumcision site in newborns as SST-CIRC. Circumcision is not a NNIS operative procedure.

• Report infection of the episiotomy site as REPR-EPIS. Episiotomy is not a NNIS operative procedure.

• Report infected burn wound as SST-BURN.

• If the incisional site infection involves or extends into the fascial and muscle layers, report as a deep incisional SSI.

• Classify infection that involves both superficial and deep incision sites as deep incisional SSI.

• Report culture specimen from superficial incisions as ID (incisional drainage).

**INFECTION SITE:** Surgical site infection (Deep incisional)

**CODE:** SSI-(ST [Soft Tissue]) except following the NNIS operative procedure, CBGB.*

For CBGB only, if infection is at chest site, use STC (Soft Tissue-Chest) or if at leg (donor) site, use STL (Soft Tissue-Leg)

**DEFINITION:** A deep incisional SSI must meet the following criterion:

Infection occurs within 30 days after the operative procedure if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operative procedure and *CBGB = coronary artery bypass graft with both chest and leg incisions.†A nonhuman derived implanted foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during surgery.

CDC Definitions of Nosocominal Infections involves deep soft tissues (e.g., fascial and muscle layers) of the incision and patient has at least one of the following:

a. purulent drainage from the deep incision but not from the organ/space component of the surgical site

b. a deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (.38° C), or localized pain or tenderness, unless incision is culture-negative
c. an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination

d. diagnosis of a deep incisional SSI by a surgeon or attending physician

REPORTING INSTRUCTIONS:

• Classify infection that involves both superficial and deep incision sites as deep incisional SSI.

• Report culture specimen from deep incisions as ID (incisional drainage).

INFECTION SITE: Surgical site infection (Organ/Space)

CODE: SSI-(Specific site of organ/space).

DEFINITION: An organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. Specific sites are assigned to organ/space SSI to further identify the location of the infection. Listed on this page are the specific sites that must be used to differentiate organ/space SSI. An example is appendectomy with subsequent subdiaphragmatic abscess, which would be reported as an organ/space SSI at the intraabdominal specific site (SSI-IAB).

An organ/space SSI must meet the following criterion:

Infection occurs within 30 days after the operative procedure if no implant* is left in place or within one year if implant is in place and the infection appears to be related to the operative procedure and infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure and patient has at least one of the following:

a. purulent drainage from a drain that is placed through a stab wound into the organ/space

b. organisms isolated from an aseptically obtained culture or fluid or tissue in the organ/space

c. an abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination

d. diagnosis of an organ/space SSI by a surgeon or attending physician
REPORTING INSTRUCTIONS:

• Occasionally an organ/space infection drains through the incision. Such infection generally does not involve reoperation and is considered a complication of the incision. Therefore, it is classified as a deep incisional SSI.

• Report culture specimen from organ/space as DD (deep drainage).

INFECTION SITE: Pneumonia

CODE: PNEU-PNEU

*A nonhuman derived implanted foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart or hip prosthesis) that is permanently placed in a patient during surgery.

DEFINITION: Pneumonia must meet at least one of the following criteria:

Criterion 1: Patient has rales or dullness to percussion on physical examination of the chest and at least one of the following:

a. new onset of purulent sputum or change in character of sputum

b. organisms cultured from blood

c. isolation of an etiologic agent from a specimen obtained by transtracheal aspirate, bronchial brushing, or biopsy.

Criterion 2: Patient has a chest radiographic examination that shows new or progressive infiltrate, consolidation, cavitation, or pleural effusion and at least one of the following:

a. new onset of purulent sputum or change in character of sputum

b. organisms cultured from blood

c. isolation of an etiologic agent from a specimen obtained by transtracheal aspirate, bronchial brushing, or biopsy

d. isolation of virus from or detection of viral antigen in respiratory secretions

e. diagnostic single antibody titer (IgM) or fourfold increase in paired sera (IgG) for pathogen

f. histopathologic evidence of pneumonia.
**Criterion 3:** Patient <1 year of age has at least two of the following signs or symptoms: apnea, tachypnea, bradycardia, wheezing, rhonchi, or cough and at least one of the following:

a. increased production of respiratory secretions

b. new onset of purulent sputum or change in character of sputum

c. organisms cultured from blood or diagnostic single antibody titer (IgM) or fourfold increase in paired sera (IgG) for pathogen

d. isolation of an etiologic agent from a specimen obtained by transtracheal aspirate, bronchial brushing, or biopsy

e. isolation of virus or detection of viral antigen in respiratory secretions

f. histopathologic evidence of pneumonia.

**Criterion 4:** Patient <1 year of age has a chest radiologic examination that shows new or progressive infiltrate, cavitation, consolidation, or pleural effusion and at least one of the following:

a. increased production of respiratory secretions

b. new onset of purulent sputum or change in character of sputum

c. organisms cultured from blood or diagnostic single antibody titer (IgM) or fourfold increase in paired sera (IgG) for pathogen

d. isolation of an etiologic agent from a specimen obtained by transtracheal aspirate, bronchial brushing, or biopsy

e. isolation of virus from or detection of viral antigen in respiratory secretions

f. histopathologic evidence of pneumonia

**COMMENTS:**

- Expectorated sputum cultured are not useful in the diagnosis of pneumonia but may help identify the etiologic agent and provide useful antimicrobial susceptibility data.

- Findings from serial chest x-rays may be more helpful than a single x-ray.
REPORTING INSTRUCTIONS:

• Report acute bronchitis as BRON.

• Report lung abscess or empyema as LUNG.

INFECTION SITE: Laboratory-confirmed bloodstream infection

CODE: BSI-LCBI

DEFINITION: Laboratory-confirmed bloodstream infection must meet at least one of the following criteria:

Criterion 1: Patient has a recognized pathogen cultured from one or more blood cultures and organism cultured from blood is not related to an infection at another site.

Criterion 2: Patient has at least one of the following signs or symptoms: fever (38° C), chills, or hypotension and at least one of the following: a. common skin contaminant (e.g., diphtheroids, Bacillus sp., Propionibacterium sp., coagulase-negative staphylococci, or micrococci) is cultured from two or more blood cultures drawn on separate occasions

b. common skin contaminant (e.g., diphtheroids, Bacillus sp., Propionibacterium sp., coagulase-negative staphylococci, or micrococci) is cultured from at least one blood culture from a patient with an intravascular line, and the physician institutes appropriate antimicrobial therapy

c. positive antigen test on blood (e.g., H. influenzae, S. pneumoniae, N. meningitidis, or group B Streptococcus) and signs and symptoms and positive laboratory results are not related to an infection at another site.

Criterion 3: Patient <1 year of age has at least one of the following signs or symptoms: fever (38° C), hypothermia (37° C), apnea, or bradycardia and at least one of the following:

a. common skin contaminant (e.g., diphtheroids, Bacillus sp., Propionibacterium sp., coagulase-negative staphylococci, or micrococci) is cultured from two or more blood cultures drawn on separate occasions

b. common skin contaminant (e.g., diphtheroids, Bacillus sp., Propionibacterium sp., coagulase-negative staphylococci, or micrococci) is cultured from at least one blood
culture from a patient with an intravascular line, and physician institutes appropriate antimicrobial therapy

c. positive antigen test on blood (e.g., H. influenzae, S. pneumoniae, N. meningitidis, or group B Streptococcus) and signs and symptoms and positive laboratory results are not related to an infection at another site.

**REPORTING INSTRUCTIONS:**

- Report purulent phlebitis confirmed with a positive semiquantitative culture of a catheter tip, but with either negative or no blood culture, as CVS-VASC.
- Report organisms cultured from blood as BSI-LCBI when no other site of infection is evident.
- Pseudobacteremias are not nosocomial infections.

**INFECTION SITE:** Clinical sepsis  
**CODE:** BSI-CSEP  
**DEFINITION:** Clinical sepsis must meet at least one of the following criteria:

**Criterion 1:** Patient has at least one of the following clinical signs or symptoms with no other recognized cause: fever (\(38^\circ\) C), hypotension (systolic pressure \#90 mm), or oliguria (\(,20 \text{ cm}^3 /\text{hr}\)) and blood culture not done or no organisms or antigen detected in blood and no apparent infection at another site and physician institutes treatment for sepsis.

**Criterion 2:** Patient \(<1\) year of age has at least one of the following clinical signs or symptoms with no other recognized cause: fever (\(38^\circ\) C), hypothermia (\(37^\circ\)C), apnea, or bradycardia and blood culture not done or no organisms or antigen detected in blood and no apparent infection at another site and physician institutes treatment for sepsis.

**REPORTING INSTRUCTIONS:**

- Report culture-positive infections of the blood stream as BSI-LCBI.
**INFECTION SITE:** Arterial or venous infection  
**CODE:** CVS-VASC  
**DEFINITION:** Arterial or venous infection must meet at least one of the following criteria:  

**Criterion 1:** Patient has organisms cultured from arteries or veins removed during a surgical operation and blood cultured not done or no organisms cultured from blood.  

**Criterion 2:** Patient has evidence of arterial or venous infection seen during a surgical operation or histopathologic examination.  

**Criterion 3:** Patient has at least one of the following signs or symptoms with no other recognized cause: fever (.38°C), pain, erythema, or heat at involved vascular site and more than 15 colonies cultured from intravascular cannula tip using semi quantitative culture method and blood culture not done or no organisms cultured from blood.  

**Criterion 4:** Patient has purulent drainage at involved vascular site and blood culture not done or no organisms cultured from blood.  

**Criterion 5:** Patient <1 year of age has at least one of the following signs or symptoms with no other recognized cause: fever (.38°C), hypothermia (.37°C), apnea, bradycardia, lethargy, or pain, erythema, or heat at involved vascular site and more than 15 colonies cultured from intravascular cannula tip using semi quantitative culture method and blood culture not done or no organisms cultured from blood.  

**REPORTING INSTRUCTIONS:**  
- Report infections of an arteriovenous graft, shunt, or fistula or intravascular cannulation site without organisms cultured from blood as CVS-VASC.  
- Report intravascular infections with organisms cultured from the blood as BSI-LCBI.  

**INFECTION SITE:** Conjunctivitis  
**CODE:** EENT-CONJ  
**DEFINITION:** Conjunctivitis must meet at least one of the following criteria:  

**Criterion 1:** Patient has pathogens cultured from purulent exudate obtained from the conjunctiva or contiguous tissues, such as eyelid, cornea, meibomian glands, or lacrimal glands.
**Criterion 2**: Patient has pain or redness of conjunctiva or around eye and at least one of the following:

a. WBCs and organisms seen on Gram stain of exudate

b. purulent exudate

c. positive antigen test (e.g., ELISA or IF for Chlamydia trachomatis, herpes simplex virus, adenovirus) on exudates or conjunctival scraping

d. multinucleated giant cells seen on microscopic examination of conjunctival exudate or scrapings

e. positive viral culture

f. diagnostic single antibody titer (IgM) or fourfold increase in paired sera (IgG) for pathogen.

**REPORTING INSTRUCTIONS:**

- Report other infections of the eye as EYE.

- Do not report chemical conjunctivitis caused by silver nitrate (AgNO₃) as a nosocomial infection.

- Do not report conjunctivitis that occurs as a part of a more widely disseminated viral illness (such as measles, chicken-pox, or a URI).

**INFECTION SITE**: Oral cavity (mouth, tongue, or gums)

**CODE**: EENT-ORA

**DEFINITION**: Oral cavity infections must meet at least one of the following criteria:

**Criterion 1**: Patient has organisms cultured from purulent material from tissues or oral cavity.

**Criterion 2**: Patient has an abscess or other evidence of oral cavity infection seen on direct examination, during a surgical operation, or during a histopathologic examination.

**Criterion 3**: Patient has at least one of the following signs or symptoms with no other recognized cause: abscess, ulceration, or raised white patches on inflamed mucosa, or plaques on oral mucosa and at least one of the following:
a. organisms seen on Gram stain
b. positive KOH (potassium hydroxide) stain
c. multinucleated giant cells seen on microscopic examination of mucosal scrapings
d. positive antigen test on oral secretions
e. diagnostic single antibody tier (IgM) or fourfold increase in paired sera (IgG) for pathogen
f. physician diagnosis of infection and treatment with topical or oral antifungal therapy.

REPORTING INSTRUCTIONS:

• Report nosocomial primary herpes simplex infections of the oral cavity as ORAL; recurrent herpes infections are not nosocomial.

INFECTION SITE: Hepatitis

CODE: GI-HEP

DEFINITION: Hepatitis must meet the following criterion:

Patient has at least two of the following signs or symptoms with no other recognized cause: fever (≥38°C), anorexia, nausea, vomiting, abdominal pain, jaundice, or history of transfusion within the previous 3 months and at least one of the following:

a. positive antigen or antibody test for hepatitis A, hepatitis B, hepatitis C, or delta hepatitis
b. abnormal liver function tests (e.g., elevated ALT/AST, bilirubin)
c. Cytomegalovirus (CMV) detected in urine or oropharyngeal secretions.

REPORTING INSTRUCTIONS:

• Do not report hepatitis or jaundice of noninfectious origin (e.g., alpha-1 antitrypsin deficiency)

• Do not report hepatitis or jaundice that results from exposure to hepatotoxins (alcoholic or acetaminophen-induced hepatitis, etc.).

• Do not report hepatitis or jaundice that results from biliary obstruction (cholecystitis).
section 2

prevention of Heath care associated infections
**Standard Precautions:**

Standard Precautions apply to all patients regardless of their diagnosis or suspected infection status. Standard Precautions apply to the following:

1. Blood.

2. All body fluids, secretions and excretions except sweat whether or not they contain visible blood.

3. Non-intact skin.


Standard Precautions include:

1- **Hand hygiene**:

   Hands must be decontaminated immediately before each and every episode of direct patient contact / care and after any activity or contact that potentially results in hands becoming contaminated.

   - All areas of broken skin, cuts or abrasions must be covered in a waterproof dressing whilst in clinical areas.
   - Further guidance can be sought by referring to the section "Hand Hygiene".

2- **Use of Personal Protective Equipment**:

   - The primary use of Personal Protective Equipment (PPE) is to protect staff and reduce the opportunities for transmission of micro-organisms

   - Selection of PPE must be made following an assessment of the risk of transmission of microorganisms to the patient or to the carer, and the risk of contamination of the healthcare worker’s clothing and skin and mucous membranes by patient's blood, body fluids, secretions and excretions.

   - Everyone involved in providing care should be educated about standard precautions and trained in the use of PPE.

   **Types of personal protective equipment**:

   ◆ **Gloves**:

   - Gloves must be worn for invasive procedures, or contact with sterile sites, and non-intact skin or mucous membranes and all activities that have been assessed
as carrying a risk of exposure to blood, body fluids, secretions and excretions; and when handling sharp or contaminated instruments.

- Gloves must be worn as single use items. They must be put on immediately before an episode of patient contact or treatment and removed as soon as the activity is completed.
- Gloves must be changed between patients, or between different care/treatment activities for the same patient. Hands must be decontaminated before gloves are worn and as soon as they are removed.
- Gloves must be disposed of as clinical waste and hands decontaminated after the gloves have been removed, either with an alcohol hand rub or with Soap and Water.

◆ **Aprons/gowns:**
- Aprons must be worn when there is close contact with the patient, materials or equipment and where there is a risk that clothing may become contaminated with pathogenic micro organisms or blood, body fluids, secretions or excretions.
- Full-body fluid repellent gowns must be worn where there is a risk of extensive splashing of blood, body fluids, secretions or excretions, onto the skin or clothing of healthcare personnel i.e. when assisting in childbirth.

◆ **Face Masks, Goggles**
- Facemasks and eye protection must be worn when there is a risk of blood, bodily fluids, secretions or excretions splashing into the face and eyes.
- Respiratory protective equipment i.e. a particulate filter mask must be used when caring of patients with respiratory infections transmitted by airborne particles.

3 Safe Use and Disposal of Sharps:

- The safe handling and disposal of sharp instruments is an important part of the overall strategy to protect staff, patients and visitors from exposure to blood borne pathogens. All staff both clinical and non-clinical must be aware of their responsibilities in avoiding needle stick injuries.
- Sharps must not be passed directly from hand to hand and handling should be kept to a minimum.
- Needles must not be resheathed, bent broken or disassembled during use or before disposal.
- Used sharps must be discarded into a sharps container at the point of use by the user.
• The bin must not be filled above the mark that indicates that it is full.
• All Sharps Bins must be assembled and labelled correctly.
• All sharps bins should be positioned out of reach of children at a height that enables safe disposal by all members of staff. They should be secure to avoid spillage.
• All staff both clinical and non-clinical must be educated about the safe use and disposal of sharps.

4 - Safe management of blood or body fluid spillages:
• It is the responsibility of clinical staff to immediately deal with any spillage of blood or other body fluid, to minimise the risk of transmission of microorganisms.
• Any spillage of blood or body fluid visibly containing blood should be treated with Chlorine releasing granules 10,000 ppm and left insitu for 2 minutes. The spill can then be safely cleared up, wearing appropriate PPE (aprons and gloves), the area should then be washed with hot water and detergent.
• Spillages of urine must be dealt with promptly using hot water and detergent. If the urine is visibly contaminated with blood, soak up the spillage with towels and then clean the area with 10000-ppm available chlorine. The appropriate PPE must be worn.

5- Safe Handling of Laundry:
• Linen must be handled correctly to reduce the risk of cross-infection to healthcare staff and all linen handlers.
• Further guidance can be sought by referring to the section “Hospital hygiene”.

6- Handling of Healthcare Waste:
• The Hazardous Waste regulations (2005), define Clinical waste as:
"Any waste which consists wholly or partly of animal or human tissue, blood or other body fluids, excretions, drugs or other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous to any person coming in contact with it; and any other waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar practice, investigation, treatment, care, teaching or research, or the collection of blood for transfusion, being waste which may cause infection to any person coming in contact with it“.
• All waste must be handled, segregated and disposed of in accordance with the section “Healthcare Waste management”.

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7- Decontamination of equipment and the environment:

- Equipment must be thoroughly cleaned and decontaminated between each patient use and when visibly soiled using the appropriate cleaning agent in accordance with Manufacturer's guidance.
- Further guidance can be sought from the section "Sterilization, Disinfection and Cleaning"
Hand hygiene

Most patient deaths and suffering attributable to health care-associated infections can be prevented. Low-cost and simple practices already exist to prevent these infections. Hand hygiene, a very simple action, remains the primary measure to reduce health care-associated infection.

Hand hygiene:
A general term that applies to hand washing, antiseptic hand washing, alcohol hand rub, or surgical hand scrub.

Handwashing: Washing hands with soap and water
Antiseptic handwashing: Washing hands with an antiseptic soap
Alcohol-based handrub: Rubbing hands with an alcohol-containing preparation

Surgical hand scrub: hand washing or using an alcohol-based hand rub before operations by surgical personnel.

Visibly soiled hands: Hands showing visible dirt or contaminated with blood, or other body fluids.
- Objective: Stop transmission of pathogens via hands

A- Normal Bacterial Skin Flora
- To understand the objectives of different approaches to hand cleansing, a knowledge of normal bacterial skin flora is essential. Normal human skin is colonized with bacteria; different areas of the body have varied total aerobic bacterial counts.
- Bacteria recovered from the hands are divided into two categories: transient and resident (Transient flora, which colonize the superficial layers of the skin, are more amenable to removal by routine hand washing. They are often acquired by HCWs during direct contact with patients or contact with contaminated environmental surfaces within close proximity of the patient. Transient flora are the organisms most frequently associated with health-care-associated infections.
- Resident flora, which are attached to deeper layers of the skin, are more resistant to removal (e.g., coagulase-negative staphylococci and diphtheroids) are less likely to be associated with such infections. The hands of HCWs may become persistently colonized with pathogenic flora (e.g., S. aureus), gram-negative bacilli, or yeast.
B- The high 5 moments for hand hygiene (see appendix)

Hand hygiene with either alcohol hand rub or soap and water is required:

a- Before patients contact.
b- Before a septic task.
c- After body fluid exposure risk.
d- After patients contact.
e- After contact with patient’s surroundings.

C- Indications for handwashing and hand antisepsis

- Wash hands with soap and water when visibly dirty or contaminated with proteinaceous material, or visibly soiled with blood or other body fluids, or if exposure to potential spore-forming organisms is strongly suspected or proven or after using the toilet.
- Preferably use an alcohol-based hand rub for routine hand antisepsis in all other clinical situations if hands are not visibly soiled. alternatively, wash hands with soap and water.

D- Perform hand hygiene:

- before and after having direct contact with patients
- after removing gloves
- before handling an invasive device (regardless of whether or not gloves are used) for patient care
- after contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings.
- if moving from a contaminated body site to a clean body site during patient care.
- after contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient.
- Wash hands with either plain or antimicrobial soap and water or rub hands with
- an alcohol-based formulation before handling medication and preparing food.
- When alcohol-based hand rub is already used, do not use antimicrobial soap concomitantly.
2- **Soap and water required:**
- Before eating
- After using the toilet
- Any time hands are visibly soiled
- After caring for a patient on contact precautions for C. difficile or other spore forming organisms, rotavirus or norovirus. The physical action of washing and rinsing hands is recommended because alcohols, chlohexidine, iodophores, and other antiseptic agents have poor activity against spores.
- Before caring for a patient with a food allergy.

**E- Routine hand hygiene techniques:**

1- Hand cleansing with alcohol-based hand rub can be accomplished by applying a thumbnail-sized amount of alcohol into the palm and briskly rubbing over all surfaces until the hands are dry.

2. Hand washing with soap and water can be accomplished in the following manner:
   a - Wet hands with water.
   b - Apply soap.
   c - Vigorously rub together all surfaces of lathered hands for 15 seconds.
   d - Thoroughly rinse hands under a stream of water.
   e - Dry hands with a paper towel.
   f - Use a dry paper towel to turn off faucets to avoid recontamination.

3. Apply lotion often (approved lotion) to help maintain the integrity of the skin and help reduce skin irritation.

**F- Artificial fingernails:**

- Any individual whose responsibilities include handling sterile supplies and/or direct, hands-on Patient contact may only have natural fingernails.
- Artificial fingernails are NOT permitted because of documented outbreaks of infection due to Gram-negative bacteria and fungi that have been associated with the use of artificial nails. Gram negative bacteria are known to adhere to the surfaces of artificial nails, and are known to persist there even after the appropriate use of hand hygiene.

**G- Patient education:**

- Staff is encouraged to educate patients and their families to practice hand hygiene measures while in the facility.
• Staff is encouraged to educate patients and families to remind healthcare workers of hand hygiene.

Recommendations for surgical hand preparation:

• If hands are visibly soiled, wash hands with a plain soap before surgical hand preparation.
• Remove debris from underneath fingernails using a nail cleaner, preferably under running water.
• Sinks should be designed to decrease the risk of splashes.
• Remove rings, watches, and bracelets before beginning surgical hand preparation, artificial nails are prohibited.
• Surgical hand antisepsis should be performed using either an antimicrobial soap or an alcohol-based hand rub, according to the WHO formula.
• sterile gloves.
• If quality of water is not assured in the operating theatre, surgical hand antisepsis using an alcohol-based hand rub is recommended before donning sterile gloves when performing surgical procedures.
• When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, 2 to 5 min. Long scrub times (e.g. 10 min) are not necessary.
• When using an alcohol-based surgical hand rub product with sustained activity, follow the manufacturer’s instructions. Apply the product on dry hands only. Do not combine surgical hand scrub and surgical hand rub with alcohol-based products sequentially.
• When using the alcohol-based product, use sufficient product to keep hands and forearms wet with the hand rub throughout the procedure.
• After application of the alcohol-based product, allow hands and forearms to dry thoroughly before donning sterile gloves.

Preparation of 1000 ml of alcohol hanrub:

Formula (1):
1. Ethanol 96% (883.3 ml)
2. Hydrogen peroxide 3% (41.7 ml)
3. Glycerol 98% (14.5 ml)
4. Complete the rest to 1000 ml by adding sterile distilled or boiled cold water, and then mix the solution by shaking.
Formula (2):
1. Isopropyl alcohol 99.8%
2. Hydrogen peroxide 3%
3. Glycerol 98%
4. Complete the rest to 1000 ml by adding sterile distilled or boiled cold water, and then mix the solution by shaking

➢ Place the bottles of alcohol handrub in a quarantine for 72 hours before use. This allows time for any spores present in the alcohol or the new/re-used bottles to be destroyed.

Important Points to Note:

• When bar soap is in use, it should be kept dry to prevent contamination with microorganisms that grow in moist conditions.
• Liquid soap dispensers should be regularly cleaned and maintained.
• Gloves should not be regarded as a substitute for hand hygiene. A glove is not always a complete impermeable barrier (20-30% of surgical gloves are punctured during surgery). However, gloves reduce very substantially the number of microorganisms being transferred to the patient or to the HCW who is wearing the gloves. Gloves also provide some protection against the transmission of blood-borne viruses.
• In an epidemic situation, hand hygiene and the use of gloves are important protective measures to prevent the transmission of infectious agents to susceptible patients or staff. The same glove must not be worn from one patient to another patient, or between clean and dirty procedures on the same patient.
• An alcoholic rub or hand wash should be performed after removing gloves and before sterile gloves are

Hand hygiene technique:

• see appendix
Transmission-Based Precautions (isolation precautions):

- Isolation precautions may be required in addition to standard infection control precautions, for in-patients who are known or suspected to be infected with organisms to prevent cross infection to other patients, staff and visitors.
- An assessment must be made of the physical and psychological safety of patients prior to placement in isolation. For patients who may be at risk in isolation due to their mental health state, and where isolation is a high priority to prevent an outbreak of an infectious disease additional supervision will be needed. All cases will need to be assessed individually and discussed with the infection control doctor.
- Clinical staff must receive training on isolation precautions for specific infections.
- For all isolation precautions an isolation card must be placed on the door of the isolation room, ensuring that patient confidentiality is maintained. All staff including domestic staff must be aware that isolation is in progress, and be aware of the specific precautions that will need to be taken.
- Types of precautions: Airborne, Contact and Droplet are to be used in addition to Standard Precautions which must be followed for every patient, regardless of whether the disease has been identified or not.
- Consider all waste from an isolation room as infectious waste.
- Proper hand hygiene should be followed before and after every patient contact or contact with the patient environment.
- Terminal cleaning (Washing walls) is not indicated unless there is obvious contamination on the surfaces. The privacy curtains should be changed in contact precautions.

Airborne Precautions:

- Used to prevent the transmission of infections that are transmitted by droplet nuclei that can remain suspended in the air for considerable lengths of time and may be dispersed over long distances.
- reduce risk of transmission by dissemination of airborne droplet nuclei size ≤ 5µm
- Use this type of precautions for:
  - Pulmonary tuberculosis- until 3 negative sputum smears are obtained
  - Measles- for the duration of the illness
  - Chicken Pox- until lesions are crusted (see also contact precautions)
  - Herpes Zoster- disseminated in immune-compromised hosts- until lesions are crusted
SARS—for the duration of the illness (see also contact precautions)

Specific Procedures for Airborne precautions:

Placement of Patient:
- Use a private room with negative pressure ventilation Or Use a portable HEPA filter in a private room with the door closed until one of the above rooms is available

Notifications:
- Place Airborne precautions sign on the door of the room

Respiratory Protection:
- All personnel entering the room must wear one of the following types of respiratory protection: N-95 respirator, N-100 respirator or the portable HEPA hood.
- The HEPA hood should be cleaned between users. Wipe down with the hospital disinfectant wipes and allow to dry.

Patient Considerations:
- Patient should remain in the room with the door closed at all times For tests that cannot be done in the room, schedule patient for the last test or surgery of the day. All non-emergent surgeries should be delayed until the patient no longer requires precautions.
- Patients should be asked to cover their nose and mouth when coughing and sneezing.
- Limit visitors and do not allow young children to visit

Personal Protective Equipment
- Gloves and gown are not indicated, except as normally used for standard precautions or when used in conjunction with Contact Precautions

Equipment
- Stethoscope and blood pressure monitor: Cleanse after each use
- Thermometers: cleanse after each use
- Linen and dishes: No special precautions
- Sputum and other specimens: Handle as all others

Transport of patients
- Have patient wear a surgical mask to contain secretions, notify the receiving department.
Cleaning:
- Routine cleaning should be done, with staff wearing the proper respiratory protection

**Contact precautions:**
- Reduce risk of transmission by direct or indirect contact (skin-to-skin, or contaminated intermediate object)

**Specific Procedures for Contact precautions:**
- Used to prevent the transmission of infections that are transmitted by bacteria or other organisms that can be transmitted by direct contact with the patient's skin or other mucous membranes, or by indirect contact with the patient's environment.
- Use this type of precautions for:
  1. Antibiotic resistant organisms -such as MRSA, VRE, or other organisms that are only susceptible to one antibiotic or no antibiotics.
  2. Chickenpox- (Also see Airborne precautions)- until lesions are crusted over
  3. Clostridium Difficile Colitis- until diarrhea has stopped
  4. Conjunctivitis- Acute viral- for the duration of the illness
  5. Group A streptococcal necrotizing fasciitis- until culture negative (see also droplet precautions
  6. Scabies- For 24 hours after therapy is initiated

**Placement of Patient:**
- Use a private room or place patient with other patient with same organism

**Notifications:**
- Place Contact precautions sign on the door of the room

**Personal Protective Equipment:**
- Respiratory protection is not needed except when used in conjunction with Airborne or Droplet Precautions.
- Gloves and gowns are indicated, mask or respirator if used in conjunction with Airborne or Droplet Precautions
• All personnel entering the room must wear gloves and gown. Gowns are not to be worn out of the room except when involved with the transport that will necessitate contact with the patient during the transport.
• All linen is handled the same, no special procedures are needed for linen

Patient Considerations:
• Patient should remain in the room with the door closed at all times
• For tests that cannot be done in the room, schedule patient for the last test or surgery of the day. All non-emergent surgeries should be delayed until the patient no longer requires precautions, if possible.
• Limit visitors; instruct them how to protect themselves by wearing gloves and washing hands.

Equipment:
• If possible, dedicate equipment to the room
  - Stethoscope and blood pressure monitor: Cleanse after each use
  - Thermometers: cleanse after each use
  - Linen and dishes: No special precautions
  - Sputum and other specimens: Handle as all others

Transport of patient
Place clean sheet over patient during transport. Clean gurney or wheel chair before and after each transport. Wash hands after removing gloves and other Personal protective equipment.

Cleaning:
• RE-useable instruments should be thoroughly cleaned before using on another patient
• Routine cleaning should be done, with staff wearing the proper personal protective equipment.
**Droplet precautions:**

- Reduce risk of transmission with large-particle droplets (≥ 5µm)

**Specific Procedures for Droplet precautions:**

- Used to prevent the transmission of infections that are transmitted by bacteria or other organisms that can be transmitted by means of inhalation of large particle droplets that are produced when coughing, sneezing, or talking.
- Use this type of precautions for:
  1. Meningitis, meningococcemia and meningococcal pneumonia for 24 hours after the initiation of appropriate therapy.
  2. Influenza-duration of illness
  3. Mumps- for 9 days after the onset of swelling
  4. Parvovirus-duration of illness
  5. Rubella-for 7 days after onset of rash

**Placement of Patient:**

- Use a private room

**Notifications:**

- Place Droplet precautions sign on the door of the room.

**Personal Protective Equipment:**

- Surgical masks should be worn when within three feet of the patient, Gowns are not indicated except as needed for standard precautions and if used in conjunction with Contact Precautions.

**Patient Considerations:**

- Patient should remain in the room
- For tests that cannot be done in the room, schedule patient for the last test or surgery of the day., All non-emergent surgeries should be delayed until the patient no longer requires precautions, if possible.
- Limit visitors; instruct them how to protect themselves by wearing mask within three feet of the patient
Equipment:
- If possible, dedicate equipment to the room
  - Stethoscope and blood pressure monitor: Cleanse after each use
  - Thermometers: cleanse after each use
  - Linen and dishes: No special precautions
  - Sputum and other specimens: Handle as all others; for CSF samples, label and hand carry to lab.

Transport of patient:
- Have patient wear surgical mask.
- Clean gurney or wheel chair before and after each transport.
- Wash hands after removing gloves and other Personal protective equipment

Cleaning:
- RE-useable instruments should be thoroughly cleaned before using on another patient
- Routine cleaning should be done, with staff wearing the proper personal protective equipment.
The prevention of infection associated with urinary catheterization

I. **consideration prior catheterization**:  
1. Urethral catheterization should be considered as a minor surgical procedure.  
2. Urinary catheter must be inserted using an aseptic technique and sterile equipment.  
3. Before the procedure, efficient and effective cleaning of the area and surface should be done.  
4. Aseptic technique should be maintained thought the procedure.  
5. Only close urinary drainage system should be used.  
6. Before the procedure, check the expiry dates, integrity of packing and the correct amount of the sterile water required to be inserted if the device has a balloon.  
7. Prior the insertion, the procedure must be explained to the patients to relieve their fear and anxiety.  
8. Use a small catheter as possible, consistent with good drainage to minimize urethral trauma

II. **catheter insertion**:  
1. All equipment used must be sterile. Prepare in trolley all times required, keep open and should be accessible.  
2. Do hand washing with antiseptic.  
3. Wear sterile gloves and use (no touch) aseptic technique. A second pair of gloves should be available in case any contamination occur.  
4. Thoroughly clean peri-urethral area in a wiping motion from front to back to avoid fecal contamination using sterile water or saline and dry. In male, grasp the distal shaft of the penis and retract the foreskin. Cleanse the glans with povidone iodine or 2% chlorohexidine. In female, separate the labia and cleanse with povidone iodone or 2% chlorohexadine the vulva using front to back technique.  
5. Use a single-use sachets of lubricants gel on the catheter prior the insertion to reduce friction and trauma to meatus. A sterile anesthetic gel (2% lignocaine) can be instilled into the urethra to minimize pain. But allow 2-3 minutes for it to take anesthetic effect before catheterization.
6. Gently insert the catheter and advance it by holding the inner sterile sleeves, avoiding contact with non-sterile surfaces. Use (no touch) technique avoiding contact the sterile shaft of the catheter.

7. Inflate the balloon by instilling the manufacturer's recommended amount of sterile water. If the site is to be dressed (e.g. supra pubic), the dressings surrounding the device must be sterile.

8. Connect catheters with sterile, closed urinary drainage system.

9. Hang the drainage bag below the level of the bed to avoid reflux of urine and prevent the bag from touch the floor.

10. Secure the catheter to the patient's thigh or abdomen to prevent movement and meatal ulceration.

11. Remove gloves and wash

III. Maintenance of catheter:

A. Meatal care:
   a. Meatal cleansing should be performed at intervals to keep meatus free of encrustations and contamination.
   b. If fecal incontinence occurs, the perineum must be cleaned and the catheter changed without delay.

B. Drainage bag:
   a. Position the drainage bag and tubing below the level of the patient's bladder to maintain flow by gravity.
   b. Attached the drainage bag with a holder to the bed frame and avoid contact with the floor.

C. Emptying the drainage bag:
   a. Empty the drainage bag regularly (e.g. 8 hourly or earlier if it fills rapidly) via the drainage tap at the bottom of the drainage bag to maintain free flow and to prevent reflux.
   b. Hands must be disinfected and non-sterile disposal gloves must be worn before emptying each bag.
   c. Use alcohol swabs to decontaminate the outlet before and after emptying the bag.
   d. When emptying a drainage bag, use separate container for each patient and avoid contact between the urinary drainage tap and the container.
e. The spout from the tap must be completely emptied to minimize a build-up of the organism in the stagnant urine.

f. When the bag is emptied, securely close the tap.

g. After emptying the drainage bags, discard gloves and do hand washing.

D. Bladder irrigation:

a. Irrigation should be avoided unless obstruction is anticipated (e.g. as might occur with bleeding after prostatic or bladder surgery); closed continuous irrigation may be used to prevent obstruction. To relieve obstruction due to clots, mucus, or other causes an intermitted method of irrigation may be used. Routine bladder irrigation washout with antiseptics (e.g. chlorhexidine) or antimicrobial agents does not prevent catheter-associated infection and should not be used.

b. The catheter-tubing junction should be disinfected before disconnection.

c. A large-volume syringe and sterile irrigant should be used and then discarded. The person performing irrigation should be use aseptic technique.

d. Continuous or intermittent bladder irrigation may be indicated during urological surgery or to manage obstruction with the advice of urologist.

e. If the catheter becomes obstructed and can be kept open only by frequent irrigation, the catheter should be changed, as it is likely that the catheter itself is contributing the obstruction.

E. Specimen collection:

a. Obtain urine sample from a sampling report.

b. Do not disconnect drainage bag to obtain a sample as this cause interruption to the closed drainage system and may pose a risk of infection to the patient.

c. Do not obtain a sample for bacteriological culture from the drainage bag.

d. Disinfect the sampling port by wiping with 70% isopropyl alcohol swab.

e. Aspirate urine using a sterile small bore needle and syringe and transfer into a sterile container.

f. Larger volumes of urine for special analysis should be obtained aseptically from the drainage bag.
IV. **Removal of the catheter:**

The optimal time limit for replacing catheter depends upon the individual circumstances and the type of catheter used. Urinary catheter should not be changed as long as they are functioning well but only when there are signs of infection, recurrent obstruction, leakage and fecal contamination.

V. **Use of anti microbial agent:**

Routine administration of prophylactic antibiotics in catheterization patients and at the time of catheter removal is not recommended. Use of antibiotics in the presence of the catheter often results in infection with a more resistant strain of bacteria. Patients should be treated with antibiotics only if there is evidence of clinical infection.
The prevention of surgical site infection

A. preparation of the patient:

1. Control serum blood glucose preoperatively in all diabetic patients and in the immediate postoperative period (48 hours)

2. Encourage tobacco cessation to at least 30 days before elective operations (e.g. smoking cigarettes, cigars pipe etc)

3. Identify and treat all infections remote to the surgical site before elective operations; postpone elective operation until treated.

4. Keep preoperative stay as short as possible to prevent succeed infection.

5. Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation.

6. If hair is removed it should be removed immediately before the operation using an electric clippers rather than razors or depilatories (if the electric clippers are used, head must be sterile. Razors and shaving brushes should not be used)

7. Thoroughly wash and clean at and around the incision site to remove gross contamination before performing antiseptic skin preparation.

8. Use an acceptable antiseptic skin agent for skin preparation such as 2% cholorhexadine or iodine/iodophors.

9. Apply preoperative antiseptic skin preparation in concentric circles moving outward the periphery. The prepared area must be large enough to extend the incision or create new incision or drain sites, if necessary

B. Hand/forearm antisepsis for all surgical team members:

1. Keep nails short and do not wear artificial nails.

2. Do not wear hand/arm jewelry.

3. Perform preoperative surgical hand scrub for at least 2 to 5 minutes using appropriate antiseptic. Scrub the hand and forearm up to the elbows.
4. After performing the surgical scrub, keep hands up and away from the body (elbow in flexed position) so that water runs from tips of the fingers toward the elbows. Dry hands with sterile towel and don a sterile gown and gloves.

C. **Management of infected colonized surgical personnel:**

1. Surgical personnel who have active infections or are colonized with certain microorganism must report to their supervisors for treatment and counselling.

2. Surgical personnel with active infections or colonization will be restricted from work until the infection has resolved.

D. **Antimicrobial prophylaxis:**

1. Select a prophylactic agent based on the efficacy against the most common pathogens causing SSI for a specific operation.

2. Administer the antimicrobial prophylactic agent by IV except for colorectal operations. Before colorectal elective operations, mechanically prepare the colon with enemas and cathartic agents; administer non-absorbable oral antimicrobial agent in individual doses the day before surgery.

3. Administer the antimicrobial agent before the operation starts to assure adequate microbial tissue levels before the skin incision is made. Ideally antimicrobial prophylaxis should be administered within 30 minutes before, but no longer than 2 hours before the initial incision.

4. Administer prophylactic antimicrobial agent as close as possible to the time of induction of anesthesia.

5. Do not prophylaxis postoperatively.

6. Do not routinely use Vancomycin for prophylaxis to avoid resistance.

II. **Intraoperative (operating room):**

   A. **Ventilation:**

   1. Maintain positive-pressure ventilation in the operating room with respect to the corridors and adjacent area.

   2. Maintain a minimum of 15 air changes per hour, of which at least three should be fresh air.

   3. Keep OR door close except as needed for passage of equipment, personnel, and the patients.
4. Limit number of personnel entering OR to necessary personnel.

B. Cleaning and disinfection of environmental surfaces:

1. When visible soiling or contamination with blood or other body fluids, of surfaces or equipment occurs during operation, use an approved hospital disinfectant to clean the affected areas before the next operation.
2. Do not perform special cleaning or closing of operating room after contaminated or dirty operations. Keep the dirty cases last on the OR lists.
3. Wet vacuum the operating room floor after the last operation of the day or night with approved hospital disinfectant.

C. Microbial agent:

Do not perform routine environmental sampling of the operating room. Perform microbial sampling of operating room environmental surface or air only as part of epidemiological investigation.

D. Sterilization of surgical instruments:

Send for sterilization all surgical instruments to CSSD.

E. Surgical attire and drapes:

1. Change scrub when visibly soiled, contaminated and/or penetrated by blood or other potentially infectious material.
2. Wear a surgical mask that fully covers the mouth and nose when entered the operating room if sterile instrument are exposed, or if an operation is about to begin or already under way. Wear the mask throughout the entire operation. (Wear N95 masks when the patient has or suspected of having infectious tuberculosis)
3. Wear surgical caps/hood to reduce contamination of the surgical field by organisms shed from the hair and scalp.
4. Wear shoe covers only to protect surgical team members from exposure to blood and body fluids during the operation but not for the prevention of SSI.
5. The surgical team must wear sterile gloves, which are put on after donning a sterile gown.
6. Use materials for surgical gowns drapes that are effective barriers when wet (e.g. materials that resist liquid penetration)
F. Asepsis and surgical technique:

1. Adhere to principles of aseptic technique when placing intravascular devices (e.g. central venous catheter), spinal or epidural anesthesia catheter. Or when dispensing and administering intravenous drugs.

2. Assembling sterile equipment and solutions immediately prior to use.

3. Handle tissue gently, maintain effective homeostasis, and minimize devitalized tissue and foreign bodies (e.g. suture, charred tissues, necrotic debris).

4. If drainage is necessary, use a closed suction drainage. Place a drain through a separate incision distant from the operative incision. Remove the drain as soon as possible.
Prevention of intravascular catheter-related infections

I. Selection of catheter type:

A. Polyurethane and silicon catheters have lower risk of complications than other types.
B. Consider the use of anti microbial impregnated CVC for adult patients requiring short term catheterization.
C. Use catheters like the Hickman type when prolonged IV access via CVC is needed because it has a cuff that are tunneled subcutaneously and associated with a lower rate sepsis than standard CVCs.
D. Consider a totally implantable access devices for patients requiring long term, intermittent vascular access.
E. Single-lumen CVCs should be used unless multiple ports essential for the management of the patient.
F. If total parenteral nutrition is being administered, use one CVC or lumen only for that purpose.
G. Select a catheter with a smaller lumen to reduce the incidence of trauma and secondary infection.

II. Selection of insertion site:

A. Selects the insertion site and technique with the lowest risk of complications, both infectious and non-infectious.
B. Do not routinely use the cutdown procedure as a method of insertion catheters.
C. Do not insert catheter into an area of inflammation or infection.
D. Avoid use of steel needle for the administration of the fluids and medications because it may cause tissue necrosis if extravasation occurs.
E. For peripheral intravascular line, use an upper extremity site for catheter insertion. Replace a catheter inserted in the lower extremity site with one in an upper extremity site as soon as it is possible.
F. For central venous catheter (CVC), subclavian rather than jugular or femoral sites should be selected for catheter insertion of CVCs unless medically contraindicated.
Tunneled catheter or implantable vascular devices (e.g. porta-A-Cath) should be used for patients requiring long-term (30 days) vascular access.

**III. Aseptic technique:**

Hand hygiene

Observe hand hygiene using either antiseptic hand preparation or alcohol-based hand disinfection

For tunneled or implanted catheters, the dressing should be replaced no more than once per week, until the insertion site is healed.

**IV. Anticoagulant flush solutions**

The use of anticoagulant flush solutions may have a role in the prevention of catheter-related sepsis since thrombi and fibrin-deposits on catheters may serve as a nidus for microbial colonization of intravascular catheter.

**V. Replacement of intravascular set, tubings and parenteral fluids**

A. Administration sets, including secondary sets and add on devices should be replaced no more frequently than at 72hrs interval unless catheter-related sepsis is suspected or documented or the integrity of the product has been compromised.

B. IV tubing used to administer blood, blood products, or lipid emulsions should be replaced at the end of the infusion or within 24 hrs of initiating the infusion.

C. Lipid emulsion infusion should be completed within 24hrs and blood within 4 hrs of hanging.

**VI. Replacement of catheters:**

A. Remove peripheral venous catheters if the patient develops signs of phlebitis (e.g., warmth, tenderness, erythema, palpable venous cord), infection, or a malfunctioning catheter.

B. Rotate peripheral venous sites every 72 hrs for adults to minimize the risk of phlebitis, and for pediatric patients leave peripheral venous catheters in place until IV therapy is completed, unless a complication occurs.

C. CVCs should not be replaced for the purpose of reducing the incidence of infection. It should be left in place as long as necessary or only if catheter-related sepsis is suspected.

D. Any catheter inserted during emergency without adherence to proper asepsis should be removed and re-sited as soon as possible preferably within 48 hrs.
VII. Catheter-related infections:
A. Two sets of blood culture from peripheral veins should be taken. Swabs should be taken from the site of catheter insertion.
B. If microbiological investigation proves catheter infection, catheter should be removed and an alternative site chosen for re-insertion.
C. In cases of proven catheter-related sepsis, the catheter should be removed and treated with appropriate antibiotics.
D. If the catheter is removed, the distal end of the catheter should be sent in a sterile container for culture. If there is strong suspicion of infection, the line should be removed.
E. Routine bacteriological sampling of catheter tips is not necessary.
**Prevention of nosocomial pneumonia**

1. Use sterile water (not distilled) to fill bubbling humidifiers, ventilator breathing circuits with heat and moisture exchanges (HME).

2. Change the humidifier-tubing (including any nasal prongs or mask) when visibly contaminated/malfunctions.

3. Perform subglottic suctioning when necessary:
   a. Suction removal of oropharyngeal secretions can reduce risk of aspiration and growth of microorganisms above the endotracheal tube cuff.
   b. Suctioning should be done prior to repositioning or extubation.

4. Incline patient's head whenever possible (Reverse Trendelenberg's position): Elevate the head 30 to 45 degrees to reduce accumulation of secretions in the subglottic area and also the microbial load.

5. Avoid nasotracheal intubation whenever possible:
   Oropharyngeal route is recommended as nasotracheal intubation has been associated with nosocomial sinusitis and high incidence of VAP.( ventilator associated pneumonia).

6. Maintain optimal pressure in endotracheal cuff while patient is intubated:
   a. A cuff that is under-inflated forms creases that can readily allow contaminated secretions to migrate past the cuff and aspirate into the lungs.
   b. Keep the optimal cuff pressure to 20mm/Hg.
   c. Cuff pressure should be monitored and recorded routinely.
   d. Avoid excessive inflation to prevent profusion of contacted mucosa and tissue damage.

7. Avoid unnecessary manipulation of the endotracheal tube:
   Manipulation of the tube creates creases and gaps in the cuff which can allow contaminated secretions to slip through and drop into the lungs.

8. Remove tube as early as possible, but avoid re-intubation:
   Early tube removal helps reduce VAP. But if the patient is not ready and needs to be re-intubated, the process will increase VAP risk. The use of noninvasive ventilation is more appropriate than re-intubation.
9. Prevent cross-contamination with reusable devices:
   a. Use single use devices whenever possible.
   b. Reusable items such as resuscitation bags, temperature probes, spirometers, humidification apparatus and endoscopes must be subjected to sterilization or high-level disinfection in CSSD to prevent cross-contamination.

10. Small volume medication nebulizers (in line or hand held):
   a. Between treatment on the same patient, clean, disinfect, rinse with sterile water and dry.
   b. Use sterile fluid and dispense aseptically.
   c. Use single dose vials / If multi dose follow the instructions.
   d. Containers of fluid- date / Discard within 24 hours.

11. Vaccinate staff
   Seasonal influenza and pneumococcal vaccinations (if indicated) are recommended to protect staff and reduce nosocomial outbreaks.

**Prevention of Person-to-Person Transmission of Bacteria:**

1. Wash hands
   Wash hands or use alcohol-based antiseptic solutions between, patients, after glove removal, before clean and after dirty tasks.

2. Wear gloves and gowns as appropriate:
   a. Change gloves between patients and between contaminated and clean procedures on the same patient
   b. Use sterile gloves when appropriate to protect the patient (e.g. suctioning)
   c. Gloves and gowns have been shown to be effective in preventing the spread of Vancomycin-Resistant Enterococci (VRE) and MRSA.

3. Make patient oral hygiene standard practice:
   a. Routine oral decontamination is an effective method for reducing VAP by decreasing the microbial load in the oropharyngeal cavity.
   b. Oral hygiene programs should consist of frequent tooth brushing, oral suctioning and swabbing of the mouth with antiseptic agents.

4. Implement Common Suction Protocol
   a. If the open-system suction is employed, use a sterile, single-use catheter.
   b. Use only sterile fluid to remove secretions from the suction catheter if the catheter is to be used for re-entry into the patient's lower respiratory tract.

5. Perform tracheostomy care under aseptic condition:
When changing a tracheostomy tube, wear gown, use aseptic technique, and replace the tube with one that has undergone sterilization or high-level disinfection.

**Prevention of Postoperative Pneumonia:**

1. Treat the pulmonary infection preoperatively.
2. Instruct preoperative patients, especially those at high risk (e.g., abdominal aortic aneurysm repair, thoracic surgery, or emergency surgery; those who will receive general anesthesia; those who are aged above 60 years; history of COPD, alcohol use, smoking; impaired sensorium, a history of CVA with residual neurologic deficit etc.) for contracting pneumonia, to take deep breaths and ambulate as soon as medically indicated.
3. Encourage all postoperative patients to take deep breaths, move around the bed, and ambulate unless medically contraindicated.
4. Use incentive spirometry on postoperative patients at risk for Pneumonia.
5. Systemic antibiotics are not routinely used to prevent post-operative Pneumonia.
section 3

Hospital Hygiene
Laundry and linen

The purpose of this section is to assist staff in identifying the correct procedures for all linen including hospital linen and patient's own linen / clothes.

1. HOSPITAL LINEN

All communal linen/clothing must be sent to a commercial laundry where thermal decontamination can take place.

This includes:-

- Sheets
- Counterpanes/Duvet covers/Duvets
- Blankets
- Hospital clothing
- Pillow cases
- Dressing Gowns
- Towels
- Night clothing
- Curtains
- Theatre Drapes
- Patient Gowns
- Staff Theatre Clothing

1.1 Management of Used Linen

Definition: Linen, which is not from a patient in source isolation and is not visibly soiled with blood or body fluids.

• A plastic disposable apron must be worn to handle the linen.

• The linen should be placed directly into nylon/polyester/plastic laundry bags.

• Bags should be coloured white / off white and must be securely fastened by knotting the bag or using the dedicated straps to prevent spillage before leaving the ward.

• Ensure the bag is only 2/3 full.

1.2 Management of Soiled and Foul Linen

Definition: Linen soiled with blood and / or body fluids.

• Disposable gloves and a plastic disposable apron must be worn to handle the linen.

• The linen should be placed directly into white nylon / polyester/polythene laundry bags and must be securely fastened by knotting / using the dedicated straps to prevent spillage before leaving the ward.

• Ensure the bag is only 2/3 full.
1.3 Management of Infected Linen / Heavily Soiled Linen

Definition: Linen from a patient in source isolation or which is heavily soiled with blood and/or body fluids.

• Disposable gloves and a plastic disposable apron must be worn when handling infected linen / heavily soiled linen.

• Linen in this category must be placed into a red water-soluble bag which is securely tied using the tear off tie strip (attached to the bag).

• This must then be placed into a red plastic bag avoiding contamination to the red outer bag, and securely fastened by knotting the bag to prevent spillage before leaving the ward.

• Take the bag directly to the appropriate holding area after each use; do not leave bags in side rooms with soiled linen in them.

1.4 Theatre Linen

• Used theatre linen to be placed in green or white bags.

• All infected theatre linen is to be placed into a red water-soluble bag which is securely tied using the tear off tie strip (attached to the bag), prior to placing it into a red plastic bag.

1.5 Curtains

Curtains require washing if visibly dirty. If curtains are changed due to infection control guidance they need to be double bagged as infected linen.

1.6 Linen Storage

At ward level linen should be stored on a designated trolley or in a designated storage area.
2. PATIENT’S OWN CLOTHES

2.1 Management of Used Linen / Clothes

• Ideally a patient’s used clothing should be taken home by relatives for laundering.
• The used clothing should be placed into a patient property bag awaiting collection.

2.2 Clothing from Patients in Source Isolation / Heavily Soiled

• For patients in source isolation or where clothing is heavily soiled, the clothing must be laundered separately from other patients clothing.
• The clothing should be washed at the highest temperature the fabric will allow.
• Clothing must be placed and washed in a water soluble bag.

2.3 Clothing from Patients not in Source Isolation

• Clothing from patients who are not in source isolation may be washed together. The clothing should be washed at the highest temperature the fabric will allow.

3. HOSPITAL BASED WASHING MACHINES

• There must be a dedicated area for the washing machine and tumbler drier to be situated. There must be clear definition of clean and dirt areas.

4. Handling of Clean Linen

Clean linen must be placed into a designated clean container, which has not been stored in the dirty area, then moved directly to a clean linen storage area.

5. Procedures must be applied for all steps of the process

Collection,
Transportation
Sorting, Washing
Storage

Collection:

• Soiled linen must be collected and handled with minimal agitation
• To prevent contamination of the environment and persons
• Linen soiled with blood or body fluids must be handled with special care
Protective barriers (gloves)
Using folding or rolling technique
Linens must be placed in bags
To prevent leakage of fluid and contamination of transporting personnel. Bags should be of good quality (cloth or plastic if linen soaked with blood or body fluids
Soiled linens should be bagged at the location where it was used
Care should be taken to avoid removal of non-linens items (needles…)
Linen from all patients should be processed in the same manner
Double bagging and distinction between « contaminated » or « soiled » are not necessary
Transportation of bagged linens by cart:
Avoid linens chute (piston action and ground level contamination, mechanical obstruction)

Sorting
Step most likely at risk
Separating different types of soiled linens
Personnel should wear protective attire including gloves and aprons
Personnel should be trained to apply standard precautions
Can be done in the ward (different bags)
Presence of foreign objects in linens is the most significant problem for laundry
Surgical devices, needles, human tissue surgical instruments, patient items can damage laundry equipment and can injury laundry workers
All workers involved in sorting and handling soiled linen should wear protective apparel
No pre washing to reduce microbial contamination necessary
Laundering process

Goal of laundering is to remove soil and reduce microbial contamination

Reduction of bacterial contamination is achieved by:

Detergent in hot water or cold water with (>70°C) chemical agent

Different factors including agitation, dilution, addition of bleach and drying, Ironing.

Transportation and storage:

- Separate clean and soiled linen during storage and transport
- Carts should be cleaned frequently
- Clean linen should be properly protected during storage
Food

- No food materials or ingredients shall be accepted by a food business if they are known to be, or might reasonably be expected to be, so contaminated with parasites, pathogenic micro-organisms, toxic, decomposed or foreign substances, that after normal sorting and/or preparatory or processing procedures hygienically applied by food businesses, they would still be unfit for human consumption.

- Raw materials and ingredients stored on the catering premises shall be kept in appropriate conditions designed to prevent harmful deterioration and to protect them from contamination.

- All food which is handled, stored, packaged, displayed and transported, shall be protected against any contamination likely to render the food unfit for human consumption, injurious to health or contaminated in such a way that it would be unreasonable to expect it to be consumed in that state.

- Food must be so placed and/or protected as to minimize any risk of contamination.

- Any temperature monitoring device, food probe etc. must be calibrated yearly with a current and relevant certificate for that piece of equipment.

- Weighing scales are to be checked on a regular basis for accuracy.

An employee working in a food handling area who knows or suspects that he is suffering from or that he is a carrier of a disease likely to be transmitted through food; or is afflicted with an infected wound, a skin infection, sores, diarrhoea or with any analogous medical condition in circumstances where there is any likelihood of him directly or indirectly contaminating any food with pathogenic micro-organisms:

- shall report that knowledge, suspicion or affliction to the proprietor of the food business at which he is working.

- An employee will conduct a high level of personal hygiene whilst carrying out their food handling duties.

- Hand wash procedures are to be practiced at all times.

- Direct Food Handlers are to comply with The Food Hygiene which does not permit the wearing of items such as: Watches – Bangles – Nail Polish – False Fingernails.

- Protective clothing is worn to prevent the possibility of contamination occurring from outside sources this should consist of:
➢ A hair net or hair covering that completely encapsulates the hair.
➢ A cleanly laundered overcoat or jacket.
➢ an apron .
➢ Food grade protective gloves

- All equipment is to be kept clean and free of food debris, rust, dirt and dust, chemical residue etc. at all times to reduce the possibility of cross contamination
- Equipment should be in good repair, be fit for purpose and not show signs of excessive wear and tear. Damage such as dents or loose fittings, rust, missing parts i.e. screws, rivets, seals, clips etc. where bacteria may harbour, is to be noted and reported immediately.

**Foodborne illnesses in hospitals:**

- Most frequently micro-organisms
  - Salmonella spp. (50%)
  - Staphylococcus aureus
  - Clostridium perfringens
  - Other (Shigella, Listeria, E. coli, Campylobacter, ...)

<table>
<thead>
<tr>
<th>Micro-organism</th>
<th>Incubation period</th>
<th>Main symptoms</th>
<th>Route of transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella</td>
<td>&gt; 12 h</td>
<td>Diarrhoea, fever vomiting</td>
<td>Undercooked meat (poultry) eggs, dairy products,</td>
</tr>
<tr>
<td>Staphylococcus</td>
<td>&lt; 4 h</td>
<td>Vomiting, abdominal pain, non fever</td>
<td>Unrefrigerated improperly refrigerated milk and dairy products, eggs, meat</td>
</tr>
<tr>
<td>C. Perfringens</td>
<td>&gt; 12 h</td>
<td>Diarrhoea abdominal pain</td>
<td>Meats, poultry, gravy</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>&gt; 12 h</td>
<td>Diarrhoea abdominal pain</td>
<td>Raw and undercooked poultry, unpasteurized milk, contaminated water.</td>
</tr>
<tr>
<td>Bacillus cereus (preformed toxin)</td>
<td>&lt; 6 h</td>
<td>Nausea, Vomiting</td>
<td>Improperly refrigerated cooked and fried rice, meats.</td>
</tr>
</tbody>
</table>
Outbreaks related to
- Inadequate food handling and preparation
- Storage at inappropriate temperature
- Use of contaminated food, contaminated equipment
- Infected food handlers and inadequate hygienic practices

Prevention of food-borne diseases based on
- Food-service design
- Food preparation procedures
- Food-service personnel

Kitchens area:
- Usually central kitchens (inside the hospital) Should be well lighted, well ventilated and spacious to avoid crowding Separate areas to avoid cross contamination
- Hand-washing facilities available
- Area for cleaning dishes and utensils, and area for waste storage must be separated from the food preparation area
- Eradication of insects and rodents
- Food delivery and storage areas located close to preparation areas
- Maintenance of all equipment

Food preparation procedures:
To avoid conditions allowing micro-organisms to proliferate (10° to 60°C) or produce toxins
- Cook to proper temperatures*
- Maintain cooked foods at the adequate temperature
  - If consumed the day of cooking = must be maintained always at T > 60°C
  - If not, quickly refrigerated (less than 2 hours to obtain 10°C), stored at 3°C no more than 3 days, transported at 3°C and put back on again at > 60°C (in less than 1 hour)
  - Maintain frozen foods < - 18°C
Food-service personnel:

- Smoking strictly forbidden
- Adequate and clean clothing
- Hand-washing
- Training
- If symptoms of gastrointestinal illness, should be excluded from food preparation
Environmental cleaning

Introduction
The cleanliness of a health care facility is vital to the health and safety of its patients, staff, and visitors as well as of the community. It is one of the foundations for preventing the transmission of infections in the facility. Routine cleaning is necessary in order to ensure a hospital environment that is visibly clean and free from soil and dust. 90% of microorganisms are present within “visible dirt”, and the purpose of routine cleaning is to eliminate this dirt. An additional benefit is that a clean facility looks appealing and improves the morale of staff and patients. This orderliness has been shown to enhance both the safety and quality of patient care and when absent can lead to clusters of Hospital acquired infections.

Definition
The term “environmental cleaning” refers to the general cleaning of environmental surfaces and to the maintenance of cleanliness in a health care facility. It is the physical removal of organic materials such as soil and dirt, which removes a large proportion of microorganisms, followed by complete drying. The staff responsible for environmental cleaning (housekeeping) is a specially trained worker. These personnel, hereafter referred to as housekeepers, are at risk of infection because they may be exposed to blood, body fluids, secretions, and excretions in the process of completing their duties unless they are properly trained in the use of protective equipment. Therefore, it is important that they have a good understanding of standard precautions and of infection control practices through education and training.

Cleaning Principles

- Warm water and detergent removes 80% of microorganisms. The majority of these microorganisms are skin flora and spores.
- Cleaning should be done in a way that minimizes the scattering of dust and dirt. A damp cloth or wet mop should be used for walls, floors, and surfaces instead of dry dusting or sweeping.
- Dry sweeping is forbidden
- Cleaning should be done from the least soiled to the more soiled areas
• From the top to the bottom of the patients rooms
• From room of non infected patient to room of infected patient
• The use of friction or scrubbing action is the most effective way to remove dirt and microorganisms in every cleaning procedure.
• The floors should be mopped with warm water and detergent and dried.
• Cleaning solutions should be changed frequently. If a disinfectant is used, the disinfectant solution is less likely to kill infectious microorganisms if it is heavily soiled.
• Cleaning of environmental surfaces should be performed by using separate buckets. One container should contain detergent and the other one should contain plain water. The procedure starts by wiping or scrubbing with detergent, followed by rinsing with water, and drying at the end.
• Cleaning procedures for environmental surfaces must not be applied to patient care equipment/instruments (e.g., dental instruments, thermometer).
• The cleaning methods and products may differ significantly. Reusable equipment (e.g., bed, chairs) is not used for the care of another patient until it has been cleaned appropriately.
• Buckets should be washed and rinsed out after use and stored dry.
• Mops should be laundered daily in very hot water and detergent or in a washing machine (if available) and dried thoroughly. Wet mops should not be left standing in a bucket.
• Clean and disinfect surfaces that are touched by hand on a frequent and regular basis
  
  Door knobs, light switches, bed rails, patient table….  

  Surfaces around the toilet, sink  

• Cleaning equipment should not be shared between different areas. Dedicate separate mops and dust cloth for infectious cases such as MRSA and discard after patient's discharge.
- Waste receptacles should be emptied daily or as needed and the liners of the receptacles replaced whenever waste is removed. Waste bins to be cleaned daily.
- Cleaning of walls, blinds and curtain is not recommended unless they are visibly soiled. Clean routinely every 3 months.
- Soap dispensers should be checked daily for function and replaced as needed.

**Organization:**

Classify area according to their category and the recommended measures of infection control

Plan work in each area according to ward organization, amount of work, number or persons

<table>
<thead>
<tr>
<th>Zone 4 very high risk</th>
<th>Zone 3 high risk</th>
<th>Zone 2 median risk</th>
<th>Zone 1 low risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatology</td>
<td>Intensive care emergency ward</td>
<td>Elevators</td>
<td>Halls areas without patients</td>
</tr>
<tr>
<td>Operating rooms</td>
<td>Birth room</td>
<td>Stairs</td>
<td>Offices</td>
</tr>
<tr>
<td>Burn units</td>
<td>Nursery</td>
<td>Waiting rooms</td>
<td>Technical service…</td>
</tr>
<tr>
<td></td>
<td>Pediatric, surgery wards</td>
<td>Physical therapy rooms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>Long term care facilities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sterilization</td>
<td>Cleaning area in sterilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laundry…..</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oncology, haematology</td>
<td></td>
</tr>
</tbody>
</table>

**Common Methods for Cleaning**

**Dry Cleaning Method**

The dry cleaning method relies on mechanical action to loosen and to remove
large objects and particulate soil but does not remove stains.

Dry cleaning is not suitable for wet or greasy areas.

**Sweeping**

The use of dry brooms, dry mops and dry dusters should be avoided in patient treatment and food preparation areas as it is not efficient and it is potentially hazardous. It leads to the dissemination of bacteria carrying particles and increases the air-borne bacterial count nearly tenfold.

If sweeping is unavoidable, it should not be permitted in the immediate vicinity of patients with exposed wounds and other sites where patients are at high risk for infection, e.g., ICU. Enough time should be allowed for disseminated bacteria carrying particles to settle.

**Wet Cleaning Method**

Wet cleaning is accomplished manually by a damp cloth, damp mop, or deck scrubber using water with or without detergent and with or without disinfectant. In addition to water, mechanical action (i.e., scrubbing) is used. Routine use of chemical disinfectants is not necessary. If a detergent cleaner is used, rinsing is recommended, since detergents become concentrated, leading to a build-up of a detergent film. Drying is essential. Moist surfaces are considered potentially contaminated because moisture encourages bacterial growth. Direct patient care and food preparation areas should not be used until completely dry.

**Terminal cleaning**

It should be done when a patient who has been under isolation is discharged.

a. cleaners should wear appropriate protective equipment eg. Gloves, mask and gown.

b. discard all disposable items or equipment as appropriate. Seal clinical waste bags and dispose off accordingly.

c. Remove any items or equipment to the dirty utility area for cleaning and disinfection.
d. Gently place all linens into appropriate bags. Bags must be sealed before leaving the room.

e. Wet dust from high ledges, window frames, curtain tracks and fixtures, furniture, floors and spot clean walls with 1000 ppm chlorox. Wet mop floors with dettol solution.

f. The bed mattresses and bed frames should be wiped with warm water and detergent and disinfected and dry thoroughly.

g. Wash sink with warm water and detergent, disinfect with 140 ppm chlorox and rinse. Clean toilet bowls, bathroom, bed pans and urinals with 2.500ppm chlorox.

h. Open windows, if indicated to facilitate thorough drying of all surfaces.

Management of spills (blood/body fluids):

Materials : Gloves (unsterile), Mask, Chlorox, Pick up forcep, Tissue paper, Disposable gown, Yellow biohazard bag

a. Splashes and drips
   1. Wear non sterile gloves and mask for this procedure.
   2. Wipe the area immediately with paper towel with the use of a pick up forcep and discard in yellow biohazard bag.
   3. Apply disinfectant chlorox appropriate for the size and surface contaminated. Make sure the spill is entirely covered and leave for 10 minutes.
   4. Clean the area with water and detergent then dry the surface with disposable paper towels.
   5. Discard gloves and paper towels in a yellow biohazard bag.
   6. Wash and dry hands immediately.

b. Large spills
   1. Wear non sterile gloves, mask and disposable gown for this procedure.
   2. Cover the spillage with paper towers to absorb all liquid using a pick up forcep. Discard paper towel in a yellow biohazard bag.
   3. Pour disinfectant ( chlorox) over the spill and leave for 10 minutes contact period.
   4. Clean the area with water and detergent and dry the surface with disposable paper towels and discard appropriately.
   5. Discard gloves, mask, and disposable gown as infectious waste.
6. Wash and dry hands immediately.

**Flowers and plants:**

* Plants totally forbidden in all medical and surgical wards
* Cut flowers tolerated except in high risk area (UCI, burn unit, etc.) but water should be changed out of the room
  water should be changed every day
  chlorine should be added (a spoon / 1 l water)

**Choice of cleaning agents:**

Any hospital-grade disinfectant-detergent may be used for cleaning environmental surfaces. Manufacturer's instructions for use of such product should be followed

<table>
<thead>
<tr>
<th>Item</th>
<th>Desired ppm</th>
<th>Chlorox 0.47 L</th>
<th>Desired dilution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spillage (blood and body fluids such as vomitus, urine, sputum,</td>
<td>10,000 ppm</td>
<td>1 bottle</td>
<td>Undiluted</td>
</tr>
<tr>
<td>2. Bed pans and urinals, toilet bowls, bathroom</td>
<td>2,500 ppm</td>
<td>1 bottle</td>
<td>10 L water</td>
</tr>
<tr>
<td>3. Floors</td>
<td>1000 ppm</td>
<td>1 bottle</td>
<td>20 L water</td>
</tr>
<tr>
<td>4. Furniture (bed frames, mattresses, bed side tables, Chairs,</td>
<td>1000 ppm</td>
<td>1 bottle</td>
<td>20 L water</td>
</tr>
<tr>
<td>5. Mops</td>
<td>1000 ppm</td>
<td>1 bottle</td>
<td>20 L water</td>
</tr>
<tr>
<td>6. Wash basins</td>
<td>140 ppm</td>
<td>2.5 ml</td>
<td>1 L water</td>
</tr>
<tr>
<td>7. Waste bins</td>
<td>140 ppm</td>
<td>2.5 ml</td>
<td>1 L water</td>
</tr>
<tr>
<td>8. Water buckets</td>
<td>140 ppm</td>
<td>2.5 ml</td>
<td>1 L water</td>
</tr>
<tr>
<td>Item</td>
<td>Dettol</td>
<td>Dilution</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>9. Laundry (linens, towels, items made of linen fabrics)</td>
<td>11.25 ml</td>
<td>12. 1 liter of water</td>
<td></td>
</tr>
<tr>
<td>10. Or rubber material eg. Air mattress, BP cuff)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Lavatories, sinks, drain etc.</td>
<td>14. Full strength</td>
<td>15. Undiluted</td>
<td></td>
</tr>
<tr>
<td>16. Floor and hard surface</td>
<td>17. 125 ml</td>
<td>18. 10 liters of water</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

- Disinfectants are NOT recommended for routine use.
- Chlorine (bleach) solutions should never be mixed with cleaning products that contain ammonia or phosphoric acid. Combining these chemicals will result in the release of a chlorine gas, which can cause nausea, eye irritation, tearing, headache, and shortness of breath. These symptoms may last for several hours. If you are exposed to an unpleasantly strong odour following the mixing of a chlorine solution with a cleaning product, leave the room or area immediately until the fumes have cleared completely. Accidents can be avoided by ensuring all solutions are clearly labelled and only one type of disinfectant solution is available in the cleaning supplies storage area.
Waste management

A. Organisation structure of healthcare waste management program at facility level:

A-1: Establishment of waste management committee:

- Director General of hospital (chairman)
- Quality director (secretary)
- Infection control doctor. (Member)
- Infection control nurse. (Member)
- Head nurse. (Member)
- Public health officer (Member)
- Member for public support services. (Member)
- Member representing contracting company. (Member)
- Administrative director (Member)
- Director of laboratories (Member)
- Director of the pharmacy (Member)

A-2: Main responsibilities:

- Oversee the identifications, classification, distribution of the different types of hazards.

- Making sure that the different types of hazards are being collected, stored, transported and disposed off in the appropriate manner.

- Making resources available for the programme of waste management in coordination with hospital management and other appropriate institutions.

- Advising the management on the best ways of waste hazards disposal including contracting with private companies.

- Developing annual plans for waste and hazards disposal
- Continuous monitoring and improving the procedures of the waste/hazards management.

- Assessment (quantitative and qualitative) of waste production;

- Evaluation of local treatment and disposal options.

- Calculation of volume and different types of waste.

- Decide on the type and site of the treatment facility based on the national guidelines.

- conducting training programmes and raising awareness in the different departments about waste management.

**A-3: Responsibilities of different departments/sectors:**

1. Preparation of a list of waste and hazardous material in it's area including:
   - It's nature.
   - Purpose of use.
   - Responsible person.
   - Permitted quantity when appropriate.

2. Making available material safety data sheet relevant to the waste/hazardous material.

3. providing the following departments with a list of waste/hazardous material:
   - Safety.
   - Medical director.
   - Head nurse.
   - Logistics.

4. All waste/hazardous material must be placed in the appropriate container and labeled clearly.

5. All department/sectors dealing with waste/hazardous material must have protective equipment/clothes as requirement.

6. Allocation of certain area for collection of waste.
8. liaise with the hospital waste management committee and coordinate activities for appropriate and safe disposal.

B. Categories of healthcare waste:
Three categories of health-care waste are recognized:

1. General (non-risk) waste:
   - Including uncontaminated waste similar to domestic waste; may represent about 80% of the total waste production from health-care establishments.
   - Usually collected in black bags.

2. Hazardous health-care waste includes:
   - Usual infectious waste, excluding sharps but including anatomical or pathological waste, and waste contaminated with human blood or other body fluids, excreta, and vomit.
   - Chemical and pharmaceutical residues, e.g. cans, bottles, or boxes containing such residues, and small quantities of outdated products.
   - Non-recyclable and discarded pressurized containers, which are hazardous only if burned as they may explode. Many undamaged containers may be refilled.
   - Usually collected in yellow bags.

3. Highly hazardous health-care waste, which should be given special attention, includes:
   - Sharps, especially hypodermic needles, which is usually collected in safety boxes.
   - Highly infectious non-sharp waste, including microbial cultures, carcasses of inoculated laboratory animals, highly infectious physiological fluids, pathological and anatomical waste.
   - Stools from cholera patients or body fluids of patients with other highly infectious diseases.
• Bulk quantities of outdated hazardous chemicals, such as strong disinfectants, or significant quantities of waste containing mercury.

• Genotoxic waste, e.g. radioactive or cytotoxic waste, typically used in cancer chemotherapy but not in district hospitals. If minimal waste management programmes are being applied, genotoxic substances should not be used in general hospitals, but may be used in the oncological departments of university hospitals.

• And this usually collected in red bags.

C- Procedures of management of Waste

1. Segregation and packaging:

Careful segregation and separate collection of hospital waste may be somewhat onerous for hospital personnel but it is the key to safe, sound management of healthcare waste. Segregation can substantially reduce the quantity of health-care waste that requires specialized treatment. To make separate collection possible, hospital personnel at all levels, especially nurses, support staff, and cleaners, should be trained to sort the waste they produce. In any area that produces hazardous waste—hospital wards, treatment rooms, operating theatres, laboratories, etc. three bins plus a separate sharps container will be needed.

The following important points should be noted:

If hazardous and highly hazardous wastes are to be disposed of in the same way, they should not be collected separately.

In a health-care establishment using genotoxic products, the safety procedures applicable to radioactive or genotoxic products should be enforced.

If sharps are to be encapsulated, it is convenient to collect them directly in the metallic drums or barrels used for encapsulation, which limits the hazards associated with handling.

For hazardous waste and highly hazardous waste the use of double packaging, e.g. a plastic bag inside a holder or container is recommended for ease of cleaning.
Stools of cholera patients should be collected in buckets because of the need for disinfection. Discharge to sewers or to the environment may contribute to the spread of the disease.

Selection of appropriate packaging is difficult in establishments that cannot afford disposable plastic bags or containers. In such circumstances, hazardous waste may also be collected in paper bags, inside a container that will not be removed. Plastic or metal containers for hazardous waste should be disinfected, for example with sodium hypochlorite (bleach), before reuse. The bags should be sealed or containers firmly closed before they are filled to three-quarters of their capacity. The equipment should be simple, robust and locally available.

2. Safe handling and storage:

Hospital cleaning personnel should be informed about the potential risks posed by waste handling. They should be trained in safe handling procedures and should wear protective aprons and gloves.

The waste should be collected daily. General waste may be stored in convenient places that facilitate collection by the municipal service, but hazardous health-care waste should be stored in a closed room. Waste should not be stored close to patients or where food is prepared. Infectious waste should be disposed of within the following periods:

- temperate climate:       maximum 72 hours in winter
                          maximum 48 hours in summer
- warm climate:           maximum 48 hours during the cool season
                          maximum 24 hours during the hot season

Before containers of hazardous health-care waste are loaded on to a truck for transport off site, they should be sealed. Waste bags and containers should also be labeled with the address of the producer and the waste category. For safety reasons, however, it is strongly recommended that establishments applying minimal waste management programmes in areas without adequate treatment facilities should dispose of hazardous health-care waste within their own premises.
3. **Treatment and disposal of hazardous health-care waste**

For health-care establishments with few resources and applying minimal waste management programmes, affordable treatment and disposal methods for hazardous and highly hazardous waste may be classified into three categories:

- thermal processes
- chemical processes
- containment processes

**Thermal processes:**

**Static-grate single-chamber incineration**

Waste may be burned in a simple furnace, with a static grate and natural air flow. De-ashing, loading, and unloading operations are carried out manually. The low heating value of properly segregated health-care waste is high enough for combustion, but addition of a small quantity of kerosene may be needed to start the fire and blowing of air may also help in establishing optimal combustion. The burning efficiency may reach 90-95%, i.e. 5-10% of the material may remain unburnt in the ashes and slags. The operating temperature will be around 300°C, which will kill most microorganisms but will be insufficient to destroy thermally resistant chemicals or pharmaceuticals.

**Advantages:**

- Good disinfection efficiency.
- Drastic reduction of waste; the weight and volume of residual ashes and slags are about 20% those of the original waste. The residues may then be landfilled.
- No requirement for highly qualified operators.
- Relatively low investment and operation costs.
Drawbacks

- Generation of significant emissions containing atmospheric pollutants, including flue gases and fly ash; may produce odours (which can be limited by not incinerating halogenated plastics).
- Periodic removal of slag and soot necessary.
- Inefficiency in destruction of thermally resistant chemicals and drugs (e.g. cytotoxics).

Drum or brick incinerators

Where a single-chamber incinerator is not affordable or available, simple confined burning may be applied. A steel drum or walls of bricks or concrete can be erected over a screen or fine grate and covered with a second screen to prevent dispersion of ashes or light material. The waste is placed inside and burned with the help of manual ventilation and addition of kerosene if necessary. Constant supervision is essential to prevent any spread of the fire to the surrounding area. The combustion efficiency may reach 80–90% and kill 99% of microorganisms. The temperature of the fire will not exceed 200 °C, and this process should be used only in emergency situations or when other treatment methods cannot be implemented.

Advantages

- Drastic reduction of weight and volume of the waste.
- Very low investment and operating costs.

Drawbacks

- Relatively poor destruction efficiency.
- No destruction of many chemicals and pharmaceuticals.
- Massive emission of black smoke, particulates, and toxic flue gases.

Open-air burning

Open-air burning of infectious waste (excluding pathological waste) should be carried out only as a last resort, in rural dispensaries, isolated health posts, or emergency situations. If possible, the burning should take place in the pit of final disposal (i.e. where the residues will be buried), and the process should be supervised by the person responsible for waste management in the health-care facility. It should be
performed downwind of, and as far as possible from, the facility or other communities. The area within which the burning is carried out should be fenced to prevent unauthorized persons and animals from entering. Confined burning, e.g. in a drum incinerator, should always be preferred, as the risk to personnel of contact with the waste or with partly burned residues is lower. The advantages and drawbacks of open-air burning are the same as for drum or brick incinerators, but there is the additional disadvantage that burning may be incomplete and non-uniform

**Wet thermal disinfection**

Wet thermal disinfection is based on exposure of shredded infectious waste to high-temperature, high-pressure steam. Shredded waste is introduced into a reacting tank, vacuum conditions are established, and steam is introduced. Precise operating procedures have to be followed by qualified technicians for efficient disinfection. Wet thermal disinfection should be considered only by health-care establishments with sufficient technical and financial resources and where incineration in single-chamber or drum/brick incinerators is unacceptable, for example because of air pollution problems.

**Advantages**

- Environmentally sound.
- Reduction in waste volume.
- Relatively low investment and operation costs.

**Drawbacks**

- Shredders subject to breakdown and poor functioning (and are thus the weak point of the process).
- Qualified operators essential.
- Inadequate for anatomical, pharmaceutical, and chemical waste, and waste that is not easily penetrated by steam

**Autoclaving**

Autoclaving is an efficient wet thermal disinfection process. Typically, autoclaves are used in hospitals for the sterilization of recyclable items, and these units allow for the treatment of only limited quantities of waste. They are therefore generally used only
for highly infectious waste, such as microbial cultures and sharps. Even a general hospital with very limited resources should be equipped with an autoclave, but a district hospital may well not have one. The advantages and drawbacks of the autoclave are similar to those of wet thermal processes.

Advantages

- Efficient.
- Environmentally sound.
- Relatively low investment and operation costs.

Drawbacks

- Qualified operators essential.
- Inadequate for anatomical, pharmaceutical, and chemical waste, and waste that is not easily penetrated by steam.
- The hospital autoclave used for sterilization has capacity for treatment of only limited quantity of waste.

**Chemical disinfection**

Chemical disinfection is an efficient process, but costly if the prices of disinfectants are high. For safe operation it requires trained technicians provided with adequate protective equipment and is therefore not recommended for treating all infectious health-care waste. However, the process can be useful in specific cases, such as disinfection of recyclable sharps or disinfection of stools from cholera patients.

**Chemical sterilization of recyclable sharps**

Chemical sterilization of scalpels, syringes with needles, and other recyclable sharps may be considered as an alternative or complementary method to thermal sterilization. After thorough cleaning and drying, the sharps are placed in a tank and exposed to a strong disinfecting gas or liquid, such as ethylene oxide, formaldehyde, or glutaraldehyde.
Advantage

- Highly efficient (may be more efficient than thermal sterilization).

Drawbacks

- Trained operators essential.
- Costly if the chemical disinfectants are expensive.
- Uses hazardous substances that necessitate safety measures.

Chemical disinfection of stools from cholera patients

Vibrio cholerae, the causative agent of cholera, is not very resistant and its elimination does not require the use of very strong chemical disinfectants. Buckets containing stools of patients with acute diarrhoea may be disinfected through addition of chlorine oxide powder or dehydrated lime oxide (CaO). Other liquid or powder disinfectants may also be used. In case of a cholera epidemic, hospital sewage must also be treated and disinfected. Where there is sufficient space, sewage may be treated through lagooning, followed by effluent disinfection with sodium hypochlorite.

In cholera epidemics in emergency situations these disinfection measures should also be applied in field hospitals to prevent the spread of the disease.

Advantages

- Efficient disinfection.
- No need for highly trained operators.

Drawback

- Not significant compared with the benefits.

Containment processes

Landfilling in municipal disposal sites

Waste may be land filled in municipal disposal sites if it cannot be treated before disposal. However, health-care waste should not be deposited or scattered on the surface of open dumps. If land filling is planned, the following minimal requirements should be met:
measures established by a municipal authority for the rational and organized deposit of municipal wastes that could be used to dispose of health-care wastes;

- if possible, engineering work instigated by the municipal authority to prepare the disposal site to retain wastes more effectively;

- rapid burial of the health-care waste, so that human or animal contact is as limited as possible. In addition, it is recommended that health-care waste is deposited in one of the following two ways:
  - in a shallow hollow excavated in the mature municipal waste, in the layer below the base of the working face, where it is immediately covered by a 2-m layer of fresh municipal waste; scavenging in this part of the site must be prevented.
  - in a deeper pit (1–2 m) excavated in mature municipal waste (at least 3 months since being land filled) which is then backfilled with the mature waste that was dug out; again, scavenging in this part of the site must be prevented.

Alternatively, a specially constructed small burial pit could be prepared to receive health-care waste only. The pit can be 2m deep and filled to a depth of 1 m. Each load of waste should be covered with a soil layer 10–15cm deep. (Lime may be placed over the waste if coverage with soil is not possible.) In case of a disease outbreak involving especially virulent pathogens (such as the Ebola virus), both lime and soil cover may be added. Access to this area should be restricted and closely supervised by the responsible staff to prevent scavenging. Before health-care wastes are sent for land disposal, it is prudent to inspect the proposed landfill site to ensure that there is satisfactory control of waste deposition.

Advantages

- Low costs.
- Relatively safe if access is restricted and the site is selected according to the above conditions.
- Effective biodegradation of the biological components of health-care waste if landfill operations are properly carried out.

Drawbacks

- Access restrictions may not always be guaranteed.
- It may be difficult to assess whether the conditions for safe landfill are being met.
Safe burying inside premises

In certain health-care establishments in remote locations, temporary refugee camps, and areas experiencing exceptional hardship, safe burial of wastes on hospital premises may be the only rational option available at times.

To limit risks to health and of environmental pollution, some basic rules should be applied:

- Access to the disposal site should be restricted to authorized personnel only.
- The burial boundary should be lined with a material of low permeability (e.g. clay), if available.
- Only hazardous health-care waste should be buried.
- Large quantities (over 1 kg) of chemical wastes should not be buried at the same time; burial should be spread over several days.
- The burial site should be managed in the same way as a landfill, with each layer of waste being covered with a layer of earth to prevent development of odours and infestation by rodents and insects.

The safety of waste burial relies critically on operational practices. Safe on-site burial is practicable for only relatively limited periods of time, e.g. 1-2 years, and for relatively small quantities of waste, say up to 5-10 tonnes in total. Where these limits are exceeded, a longer-term solution, involving treatment of the waste or disposal at a municipal solid waste landfill, will need to be found.

Advantages

- Less hazardous than letting waste accumulate and remain accessible.
- Low costs.

Drawbacks

- Risks of pollution in permeable soils if the waste becomes saturated with water.
- It may be difficult to prevent scavenging at all times.
Encapsulation

Encapsulation is recommended as the easiest technology for the safe disposal of sharps. Sharps are collected in puncture-proof and leak-proof containers, such as high-density polyethylene boxes, metallic drums, or barrels. When a container is three-quarters full, a material such as cement mortar, bituminous sand, plastic foam, or clay is poured in until the container is completely filled. After this material has dried, the container is sealed and may be land filled, stored, or buried inside the hospital premises. It is also possible to encapsulate chemical or pharmaceutical residues together with sharps.

Advantages

- Simple and safe.
- Low costs.
- Also applicable to chemicals and pharmaceuticals.

Drawback

- Not recommended for non-sharp infectious waste.

Management of hazardous health-care waste by waste categories:

Infectious waste and sharps:

Most treatment methods outlined in section 16.4 above are suitable for infectious waste and sharps, except that:

- in the wet thermal process, shredding of sharps is problematic;
- encapsulation is not suitable for infectious waste.

Incineration in single-chamber incinerators should be the method of choice in establishments that apply minimal waste management programmes. Highly infectious waste, such as cultures and stocks of infectious agents from laboratory work, should be sterilized by wet thermal treatment (e.g. autoclaving) at the earliest stage, i.e. inside the health-care establishment, and soon after production, if possible. For other infectious health-care waste, disinfection to reduce microbial concentration is sufficient.

Sharps should also be incinerated whenever possible and can be incinerated together with other infectious waste. Encapsulation is also suitable for disposing of sharps. Blood should be disinfected before discharge to the sewer (unless there is
an adequate wastewater treatment plant) or may be incinerated. After incineration or other disinfection process, residues may be land filled.

**Pharmaceutical waste:**

Sound management of pharmaceutical products, with a view to waste minimization, is of prime importance. Small quantities of chemical or pharmaceutical waste can be disposed of easily and relatively cheaply, but large amounts may require special, more costly treatment, such as high-temperature incineration. Comprehensive management of pharmaceutical stores should be supervised by the Chief Pharmacist of the health-care establishment. Small quantities of pharmaceutical waste are usually collected in yellow containers together with infectious waste and therefore follow the same disposal pathway, being either incinerated or safely buried. It should be noted, however, that temperatures reached in a single-chamber furnace may be insufficient to disintegrate thermally resistant pharmaceuticals. Small quantities of pharmaceutical waste, such as outdated drugs (except cytotoxics and antibiotics), may also be discharged to the sewer but should not be discharged into natural waters (rivers, lakes, etc.).

Significant quantities of pharmaceutical waste may be disposed of by the following methods:

- **Incineration** (if an incinerator able to reach a combustion temperature of 800°C is available); the incineration residues may be land filled.
- **Discharge to the sewer.** Water-soluble, relatively mild pharmaceutical mixtures, such as vitamin solutions, cough syrups, intravenous solutions, eye drops, etc., may be diluted with large amounts of water and then discharged to sewers (where sewerage systems exist). This process should not be used for antibiotics.
- **Encapsulation.** When incineration is not feasible and water dispersion is not recommended, pharmaceutical waste should be encapsulated.
- **Return to the original supplier if possible.**

Note: Cytotoxic drug residues and other cytotoxic waste should never be mixed with other pharmaceutical waste, but should be processed separately.
Chemical waste

As for pharmaceutical waste, improved management of chemical waste starts with waste minimization efforts. The proper management of chemical stores will be supervised by the Chief Pharmacist of the healthcare establishment.

The hospitals Infection Control Officer, Chief Hygienist, or Chief Pharmacist should be designated to supervise the use of chemicals throughout the health-care establishment. The main users of chemical disinfectants, which are among the most hazardous chemicals used in the establishment, are likely to be the Infection Control Office/Chief Hygienist and his or her staff. Small quantities of chemical waste will include residues of chemicals in their packaging, outdated or decomposed chemicals, or chemicals that are no longer required. These are generally collected in yellow containers, together with infectious waste, and follow the same disposal pathway (either incineration or safe burying).

Large quantities of chemical waste should not be collected in yellow plastic bags or containers. There is no safe and cheap method for their disposal; the treatment options are the following:

- Incineration under subcontract by a public or private agency equipped for the safe disposal of hazardous chemical waste. The thermal reactivity of the waste should be checked; certain solvents will burn and can therefore be incinerated in simple incineration units, although it must be remembered that those containing halogens could cause air pollution.

- Return to the original supplier (if the supplier has facilities for safe disposal). In this case, appropriate provisions should be included in the original purchase contract for chemicals.

- Exportation to a country with the expertise and facilities to dispose safely of hazardous chemical waste. Shipment of chemical waste should comply with international agreements, such as the Basel Convention and the United Nations Recommendations on the transport of dangerous goods.

All three options are costly and may be unpractical, which makes it particularly crucial that chemical waste is minimized. The following recommendations should also be observed:

- Hazardous chemical wastes of different nature should never be mixed.
• Hazardous chemical waste should not be disposed of in sewer systems.
• Large amounts of chemical waste should not be buried as they may contaminate groundwater.
• Large amounts of chemical disinfectants should not be encapsulated as they are corrosive and sometimes flammable.

Cytotoxic waste

Cytotoxic drugs are highly hazardous to the health of the individual and to the environment:
• Return to the original supplier.
• Incineration at high temperatures, e.g. in rotary kilns or high-performance double-chamber pyrolytic incinerators (if available).
• Chemical degradation.

The following recommendations should also be observed:

Residues from cytotoxic drugs or other cytotoxic waste should never be mixed with other pharmaceutical waste.

Cytotoxic waste should never be discharged into natural water bodies or land filled. In countries where the above disposal procedures are not feasible, use of cytotoxic and radioactive products should be restricted to university research and teaching hospitals.

Radioactive waste

For safety reasons, medical use of radioactive isotopes should be restricted to university hospitals, and any hospital that uses radioactive products should appoint a qualified Radiation Officer.

Pressurized containers

Undamaged pressurized containers should be returned to the supplier for refilling, and adequate provision for this should be included in the original purchase contracts.
If return is not possible, containers may be buried safely. Any residual pressure should be released before disposal.

Aerosol containers cannot usually be refilled and should be buried. Pressurized containers should never be burned or incinerated because of the severe risk of explosion.

**Used batteries and thermometers**

Batteries, thermometers, and various items of measuring equipment may have a high metal content, including toxic heavy metals such as mercury or cadmium. Disposal options are as follows:

- Recycling by specialized cottage industries. This is the best disposal solution when available.
- Exportation to a country with the expertise and facilities to dispose safely of hazardous chemical waste. Conditions of shipment should comply with the Basel Convention.
- Encapsulation. If neither of the two options above is feasible, encapsulated waste may be disposed of in an impermeable landfill (if available) or other landfill. This type of waste should not be incinerated because of the toxic metallic vapours emitted, nor should it be buried without encapsulation as this may cause pollution of groundwater. However, if the quantities of wastes with high heavy-metal content are minimal (similar to the quantities in municipal waste) and there are no opportunities for reuse of heavy metals within the country, they may also join the municipal waste stream.

**Workers training and safety at work:**

In health-care establishments and regions that operate minimal management programmes

This is of particular importance, since minimal programmes of waste management are likely to result in greater risks of exposure for workers than the more comprehensive managerial methods described in this handbook. For personnel who handle wastes, including hospital cleaners and technicians,

Training in safety measures should cover the following issues:

- packing, handling, and storing of hazardous health-care waste;
- the need to wear protective gloves and aprons when handling waste containers;
- Operation of on-site treatment and disposal methods, such as single chamber furnace operations, encapsulation, and safe burying.

Technicians in charge of chemical disinfection should be trained to implement appropriate safety precautions and emergency measures and be informed about chemical hazards. Nurses and cleaning personnel should be made aware of the occupational risks linked to
Section 4

Decontamination, Disinfection and sterilization
**Introduction:**

Decontamination, disinfection and sterilization are basic components of any infection control program.

Patients expect that any reusable instruments or devices used for diagnosis of their illness or treatment has undergone a process to eliminate and risk for cross infection.

**Physical Facilities:**

The central processing area(s) ideally should be divided into at least three areas: decontamination, packaging, and sterilization and storage. Physical barriers should separate the decontamination area from the other sections to contain contamination on used items.

In the decontamination area reusable contaminated supplies (and possibly disposable items that are reused) are received, sorted, and decontaminated. It is recommended that that the air flow should be negative and the 6 air changes per hour in the decontamination area and 10 air changes with positive pressure in the sterilizing equipment room should be ensured.

The packaging area is for inspecting, assembling, packaging and clean, but not sterile, material. The sterile storage area should be a limited access area with a controlled temperature (may be as high as 75°F) and relative humidity (30-60% in all works areas except sterile storage, where the relative humidity should not exceed 70%). The floors and walls should be constructed of materials capable of withstanding chemical agents used for cleaning or disinfecting. Ceilings and wall surfaces should be constructed of non-shedding materials.

**Classification of Medical Devices**

1- Critical Devices
2- Semi critical Devices
3- Non-critical Devices
4- Medical Equipments
1- Critical Devices
a) Definition:
A medical device that is intended to enter a normally sterile environment, sterile tissue or the vasculature

b) Examples:
   - All surgical instruments
   - Venous or arterial catheters
   - Canulas, needles, in plants

c) Infection Risk: High level
d) Reprocessing Procedure:
   Sterilization by steam, plan, Ethylene Oxide or by chemical sterilization

2- Semi critical Devices
a) Definition:
A medical device that is intended to come in contact with mucous membranes or minor skin breaches.

b) Example:
   - Flexible endoscopes, bronchoscopes
   - Anesthesia equipment
   - Cystoscopes
   - Respiratory equipment
c) Infection Risk: Intermediate to High
d) Reprocessing Procedure:
   - Sterilization
   - High level Disinfection – acceptable
   - Use Disposables

3- Noncritical Devices
a) Definition
A medical device that comes into contact with intact skin
b) Example: Blood pressure cuffs, ECG-electrones, furniture, Stethoscope, Oximètres, Bed side table, floor

c) Infection Risk - Low

d) Reprocessing Procedure:
Hospital disinfectant or decontamination.

4- Medical Equipment

a. Definition: A device or a component of a device that does not typically come in direct contact with the patient.

b. Example Examination table,

c. Infection Risk - Low

d. Reprocessing procedure Low level Disinfection

**Level of Decontamination**:

level I - CLEANING

Level II - DISINFECTION

level III - STERILIZATION
Cleaning

Cleaning is the removal of foreign material (e.g., soil, and organic material) from objects and is normally accomplished using water with detergents or enzymatic products. Thorough cleaning is required before high-level disinfection and sterilization because inorganic and organic materials that remain on the surfaces of instruments interfere with the effectiveness of these processes. Also, if soiled materials dry or bake onto the instruments, the removal process becomes more difficult and the disinfection or sterilization process less effective or ineffective. Surgical instruments should be presoaked or rinsed to prevent drying of blood and to soften or remove blood from the instruments.

Cleaning is done manually in use areas without mechanical units (e.g., ultrasonic cleaners or washer-disinfectors) or for fragile or difficult-to-clean instruments. With manual cleaning, the two essential components are friction and fluidics. Friction (e.g., rubbing/scrubbing the soiled area with a brush) is an old and dependable method. Fluidics (i.e., fluids under pressure) is used to remove soil and debris from internal channels after brushing and when the design does not allow passage of a brush through a channel. When a washer-disinfector is used, care should be taken in loading instruments: hinged instruments should be opened fully to allow adequate contact with the detergent solution; stacking of instruments in washers should be avoided; and instruments should be disassembled as much as possible.

Note:

- All instruments should be individually inspected and be visibly clean
- Cleaning is obligatory before any disinfection or sterilization process.
Disinfection

1) Definition

Disinfection is a process that reduces the count of pathogenic organisms in a potential source of infection to below that required to cause infection, rather than to eliminate completely the organism from the source.

Each hospital should produce a disinfectant policy, to avoid the use of expensive and ineffective disinfectants, when a cheap and effective agents are available.

2) Objective:

It is specifically targeted antimicrobial treatment with the objective of preventing transmission of certain microorganisms.

The purpose of the disinfection procedure is to render an object incapable of spreading infection.

3) Indications:

If the medical device can't withstand the high temperature of the autoclave. *

* Semi critical & Non critical devices

4) Types of disinfectants:

A) Disinfectants

They are used on inanimate objects.

B) Antiseptics

They are used on living tissue.

C) High level disinfection

A process that destroys vegetative bacteria, all viruses, fungi and tubercle bacilli, but not all spores.

D) Low level disinfection

A process that kills most of vegetative bacteria, not all viruses, some fungi but not tubercle bacilli nor bacterial spores.
Methods of Disinfection of devices

1) Thermal Disinfection: washer disinfector (60 C - 90 C)

2) Chemical Disinfection: i-e soaking in a disinfectant.

3) Thermo Chemical

Types of Chemical Disinfectants

1. Phenolics
2. Chloroxylend
3. Pine oil disinfectant
4. Halogen
5. Quaternary ammonium comp……..
6. Hexachlorophene
7. Chlorhexadine
8. Alcohols
9. Aldehydes
10. Hydrogen peroxide (H2O2) compounds

1- Phenolics

Phenol and cresol are derived from distillation of coal far, mixture of synthetic phenolics may be used active against wide range of bacteria include ………………

a. Black and White Fluids

i. Black Fluid
   - Crude for coal derivatives eg. Eyes fluid
   - Soluble in soap
   - Toxic and irritant to skin

ii. White Fluids: eg (IZAL)
   - Emulsified suspension
   - Tend to precipitate on surfaces and make cleaning difficult
   - Some times used for environment disinfection in hospital
   - Black and white fluids replaced by clear soluble phenolics

b. Clear soluble phenolics

e.g. (Stericol, Hycloin, Clearsol)

   - They are cheap and stable
- Not inactivated by organic matter.
- Use confined to environmental disinfection
- They are too corrosive for instruments
- Toxic to be applied to skin

2-2 Chloroxylenols (Dettol, IBcol)

- Non irritant
- Inactivated by organic matter
- Effective against gram positive bacteria poorly active against gram negative bacteria.

3- Pine Oil Disinfectants

- Non irritant, Non toxic
- Relatively ineffective against many organisms e.g. pseudomonas
- They should not be used in Hospital

5- Halogens

- Compounds or solutions releasing chlorine, bromine and iodine.
  a. Chlorine Releasing Agents:-
    - Cheap and effective disinfectants.
    - Rapidly effective against viruses, fungi and Bacteria and spores
    - Recommended for use when hazards of viral infections exist
    - Solutions are unstable at use dilutions should be pre-paired daily.
    - Inactivated by organic matter (pus, dirt, blood).
    - May damage certain materials e.g. plastics, rubber, some methods an fabrics.
    - They disinfect at low concentrations, and non toxic, so used for water treatment babies bottles and food preparation surfaces.
  i. Strong alkaline, hypochlorite solutions (chloros, Demestos, Sterile).
    - Containing approximately 10% ppre
    - Undiluted concentration is corrosive – Co dilution is a must
  ii. Hypochlonite solutions containing 1% (10,000 ppre C1/2) e.g. Milton
    - Dilute 1:80 to disinfect infant feeding.
- Used to clean and disinfect catering equipment.
- Inactivated by organic matter.

iii. Hypochlorite, Hypobromide powders:
- Solution of these powders 0.5 – 1% used as other hypochlorite solutions.
- The powder is used to clean Baths, sinks
- Abrasive powders e.g. Vim, Ajax etc. cleaning bath, kitchen sinks and granules
- Powders and granules may be applied directly to spillage of blood from suspected hepatitis and HIV patients.

b- Iodine and Iodophores

i. Iodine 1% solution of iodine in 70% alcohol is an effective – pre-operative skin antiseptic.
- Stained skin and fabrics

ii. Iodophores: Provide iodine + beta dine etc…
- Complexes of iodine and solublizens which possess the same activity as iodine.
- Non irritant
- Do not stain skin and fabrics
- Mainly used for hard disinfection.
- Alcoholic preparations – used for pre-operative preparation of skin
- Expensive – Not used for environment disinfection.
- Strong sporicidal effect on skin.

6- Quaternary Ammonium Confinable

E.g. Benza konium chloride (Roccal …et) (cetimide (CETAVLON)

- Non toxic
- Mainly active against gram positive organisms
- Inactivated by soap and organic matter
- They are bacteriostatic and not bactericidal
- Use in hospitals are limited e.g. Cleaning dirty wounds e.g. cetavlon
- Ineffective against HIV, HBV and tuberculosis
- Not recommend for hospital use
7- Chlorhexadine (Hibitane)
- Useful skin antiseptic
- Mostly active against gram positive bacteria
- No activity against tuberculosis
- Should be limited in use to procedures involving skin and mucous membranes
- Expensive
- Detergent solutions containing 4% chlorhexadine gluconate Available e.g. Hibiscrub for surgeon hand disinfection
- Savlon - mixture of chlorhexadine and cetrimide
- Savlon contain 15% cetrimide and 1.5% Chlorhexadine.
- Hibisol 0.5% solution of chlorhexadine + 70% isopropyl alcohol used for hand disinfection and operation site disinfection.

8- Hexachlorophene
- Highly active against gram positive organism and less active against gram negative bacteria.
- Insoluble in water e.g. incorporated in soaps
- Limited use in hospitals
- Used for hands in situation of staphylococci outbreak
- Used for neonatal umbilical stump powdering

9- Alcohols
- Ethyl alcohol 70% (ethanol) and 60 – 70% isopropyl alcohol (Isopropanol).
- Effective and acts rapidly as disinfectants and antiseptics.
- They evaporate leaving surfaces dry.
- They have poor penetration powers and so used to clean surfaces.
- They are active against tuberculosis and spores.
- Poor viral activity specially non-enveloped viruses e.g. polio virus is resistant.
- Used for rapid disinfection on smooth clean surfaces e.g. trolley tops, thermometers.
- Commonly used for skin disinfection to which 1% glycerol added to prevent skin dryness.
- Dirty objects with blood or secretion should be cleaned before alcohol use.

10-Al Dehydes:
- Formaldehyde, Glutaraldehyde …etc
- Used for fumigation
- They are irritant
- Used for sterilization if used at sub-atmospheric steam
- Gultaraldehyde is used for sterilization of heat sensitive items
- They are non-damaging to metals, Rubber and plastics
- Effective against bacteria, viruses and fungi with slow activity against tuberculosis (20-60 minutes)
- Very active against spores
- Activity improved if used at temperature 50-60oC

11-Hydrogen Peroxide (H2O2) Compounds
- May be used infrequently in hospitals
- Used for disinfection of tonometers and soft contact lenses
- To disinfect ventilators
- It may lead to corrosion of certain metals if used frequently

Different steps for disinfecting medical device:

☀ Decontamination: For 10 min.

☀ Rinsing: Tap water.

☀ Drying: by clean tissue.

☀ Chemical disinfection: By immersion in a disinfectant solution.

☀ Abundant rinsing using sterile H2O. Or sterile saline to eliminate the residues of the disinfectant solution and to prevent recontamination.

☀ Drying: By sterile tissue or air + alcohol spray
Formulation of a Disinfectant Policy

Each hospital should formulate a disinfected policy according to its local needs.

Principles of the policy

1- List all the purposes for which disinfectants are used.
2- Eliminate the use of chemical disinfectants when can be reasonably used as an alternative when disposable can be used to reduce the number of disinfectants to the minimal.
3- Select the smallest number which can cover your needs.
4- Distribute disinfectants chosen at the correct use – dilution or supply equipment to users for correct measuring and preparation for at the site use.
5- Supply all potential users with all the information about the antiseptic they are using.
6- Monitor your policy frequently to insure that it is effective and perform occasional in-use tests.
Sterilization

Sterilization:

(complete absence of any viable microorganisms and their endospore).

Sterile:

The absence of all viable organisms including viruses and spores.

But:

Whatever long applying the sterilizing agent there will be always a fraction that will survive; the number becomes very small, but will never reach zero.

Absolute sterility cannot be achieved.

Sterilility assurance level (SAL):

A medical device is considered sterile if the chance that there are viable microorganisms on the product is less than 1 to a million i.e. $10^{-6}$

- It should be monitored by mechanical physical, chemical and biological methods eg. Pressure, Temperature, steam penetration.

Sterilization could be achieved by:-

i. Heat

ii. Ionizing Radiation

iii. Chemical Methods

   a) Ethylene oxide
   b) Guiltaldehyde
   c) Low temperature steam and formaldehyde

iv. Plasma Sterilization

I. Heat Sterilization

A/ Dry Heat

i. Red Heat – Microbiological Labs

ii. Hot Air over – the FAN OVEN

   - 160°C for 60 minutes
   - Total cycle 2 - 21/2 hours
- Used for Glass, metals, fats powers
- Disadvantage
  - Long cycle
  - Linen, Fabrics not used
  - Oven without a fan unsatisfactory

B/ Moist Heat:

  i. Boiling at 100 °C – 5 – 10 minutes
  ii. Pasteurization 75°C – for at least 10 minutes
  iii. Temperature above 100 °C steam eg. Autoclave

Autoclave

  - The most reliable method of sterilization
  - Use saturated steam under pressure
  - Inexpensive
  - Non Toxic
  - Penetrate fabrics
  - High Safety margin
  - Destroy microorganism by irreversible coagulation and denaturation of enzymes and porters
  - Can not be used for plastics, Rubber and Heat sensitive objects.
  - Temperature 121°C, Pressure 151b/in2 for 15 minutes on 132 for 14 minutes
  - Non Air Displacement first – gravity displacement
  - Monitoring by:
    - Biological – Bacteria streothermophilve
    - Physical – Thermocouple
    - Barrie – Dick Test
    - Brown tuber

II. Ionizing Radiator

  - Not suitable for hospital use any commercially
  - Y – Rays used
  - Used for plastics, Rubber eg. Disposable syrup

III. Chemical Methods

  (1) Ethylene oxide
    - For heat sensitive articles
- Temperature about 55oC
- Ethylene oxide metal with inert gas Freon or CO2 to reduce Risk of Explosion
- Pre humidity needed 50 – 60%
- Gas is irritant and toxic – objects sterilizer should be aired for use to 7 – days

(2) Glutaldehyde
- Immersing an object
- Used 2% solution less reliable than heat
- Irritant and cover sensitization
- Reliable if use 2% solution for 10 have Bart 3 hours could to acceptable
- 10 – 20 minutes for endoscope between patient, D4 good disinfection

(3) Low temperature steam formaldehyde
- Alternative method for ethylene oxide
- 71 – 75oC – For 1 -3 hours

IV. Plasma Sterilization

Plasma describes any gas that consist of electrons, or neutral particles

- Low temperature
- Closed champer
- High Vacuum
- Chemical pre……. to den…….. plasma
- Source of electromagnetic energy

**Sterilization cycle :**

**Cleaning:**

As repeatedly mentioned, items must be cleaned using water with detergents or enzymatic cleaners, before processing. Cleaning reduces the bioburden and removes foreign material (i.e., organic residue and inorganic salts) that interferes with the sterilization process by acting as a barrier to the sterilization agent. Surgical instruments are generally presoaked or prerinsed to prevent drying of blood and tissue. Precleaning in patient-care areas may be needed on items that are heavily soiled with feces, sputum, blood, or other material.
Personnel working in the decontamination area should wear household-cleaning-type rubber or plastic gloves when handling or cleaning contaminated instruments and devices. Face masks, eye protection such as goggles or full-length faceshields, and appropriate gowns should be worn when exposure to blood and contaminated fluids may occur (e.g., when manually cleaning contaminated devices)

**Inspection:**

No Stain, No Dirt, No Rust, Functionality of the instrument

**Packaging:**

. Once items are cleaned, dried, and inspected, those requiring sterilization must be wrapped or placed in rigid containers and should be arranged in instrument trays/baskets

**Objectives:**

To protect sterile equipments.

To prevent recontamination before sterilization.

**Method using:**

a) Disposable paper sheets, complying with standard porosity and resistance.

b) Bags.

c) Containers.

**Loading:**

All items to be sterilized should be arranged so all surfaces will be directly exposed to the sterilizing agent. Thus, loading procedures must allow for free circulation of steam (or another sterilant) around each item

**Sterilization:**

Killing all of micro-organisms, including spores

**storage**

Safe storage times for sterile packs vary with the porosity of the wrapper and storage conditions (e.g., open versus closed cabinets)
Monitoring...

The sterilization procedure should be monitored routinely by using a combination of mechanical, chemical, and biological indicators to evaluate the sterilizing conditions and indirectly the microbiologic status of the processed items

* Physical control:
  1. Leak test.
  2. Bowie-Dick test: Steam penetration and distribution.
  3. Chart record time, temperature, pressure.
* Chemical indicator: strips.
* Physico-chemical indicator.
* Biological indicators

The mechanical monitors for steam sterilization include the daily assessment of cycle time and temperature by examining the temperature record chart.

Chemical indicators are convenient, are inexpensive, and indicate that the item has been exposed to the sterilization process.

Chemical indicators are affixed on the outside of each pack to show that the package has been processed through a sterilization cycle, but these indicators do not prove sterilization has been achieved. Preferably, a chemical indicator also should be placed on the inside of each pack to verify sterilant penetration. Chemical indicators usually are either heat-or chemical-sensitive inks that change color when one or more sterilization parameters (e.g., steam-time, temperature, and/or saturated steam; ETO-time, temperature, relative humidity and/or ETO concentration) are present.

Biological indicators are recognized by most authorities as being closest to the ideal monitors of the sterilization process because they measure the sterilization process directly by using the most resistant microorganisms (i.e., Bacillus spores), and not by merely testing the physical and chemical conditions necessary for sterilization.
Section 5

surveillance
Surgical Site Infections

Despite advances in operative techniques and a better understanding of the pathogenesis of wound infection, post-operative wound infection continues to be a major source of morbidity and mortality for patients undergoing operative procedures. It can account for up to 15% of all nosocomial infections. The most critical factors in the prevention of post-operative infections, although difficult to quantify, are the sound judgment and proper technique of the surgeon and surgical team, as well as the general health and disease state of the patient. In order to minimize post-operative surgical wound infection, it is important to create a safe environment by controlling four main sources of infection, i.e. personnel, equipment, the environment and patient’s risk factors.

Surveillance

Surveillance of surgical site infection (SSI) is a useful tool to demonstrate the magnitude of the problem. Regular feedback of SSI to the surgeon has been shown to provide strong motivation and a reduction in infection rates in clinical practice. For surveillance of SSI, it is important that internationally agreed definitions should be followed, which must be agreed with the surgical team prior to embarking on the surveillance programme. The most widely used definition of SSI is that employed by CDC Nosocomial Infections Surveillance (NNIS) system. They must be risk adjusted so that they can be compared amongst surgeons or among facilities.

In recent years, the surveillance of SSIs has been complicated by changes in surgical practice, the short duration of post-operative stay, outpatient procedures, and laparoscopic procedures. SSIs are considered to be nosocomial if the infection occurs within 30 days the operative procedure or within 1 year if a device or foreign material is implanted.

Criteria for defining a surgical site infection (SSI)

Superficial incisional SSI

Infection occurs within 30 days after the operation, and infection involves only skin or subcutaneous tissue of the incision, and at least one of the following: 1. Purulent drainage, with or without laboratory confirmation, from the superficial incision.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.

3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat and the superficial incision is deliberately opened by surgeon, unless incision is culture-negative.

4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.

**Do not report the following conditions as SSI:**

1. Stitch abscess (minimal inflammation and discharge confined to the points of suture penetration).

2. Infection of an episiotomy or newborn circumcision site.

3. Infected burn wound.

4. Incisional SSI that extends into the fascial and muscle layers (see deep incisional SSI).

**Note:** Specific criteria are used for identifying infected episiotomy and circumcision sites and burn wounds.

**Deep incisional SSI**

Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation. Infection involves deep soft tissues (e.g. fascial and muscle layers) of the incision and at least one of the following:

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.

2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (≥38°C), localized pain or tenderness, unless site is culture-negative.

3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of a deep incisional SSI by a surgeon or attending physician.

Notes:

1. Report infection that involves both superficial and deep incision sites as deep incisional SSI.

2. Report an organ/space SSI that drains through the incision as a deep incisional SSI.

**Organ/space SSI**

Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place and the infection appear to be related to the operation and infection involves any part of the anatomy (e.g. organs or spaces) other than the incision which was opened or manipulated during an operation and at least one of the following:

1. Purulent drainage from a drain that is placed through a stab wounds into the organ/space.

2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.

3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.

4. Diagnosis of an organ/space SSI by a surgeon or attending physician.

The traditional classification of surgical wound infection was based on the exposure of the incision to bacterial contamination attempted to redefine surgical wound infection. This system has provided a greater discrimination for the patients at risk of developing wound infection. The system includes:

- Contaminated or dirty wound class.

- High pre-operative risk as defined by the American Society of Anesthesiologists (ASA) pre-operative assessment score.

- Duration of operation exceeding the 75th percentile for a given procedure.
**Superficial surgical Site Infection**

(superficial incisional)

**DEFINITION:** A superficial SSI must meet the following criteria: Infection occurs within 30 days after the operative procedure and involves only skin and subcutaneous tissue of the incision and patient has at least one of the following:

- Purulent drainage from the superficial incision
- Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
- At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat, and superficial incision is deliberately opened by surgeon, unless incision is culture-negative
- Diagnosis of superficial incisional SSI by the surgeon or attending physician

**REPORTING INSTRUCTIONS:**

- Do not report a stitch abscess (minimal inflammation and discharge confined to the points of suture penetration) as an infection.
- Do not report a localized stab wound infection as SSI, instead report as skin or soft tissue infection, depending on its depth.
- Report infection of the circumcision site in newborns as SST-CIRC. Circumcision is not an NNIS operative procedure.
- Report infection of the episiotomy site as REPR-EPIS. Episiotomy is not an NNIS operative procedure.
- Report infected burn wound as SST-BURN.
- If the incisional site infection involves or extends into the fascial and muscle layers, report as a deep incisional SSI.
- Classify infection that involves both superficial and deep incision sites as deep incisional SSI.
- Report culture specimen from superficial incisions as ID (incisional drainage).
Deep surgical Site Infection

Definition:

A deep incisional SSI must meet the following criteria:

Infection occurs within 30 days after the operative procedure if no implantb is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure and involves deep soft tissues (e.g., fascial and muscle layers) of the incision and patient has at least one of the following:

a. Purulent drainage from the deep incision but not from the organ/space component of the surgical site
b. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (>38°C) or localized pain or tenderness, unless incision is culture-negative
c. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
d. Diagnosis of a deep incisional SSI by a surgeon or attending physician

REPORTING INSTRUCTIONS:

e. Classify infection that involves both superficial and deep incision sites as deep incisional SSI.
f. Report culture specimen from deep incisions as ID.

Surgical site infection (organ/space)

g. DEFINITION: An organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure. Specific sites are assigned to organ/space SSI to further identify the location of the infection. Listed later are the specific sites that must be used to differentiate organ/space SSI. An example is appendectomy with subsequent subdiaphragmatic abscess, which would be reported as an organ/space SSI at the intraabdominal specific site (SSI-IAB).
An organ/space SSI must meet the following criteria:
Infection occurs within 30 days after the operative procedure if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operative procedure and infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure and patient has at least one of the following:

h. Purulent drainage from a drain that is placed through a stab wound into the organ/space
i. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space
j. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination
k. Diagnosis of an organ/space SSI by a surgeon or attending physician

REPORTING INSTRUCTIONS:

• Occasionally, an organ/space infection drains through the incision. Such infection generally does not involve reoperation and is considered a complication of the incision. Therefore, it is classified as a deep incisional SSI.

• Report culture specimen from organ/space as DD (deep drainage).

Microbiology

The pathogens isolated from infections differ, primarily depending on the type of surgical procedure. For example, in clean surgical procedures, Staphylococcus aureus from the exogenous environment or the patient’s skin flora is the usual cause of infection. In other categories of surgical procedures, including clean-contaminated, contaminated, and dirty, the polymicrobial aerobic and anaerobic flora closely resembling the normal endogenous microflora of the surgically resected organ are the most frequently isolated pathogens. According to data from the NNIS, there has been little change in the incidence and distribution of the pathogens isolated from infections during the last decade. However, more of these pathogens show antimicrobial-drug resistance, especially methicillin-resistant S. aureus (MRSA).
Risk factors associated with surgical site infections.

Definite

• Age • Pre-operative hair removal
• Obesity • Type of procedure

Duration of surgery

• Nasal carriage of Staph. aureus
• Remote infection
• Duration of pre-operative hospitalization

Likely

• Malnutrition and low serum albumin • Tissue trauma
• Diabetes mellitus • Foreign material
• Blood transfusion

Possible

• Malignancy • Pre-operative showers
• Immunosuppressive therapy • Emergency surgery
• Breast size in women • Drains

Wound classification:

Based on estimation of bacterial density, contamination and risk of subsequent infections.

Surgical procedure Definition and Expected infection rate (%)
Clean

Non-traumatic, uninfected operative 1–3 % wounds in which no inflammation is encountered; there is no break in technique; and the respiratory, alimentary, or genitourinary tracts or the oropharyngeal cavities are not entered.

Clean contaminated

Operation in which the respiratory, 8–10 % alimentary or genitourinary tracts are entered under controlled conditions and without unusual contamination.

Contaminated

Operation associated with: 15–20 %

• Open, fresh trauma wounds
• Major breaks in a sterile technique or gross spillage from the gastrointestinal tract
• Acute, non-purulent inflammation

Dirty and infected Operation involving old trauma wounds 25–40 %

With retained devitalized tissue, foreign bodies, or faecal contamination, and those with existing infection.

Surveillance of Nosocomial Infection

Surveillance of nosocomial infection is the foundation for organizing and maintaining an infection control programme. In addition, information obtained from surveillance data is a useful tool for identifying areas of priority and allocating resources accordingly.

It is essential to tailor the surveillance for each health facility to maximize the use of all health care resources, given outcome priorities, population characteristics and institutional objectives.

The main objectives of surveillance are as follows:

• Reducing infection rates within health care facilities.
• Establishing endemic infection rates.
• Identifying outbreaks.

• Convincing medical personnel to adopt recommended preventive practices.

• Comparing infection rates between health care establishments.

• Evaluating control measures.

The process of surveillance must incorporate four key stages:

- Data Collection

- Data recording

- Data Analysis

- Data Interpretation

The most vital component of surveillance is ensuring that the information obtained is conveyed to those who may influence practice, implement change or provide financial resources necessary to improve outcomes.

It is a useless exercise to collect and record data without taking any further action. Ideally surveillance should be carried out in all health care establishments to obtain baseline information on the frequency and type of nosocomial infections. Any increase in the rate of infection can then be quickly recognized and appropriate infection control action taken to minimize its transmission. A change in infection rates against a baseline rate can also be used to evaluate the effectiveness of new infection control policies and procedures.

Methods of surveillance

Different methods of surveillance. The type of surveillance method depends on the local factors, i.e. the type and size of hospital, case mix and availability of resources. Continuous surveillance of an entire health care facility requires staff, IT resource and a well organized reporting system.

Targeted surveillance aimed at high risk areas is more effective and manageable and is preferred in larger establishments. Irrespective of the methods used, it is essential that data generated from the surveillance is appropriately risk-adjusted for the generation of meaningful infection rates, especially when the information is released beyond the institution. Surveillance methods should be flexible enough to accommodate technological changes within health care facilities, shortening lengths
of stay and the necessity to provide post-discharge surveillance, including surveillance of procedures carried out in the community. Numerator and denominator data should be collected in all situations for the calculation of rates of infection. For surveillance purposes, the analysis of numerator data alone is meaningless.

A minimum data set for surveillance should include details of the infected individual 1- name or other unique identifier, 2- date of birth 3- sex,

4- hospital record number, 5- ward or unit 7- name of the consultant,

8- unit involved, 10 date of admission,

11- date of onset of infection 12- date of discharge or death 13-site of infection

Colonization 14- organism isolated with antibiotic sensitivities. 15- medical treatment/procedures at the time of infection and any 16-other information relevant to why the infection may have occurred including the patient’s underlying medical risk factors, clinical outcome and an assessment of whether the incident was preventable.

Comparison of infection rates between establishments and the publication of such comparisons needs careful consideration and sensitive handling. This is mainly because the surveillance data may not be comparable, and the range of institutions involved will introduce confounding factors inherent in all surveillance systems. Problems of data interpretation can be overcome when surveillance systems are set up with clearly defined surveillance objectives included in the expected outputs of surveillance. Unfortunately, at this time, surveillance objectives rarely underpin surveillance methods.

**Management of an outbreak**

An outbreak may be defined as the occurrence of disease at a rate greater than that expected within a specific geographical area and over a defined period of time Day-to-day surveillance is important to identify cases of nosocomial infections and other infectious diseases so that appropriate action is taken. Major outbreaks of transmissible infection in both the hospital and community require appropriate planning to ensure effective management of such episodes.
Various methods of surveillance used in infection control.

<table>
<thead>
<tr>
<th>Methods</th>
<th>Sources of data</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Continuing surveillance</td>
<td>Medical, nursing, laboratory and of all patients (CS) records including temperature treatment reports</td>
<td>Time-consuming not cost effective: charts, X-ray and antibiotic infection rates are low in some specialties.</td>
</tr>
<tr>
<td>Ward liaison (WL)</td>
<td>Twice-weekly visits to wards.</td>
<td>Less comprehensive Discuss all patients with staff than CS, with similar and review records. disadvantages.</td>
</tr>
<tr>
<td>Laboratory-based (LB)</td>
<td>Laboratory records only. Depends on samples taken and information on request forms.</td>
<td>Follow up of LB in wards. Disadvantages of LB, but more accurate surveillance (LBWS). Laboratory-based ward As LBWS and reporting of As LBWS, but early surveillance and outbreaks by ward staff and detection of outbreaks selected continuing CS in special units. and incidence in surveillance (LBWS (e.g. ITU) or infections studies in selected and CS) (e.g. wounds). areas of infection. Laboratory-based ward Combination of LB and LBWS. Time-consuming but liaison (LBWL) most sensitive after CS.</td>
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</table>
### Advantages and Disadvantages of Various Surveillance Strategies:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>Hospital-wide incidence surveillance</td>
<td>Provides data on all infection sites, and units</td>
<td>Expensive</td>
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<tr>
<td></td>
<td>Identifies clusters</td>
<td>Labour-intensive and time-consuming</td>
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<tr>
<td></td>
<td>Establishes baseline rates</td>
<td>No defined management objectives</td>
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<tr>
<td></td>
<td>Recognizes outbreaks early, identifies risk factors</td>
<td>Large amounts of data collected and little time to analyse.</td>
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<tr>
<td>Prevalence</td>
<td>Inexpensive</td>
<td>Overestimates rates</td>
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<td></td>
<td>Time efficient</td>
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<td></td>
<td>, important differences compared with incidence surveys.</td>
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<tr>
<td></td>
<td>can be done, periodically</td>
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<td></td>
<td>Objective/</td>
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<td></td>
<td>Adapts to hospitals with No baseline infection rates.</td>
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<td></td>
<td>priority based special interests and resources</td>
<td>May miss clusters</td>
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<td></td>
<td>Focuses on specific problems outbreaks, at the individual institution</td>
<td></td>
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<td></td>
<td>Identifies risk factors.</td>
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<td></td>
<td>Can include post-discharge</td>
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<tr>
<td>Component</td>
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<tr>
<td>Targeted surveillance</td>
<td></td>
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<tr>
<td>Site specific</td>
<td>No defined management objectives</td>
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<tr>
<td>Flexible, can be mixed with other strategies.</td>
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<tr>
<td>Can include a post-discharge component.</td>
<td>No baseline rates in other units May miss clusters.</td>
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<tr>
<td>Unit specific</td>
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<tr>
<td>Focuses on patients at greater risk.</td>
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<tr>
<td>Requires fewer personnel.</td>
<td>Can miss clusters.</td>
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<tr>
<td>Simplifies surveillance effort.</td>
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<tr>
<td>Rotating</td>
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<tr>
<td>Less expensive.</td>
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<tr>
<td>Less time-consuming and labour-intensive.</td>
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<tr>
<td>Includes all hospital areas.</td>
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</tbody>
</table>
| Outbreak | Valuable when used with all types of surveillance  
| Thresholds are institution specific | No baseline rates provided. |

| Limited Decreases possibility of missing an outbreak |

| May miss cluster |

| Periodic surveillance Liberates infection control nurse to perform other activities.  
| Increase efficiency of surveillance. |

**Planning an outbreak Control**

Therefore it is important that the health care facilities must draw up detailed outbreak control plans appropriate to local situations. These plans should be discussed and endorsed by the hospital ICC and should include the criteria and method for convening the Outbreak Control Committee. The plan should also clearly address the areas of individual responsibilities, and action plans for all involved. Those who are or may be involved in the management of a major outbreak must be aware of such a policy and their individual role.

In an outbreak situation, communication to relevant staff is important. Effective outbreak investigation requires adequate laboratory support. It is particularly important to ensure that outbreak isolates pathogens involved are stored for further investigation. This is because many of the infectious agents that cause outbreaks in health care facilities are endemic organisms, and it may be necessary to use a typing system to evaluate which isolates are part of any putative outbreak. Although simple antimicrobial susceptibility testing may be enough to distinguish isolates, against a background of increasing resistance, other more sophisticated methods of typing may be necessary. These are usually available from a reference laboratory.
Recognition of outbreaks:

The rapid recognition of outbreaks is one of the most important objectives of the routine surveillance of infection. Ideally, hospital surveillance systems should facilitate the early detection of outbreaks. In some instances, the occurrence of an outbreak may be obvious, such as in an episode of food poisoning that affects both health care workers (HCWs) and patients, while in other instances the onset may not be immediately apparent. Sometimes the outbreak may manifest itself clearly to the medical and nursing staff. However, some outbreaks may arise more insidiously and reach considerable proportions before they become apparent. These outbreaks are detected by the laboratory, but under some circumstances may be identified only through the vigilance of general nursing and medical staff.

Investigation:

The principles for investigating outbreaks in hospitals are the same as for community-based outbreaks. There are three basic steps: i.e.

(a) describing the outbreak, (b) developing a hypothesis and (c) testing the hypothesis with analytical epidemiology.

Once a possible outbreak has been recognized, the Infection Control Team should take immediate steps to collect information from the ward and the laboratory, determine whether an outbreak is occurring and establish a case definition. If the initial investigation confirms that an outbreak is occurring, it is important to establish its severity and initiate some immediate control measures. If, after the initial observation, it is established that no outbreak exists, then it is important that the person who has made the initial observation should be informed and the reason given. Ward staff may need reassurance and care should be taken not to discourage further reporting.

Outbreak control:

Preliminary control measures should be introduced as soon as possible and be based on sound infection control practices such as patient isolation and/or hand washing. Heightened surveillance should be introduced to assess the situation.

Summary for investigation of an outbreak

• Begin preliminary evaluation and determine a background rate of infection.
• Confirm the existence of an outbreak.

• Confirm the diagnosis using the microbiological methods.

• Create a case definition that may include laboratory and clinical data.

• Start with a broad case definition that can be redefined at a later date.

• Develop line listings by identifying and counting cases or exposures.

• Describe the data in terms of time, place and person. Remember that cases may have been discharged from the health care facilities.

• Construct an epidemic curve. This may indicate the source of the Outbreak

  • Develop and test the hypothesis. In larger outbreaks, a case-control method may be the most efficient way of testing a hypothesis: however, if a single hospital ward is affected, a retrospective cohort study is relatively easy.

• Take immediate control measures. Determine who is at risk of becoming ill. Look at changes that may have affected the rate of infection, e.g. new staff, new procedures, new laboratory tests, and health care worker:patient ratio, etc.

• Communicate information to relevant personnel.

• Screen personnel and environment as indicated.

• Write a coherent report (preliminary and final).

• Summarize investigation and recommendations to the appropriate authorities.

• Implement long term infection control measures for prevention of similar outbreaks.

  **impact of all control measures.**

As soon as possible, information about the outbreak, the investigation and the results should be conveyed to those at risk. Outbreak control plan: Depending upon the nature of the infectious disease and number of cases involved, the Outbreak Control Committee should be convened. The membership of the committee varies depending upon the type of health care facilities.

The aim of the Outbreak Control Committee is to:

• Facilitate the investigation of the outbreak.
• Implement measures necessary to control the outbreak.

• Monitor the effectiveness of the control measures.

• Oversee communication to all relevant groups.

• Facilitate the medical care of patients.

**Communication:**

The Outbreak Control Committee will inform the senior management of the hospital and other appropriate people on a regular basis. In an outbreak situation, it is good practice to have one designated person within the health care facility to respond to enquiries from the public, press and the media. That person should be kept informed of all the developments by the chairperson of the Outbreak

**End of outbreak:**

At the end of an outbreak, the Outbreak Control Committee will prepare a final report.

When the outbreak has been controlled, a final meeting of the Outbreak Control Committee should be held to:

• Review the experience of all participants involved in management of outbreak.

• Identify any shortfalls and particular difficulties that were encountered.

• Revise the outbreak control plan in accordance with the results.

• Recommend, if necessary, structural or procedural improvements which would reduce the chances of recurrence.

All outbreaks provide the opportunity to educate health care workers about infection control matters. It is essential that all outbreaks, however minor, should be investigated thoroughly and the outcomes of such investigations documented.
Look back investigations

Look back investigations refer to the process of identifying, tracing, recalling, counselling and testing patients or health care workers who may have been exposed to an infection. An example is the case of a health care worker who has undertaken exposure-prone procedures on surgical patients and is later found to be positive for a blood-borne virus, e.g. HIV, hepatitis B or C virus. A similar process may be needed if a breakdown in the normal processes of cleaning and disinfection or sterilization of instruments such as endoscopes is detected, allowing the potential for transfer of infection from one patient to another.

All types of look back investigation have the potential to cause a great deal of publicity. This can cause unnecessary anxiety in patients treated at the health care facility who have not been exposed to infection, as well as anger and distress among patients who were put at risk of infection. Look back investigations can take up a great deal of time and resources and should not be undertaken lightly.

The hospital and the local health authority should be involved at the outset and a planning team established with members who have expertise in infection control, infectious disease, microbiology, the discipline involved, public relations, representatives of the health authority; legal and indemnity issues should also be included. The procedures to be undertaken and how these are presented to at-risk patients and the public should be clearly worked out at the outset. These procedures should also clearly set out protocols for tracing, counselling and referral of at-risk patients in a timely manner. Test results should be available with minimal delay, and the planning team should ensure that the project is completed and a final report produced as soon as possible.

Prevention of Infections Caused by Multi-resistant Organisms

Resistance to antimicrobial agents among clinically important bacteria has increased in recent decades and occurs worldwide. The impacts of resistance range from the failure of an individual patient to respond to therapy and the changes needed in empirical therapy to the economic impact of prescribing costs, hospital stay, and the social costs of morbidity and mortality from infection.

Acute health care facilities serve both as a point of origin and as a reservoir for highly resistant pathogens. This is because patients admitted to hospitals are highly
susceptible and are usually subjected to intensive and prolonged antimicrobial use. In addition, failure in infection control practice can result in cross-infection and outbreak of nosocomial infections with highly resistant bacterial pathogens such as methicillin resistant

Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE) and multi-resistant Gram-negative bacilli as well as resistant fungal infections. Some of these resistant strains have now spread outside hospitals causing infections in the community. In addition, patients admitted to hospital can bring with them resistant microorganisms acquired in the community, including penicillin-resistant Streptococcus pneumoniae, multi-resistant salmonellae and multi-resistant M. tuberculosis.

The key element in minimizing the emergence of multi-resistant microorganisms and control include:

- Active surveillance of infections and antimicrobial resistance pattern recognition, investigation and control of outbreaks or clusters of infections.

- Good microbiology laboratory practice using international accepted method of antibiotic susceptibility testing is the key to the prompt identification of resistant pathogens and collection of accurate surveillance data.

- Effective control of antimicrobial use in health care setting by developing antibiotic policies based on local antibiotic resistance pattern and surveillance data. This should be supplemented by regular audit and feedback of date to the prescribers.

- Development and implementation of appropriate infection control measures including hand decontamination and isolation/cohorting of affected patients.

- Adequate disinfection and sterilization of items and equipment, which come into contact with patients.

- Effective cleaning and decontamination of the hospital environment.

- Education and training of health care personnel in appropriate aseptic techniques for medical and nursing procedures, infection control procedures, and antibiotic prescribing.
METHICILLIN-RESISTANT Staph. aureus

Staph. aureus is one of the most common pathogens well known for causing skin and soft tissue infection, e.g. impetigo, folliculitis, cellulitis etc. In addition, Staph. Aureus may cause systemic infections such as abscesses, pneumonia, osteomyelitis, septicaemia, endocarditis and meningitis. Up to 30% of healthy people carry Staph. aureus in their nose and other moist and hairy areas of the body. Methicillin (flucloxacillin or cloxacillin) resistant Staph. aureus (MRSA) are important in that they are resistant not only to flucloxacillin and erythromycin, the most commonly used antibiotics to treat Staph. aureus infection, but also to other oral antibacterial agents, leaving only intravenous (IV) antibiotics for treatment. MRSAs do not generally appear to be more virulent than sensitive strains but, because of their resistance patterns, they are more difficult to treat if infection occurs. In addition, intermediate vancomycin or glycopeptide resistant Staph. aureus (VISA or GISA) have been detected in some countries. In June 2002, the first clinical occurrence of Staph. aureus fully resistant to vancomycin (VRSA) was isolated from the USA.

Despite vigorous attempts at eradication over the last 20 years, MRSA continues to be the major nosocomial pathogen worldwide. The level of hospital MRSA infection is indicative of the overall infection rate of the institution and usually reflects:

- Higher concentrations of sicker patients
- Overcrowding of wards
- Higher throughput of patients
- Heavy nursing load and under staffing, and
- Increased use of agency nursing staff unfamiliar with local infection control procedures. There is a high patient morbidity and mortality associated with hospital-acquired MRSA especially in intensive care wards, infected vascular/orthopaedic prostheses, surgical wound infection and cases where septicaemia and pneumonia develop.

Source of infection

MRSA is common in many hospitals, and has a high propensity to become endemic. MRSA colonization precedes infection. Infected and colonized hospital patients are
the major primary reservoirs in the health care setting. Colonization of hospital patients is dependent on:

• Length of hospital stay
• Severity of underlying disease
• Presence of wounds and/or invasive devices
• Recurrent or recent antibiotic treatment, and
• Nutritional status of the patient.

Community reservoirs include:

• Patients recently discharged from hospital
• Patients with chronic leg ulcer
• Nursing and residential home residents
• Patients with dermatological disease, e.g. eczema, and
• IV drug users.

**Mode of transmission**

The major route of transmission of MRSA within institutions is from patient to patient via the hands of hospital health care workers (HCWs) who acquire the organism after direct patient contact or after handling contaminated materials. This is usually associated with inadequate handwashing. Unfortunately it has been shown that HCWs, particularly doctors, frequently fail to wash their hands between seeing patients. Other forms of transmission, such as from colonized HCWs or from the air or environmental surfaces, are usually less important.

**Control measures**

It is important to ensure that a proper surveillance and monitoring system is in place. If it becomes apparent that the rate of MRSA is disproportionately high, then specific and locally appropriate preventative measures need to be developed and implemented. Although various guidelines have been published, there are no
universally agreed standards for control. The approach of management depends on two factors:

- Endemicity of the resistant organism in the institution, and
- Vulnerability of the patients in the wards/unit where they occur.

In non-endemic institutions, the object should be elimination (‘search and destroy’ policy) of MRSA. Elimination involves confining the organisms to the individual(s) first identified as colonized or infected, and detecting other patients to whom the infection may have been transmitted (as for outbreak screening). Elimination is usually achieved by discharging colonized/infected patients. An alert system for readmission of these patients is required to make this fully effective, because carriage, (particularly of MRSA and VRE) can be very prolonged. The role of broader screening of risk groups on a routine basis is less clear, and costs can be considerable. In an institution where MRSA is endemic the object is of minimization which involves ensuring that further transmission to new patients is minimized. Segregation of known colonized and infected patients still plays a useful role. In high-risk patients and clinical areas (e.g. intensive care units), some form of ongoing screening programme may be of benefit in identifying new admissions who are colonized.

In an acute health care facility, where the organisms are not endemic, rigorous application of infection control measures have been shown to be effective in containing or eliminating the problem, although this can be expensive and its cost-effectiveness is unclear.

**Infection control precautions**

All patients admitted from other hospitals and patients from other countries requiring medical treatment, especially with a history of previous hospital admission, should be admitted to a side ward and screened for carriage of MRSA. The patient’s case notes must be identified with a warning MRSA sticker. They should also be ‘flagged’ on the Patient Information Services computer, if possible. If asymptomatic patients are found to be carriers of MRSA, it is worthwhile discharging them from hospital (if clinical condition permits) on an anti-staphylococcal protocol for elimination of MRSA. If the patient requires treatment in another hospital, the clinician and the member of Infection Control Team (ICT) at the receiving hospital should be informed.
The number of staff caring for the patient should be kept to a minimum, if possible. Staff with skin lesions, eczema or superficial skin sepsis should be excluded from contact with the patient. As a general rule, patients with MRSA should be the last seen on a ward round, if at all possible.

- All patients known to be infected or colonized with MRSA should be admitted to a single room with its own bathroom facilities or cohorted with patients with the strain. The patient should be advised that there is no risk to healthy relatives or others outside the hospital. They should also be given information and a fact sheet about MRSA.

- Single-use disposable plastic aprons should be worn for activities involving contact with the patient or their environment. For extensive physical contact with the patient, non-permeable disposable gowns are required.

- The gown or plastic apron and gloves should be removed before leaving room. When disposing of protective clothing, it is essential that it should not come in contact with the environmental surfaces. Used plastic aprons/gowns should be discarded into a yellow clinical waste bag before leaving the room.

- Single-use disposable gloves should be worn for handling contaminated tissue, dressings or linen. Hands must be decontaminated after removing gloves.

- High efficiency filter type masks should be used for procedures that may generate staphylococcus aerosols, e.g. sputum suction, chest physiotherapy or procedures on patients with an exfoliative skin condition, and when performing dressings on patients with extensive burns or lesions.

- Hands must be washed before and after contact with the patient or their immediate environment. They should be washed thoroughly using an antiseptic chlorhexidine/detergent or alternatively, physically clean hands can be disinfected with an alcoholic hand rub.

- All single-use items must be disposed of as clinical waste. Clinical waste bags must be sealed before leaving the room. Any reusable items should be processed in accordance with the local disinfection policy.

- Use dedicated equipment, e.g. stethoscope, sphygmomanometer and thermometer. Clean and disinfect before reuse.
• Instruments used for dressing changes should not be transferred from patient-to-
patient but should remain by the patient’s bedside. Consider the surfaces and
furniture within the rooms to be contaminated as well as the patients themselves.

• All bed linen and clothing should be changed daily. Used linen must be handled
gently at all times and should be processed according to local policy. Linen bags
must be sealed at the bedside and removed directly to the dirty utility area or to the
collection point.

• After discharge of the patient, the room should be thoroughly cleaned using
detergents. Surfaces should be disinfected using appropriate disinfectant, e.g.
freshly prepared hypochlorite solution 1:100 dilution. Once the room is dry it can be
used for other patients.

Patient’s movement

Visits by patients with MRSA to other departments should be kept to a minimum. For
any treatment or investigations, prior arrangements must be made with the other
department. They should be seen immediately and not left in a waiting room with
other patients.

Within the hospital: Transfer of infected or colonized patients to other wards or
departments should be kept to a minimum. If the patient is moved to a different ward,
all open lesions should be covered with an impermeable dressing during the transfer.
Inter-hospital transfer: Inter-hospital movement should be restricted where this is
possible. If transfer is necessary, then the ICT of the receiving hospital should be
informed. A letter should also be sent giving the relevant clinical details as to whether
the patient is infected or colonized with MRSA and the details of the treatment
protocol, so that a course of treatment can be completed.

Nursing or residential home: Continued carriage of MRSA is not a contraindication
for the transfer of the patient to a nursing or residential home. If the patient is
discharged to the residential or nursing home, the owner of the nursing home should
be informed.

Decolonization therapy for MRSA

Treatment should be prescribed for 5 days at the advice of medical practitioner.
Nose: Apply 2% nasal mupirocin ointment three times a day for 5 days. A small
amount of ointment (about the size of a match-head) should be placed on a cotton
bud and applied to the anterior part of the inside of each nostril. The nostrils are closed by gently pressing the sides of the nose together; this will spread the ointment throughout the nares.

Body bathing: Shower: Wash vigorously with an antiseptic detergent (triclosan or chlorhexidine), beginning with and paying particular attention to the hair, around the nostrils, under the arms, between the legs (groin, perineum, and buttock area), feet and working downwards. Rinse from head to toe and dry body with a clean towel. For the bath add antiseptic (triclosan or chlorhexidine) bath concentrate to a bath full of water immediately prior to the patient entering the water.

Body bathing or bed bathing: Patients confined to bed can be washed with an antiseptic detergent (triclosan or chlorhexidine). Wet skin, apply about 30 ml of antiseptic soap preparation directly onto the skin using a disposable cloth. Wash and rinse from head to toe. Dry body with a clean towel.

Note: Triclosan should be in contact with the skin for about 1 min and then thoroughly rinsed. Hexachlorophane powder: Hexachlorophane 0.33% powder can be used to treat carrier sites. It should be applied to intact skin such as the perineum, buttocks, flexures and axillae three times daily for 5 days. Do not use hexachlorophane powder on badly excoriated or inflamed skin or during pregnancy. The product should be administered to children less than two years of age on medical advice only. Colonized lesions: Mupirocin ointment can be applied topically three times a day to small lesions for 5 days. It should be used with caution if there is evidence of moderate or severe renal impairment. Dressing containing chlorhexidine or povidoneiiodine may be applied to the infected wound.

Points to be considered

• Antiseptic detergents should be used with care in-patients with dermatitis and broken skin and must be discontinued if skin irritation develops.

• Mupirocin ointment should be reserved for the treatment of MRSA. Prolong course (more than 7 days) or repeated course (more than two courses per hospital admission) should be avoided to prevent emergence of resistant.

• Repeat swabbing is required at the advice of the ICT.

• Launder towels and cloths after use. Patient’s clothes (including undergarments/night wear) should be changed on a daily basis and washed in hot
water cycle. Dry clean non-washable and woolen clothes. Bed linen should be changed at the beginning of protocol and then every day until the end of protocol.

Ambulance transportation: The ambulance service should be notified in advance.

There is no evidence that ambulance staff or their families are at risk from transporting patients with MRSA. The following infection control measures should be taken:

- The patient should be given clean clothing before transport.
- A disposable plastic apron should be worn for patient contact.
- Physically clean hands can be disinfected with an alcoholic hand rub after contact with the patient or the environment.
- The patient’s contact area, e.g. chair and the stretcher should be cleaned and disinfected with a large alcohol impregnated wipe or disinfectant solution after transport of an affected patient.
- Blankets and pillow cases should be placed in an appropriate bag for laundering according to local protocol.
- The vehicle should be thoroughly cleaned with detergent and disinfected with freshly prepared hypochlorite solution 1:100 dilution. The vehicle may be used when all surfaces are dry. Fumigation and prolonged airing is not necessary. Once the ambulance is dry it can be used for other patients.

**Patient screening and microbiological surveillance**

A swab moistened with sterile water should be used to sample carrier sites and lesions. The screening swabs should be taken from the nose, perineum/groin, operative and wound sites, abnormal or damaged skin, insertion sites of IV lines, catheter urine samples and sputum, if expectorating, at the advice of the ICT.

Once the patient is positive for MRSA, swabs from carrier and other sites should be taken at least 3 days after stopping the MRSA treatment protocol. Three sets of negative screening swabs are required before the patient is considered to be ‘clear’, as scanty colonization may not be detected with fewer screening specimens. Advice should be taken from a member of the ICT regarding follow-up screening swabs. It is important to note that relapses are particularly likely if the patient is receiving antibiotics and can occur after relatively long periods, such as 6–12 months.
Carriage of MRSA strains may persist for months or years and may reappear in an apparently ‘clear or cured’ patient.

**Clearance of MRSA carriage**

If considered appropriate, clearance of MRSA carriage should be carried out as outlined on page 125. The treatment should only be prescribed on the advice of the medical practitioner.

Topical nasal applications of antibiotics are usually ineffective in clearing throat or sputum colonization. In addition, it is also often difficult to eradicate colonization from chronic lesions such as pressure sores or leg ulcers in elderly patients. In these situations, reliance must be placed on isolation procedures and early discharge. Systematic therapy can be given as advised by the medical practitioner on an individual patient basis. Certain body sites are more resistant to the eradication of MRSA, e.g. tracheostomy sites, deep pressure sores and wounds, chronic leg ulcers, rectal and perineal regions and colostomy sites.

Clearance of MRSA carriage should be attempted before surgery wherever possible. These patients should be operated upon at the end of an operating list, if possible. All lesions must be covered with an impermeable dressing during the operation and the adjacent areas treated with appropriate antiseptic.

**Health Care Workers**

There is no evidence that MRSA poses a risk to healthy people. This includes HCWs and their families. It is essential that HCWs must adhere to the recommended infection control practice. Carriage by HCWs is usually transient, but some may harbour MRSA in the nose or on the hands (contact dermatitis or eczema), and may act as primary reservoirs. Therefore, it is important, that HCWs who have worked in a hospital or health care facility where MRSA was endemic or who have reason to believe that they may be carriers of MRSA, should inform their employer. HCWs who require treatment for MRSA carriage should be referred to the occupational health department.
VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)

The first clinical strains of vancomycin or glycopeptide resistant enterococci (VRE or GRE) were reported in 1988. Since then, the incidence of VRE (Enterococcus faecium or Enterococcus faecalis) has been rising steadily. VRE do not generally appear to be more virulent than sensitive strains but, because of their resistance patterns, are more difficult to treat if infection occurs. In addition, these microorganisms have a high propensity to become endemic.

Risk factors

The epidemiology of VRE has not been clarified. However, the following patient populations are at increased risk of colonization and infection:

• Treatment with previous vancomycin and/or multiple broad-spectrum antibiotic therapy.

• Presence of indwelling devices (peripheral IV and central lines, urinary catheters, surgical drains, endotracheal tubes).

• Critically ill patients (e.g. patients in ICU, oncology or transplant wards).

• Patients who have had intra-abdominal, cardiothoracic, orthopaedic, vascular and urology surgery.

• Severe underlying disease or immunosuppression.

Source of infection

E. faecium and E. faecalis are commensal bacteria in the gastrointestinal tract of healthy individuals. However, these microorganisms are selected by the use of broad-spectrum antibiotics. Most enterococcal infections have been attributed to endogenous sources. However, in an outbreak situation or when the organism is endemic in a health care institution, patient-to-patient cross-infection can occur either through direct or indirect contact via the hands of personnel or from contaminated patient-care equipment and environmental surfaces.

Mode of transmission

A major route of transmission of VRE within health care facilities is from patient-to-patient via the hands of HCWs that acquire the organism after direct patient
contact or after handling contaminated materials. This is usually associated with inadequate hand washing.

**Infection control measures**

The approach to management of these organisms depends on two factors, i.e. endemicity of the organism in the institution, and vulnerability of the patients, largely determined by the presence of risk factors (see above).

Elimination is usually achieved by discharging patients (colonized/infected). Patients can remain colonized for a long time after discharge from hospital. An alert system for re-admission of these patients is required so that these patients can be promptly identified and placed on additional (contact) isolation precautions upon re-admission to the hospital. If patients require transfer to another hospital, a member of the ICT of the receiving hospital must be informed.

Where the organisms are not endemic to the institution, the object should be elimination. Rigorous application of additional precautions (contact transmission) has been shown to be effective in containing and eliminating the problem, although this can be expensive and its cost-effectiveness is unclear. Eradication of VRE from hospitals is most likely to succeed when infection or colonization is confined to a few patients on a single ward. If the VRE has become endemic on a ward, or has spread to multiple wards, eradication becomes difficult and costly. In these cases, the object should be minimization of further transmission. Aggressive infection control measures and strict compliance by hospital personnel is required to limit nosocomial spread. Application of additional precautions (contact transmission) is useful in both settings. In addition to infection control following infection control measures, antibiotic policy must be reviewed in an attempt to reduce use of all broad-spectrum antibiotics and glycopeptides.

- Isolate or cohort them with other patients with presumed or known same strain. Patients with VRE and diarrhoea or incontinence pose a high risk of transmission to others and must be isolated in a single room.

- Appropriate protective clothing, i.e. gown/plastic apron should be worn when entering room.

- Wear non-sterile disposable gloves when in contact with infected or colonized patients or their environment. Hands are subsequently disinfected with an antiseptic.
• Remove gown and gloves before leaving room and wash hands with antiseptic solution or alcoholic hand rub. Ensure gown/plastic apron and gloves do not contact environmental surfaces before disposal.

• Use a mask if the patient has colonized respiratory secretions.

• Use dedicated equipment, e.g. stethoscope, sphygmomanometer, rectal thermometers.

• Use disposable equipment whenever possible. If not possible, clean and disinfect items and equipment before reuse. Standard sterilization procedures for instruments will inactivate the organisms.

• Instruments used for dressing changes should not be transferred from patient-to-patient but should remain by the patient’s bedside.

• Consider the surfaces and furniture within the rooms to be contaminated as well as the patients themselves.

• Adequate cleaning and disinfection of re-usable devices should be carried out if such devices are re-used on other patients.

• Enterococci persist in the environment. Disinfection with a high-level disinfectant (e.g. freshly prepared hypochlorite solution 1:100 dilution) should be undertaken in addition to standard cleaning and this should be done on a regular basis.

• Transfer of patients to other high dependency units should be restricted, if possible.

Screening of patients

The role of broader screening of risk groups on a routine basis is less clear, and costs can be considerable. Therefore, it is not recommended as a routine procedure.

However, in high-risk patients and clinical areas (e.g. in ICUs), some form of ongoing screening programme may be of benefit in identifying new admissions who are colonized. In an outbreak situation, screening swabs for culture from multiple body sites, i.e. stool or rectal swabs, perineal area, areas of broken skin (i.e. ulcer and all infected or colonized patients in a single room with its own bathroom facilities wound), urine from catheterized patients, colostomy site should be taken to identify carriers. Since the most frequent site of colonization is the large bowel, a faecal
sample is the most useful screening specimen. It is important to emphasize that stool carriage may persist for months or years and oral antibiotic therapy to eradicate the carriage is not successful.

MULTI-RESISTANT GRAM-NEGATIVE BACILLI

The first reports of extended-spectrum beta-lactamases (ESBLs) in Gram-negative bacilli came from Europe and were followed quickly by reports in the US. This type of antimicrobial resistance is now recognized worldwide. Although ESBLs are found most frequently in Klebsiella pneumoniae, the elements conferring this type of resistance are transferable to other genera, including Escherichia coli and others.

These pathogens often occur in an outbreak setting and pose a therapeutic dilemma due to resistance to multiple antimicrobials to beta-lactams and other agents, including fluoroquinolones and gentamicin. These isolates also have a propensity for spread by clonal strain-transmission from patient to patient, thereby posing an infection control dilemma. Control interventions for these organisms involve choosing effective therapy for infected patients and instituting infection control measures and antibiotic utilization measures.

Risk factors for colonization or infection

Reported risk factors for colonization or infection from multiple outbreaks of ESBL-producing organisms include: presence of IV catheters, emergency intra-abdominal surgery, gastrostomy or jejunostomy tube, gastrointestinal colonization, length of hospital or ICU stay, prior antibiotics (including third-generation cephalosporins), prior nursing home stay, severity of illness, presence of a urinary catheter, and ventilator assistance. In the majority of cases, these organisms affect severely ill patients in the ICU setting as well as chronically debilitated patients in the long-term care setting.

Infection control precautions

In addition to the following infection control measures, excessive use of broadspectrum antibiotics (in particular the widespread use of ceftazidime) should be avoided. Antimicrobial prophylaxis for surgery should be restricted to a maximum of 24 h.
• Application of additional precautions (contact transmission) should be instituted. Such precautions involve use of barriers, e.g. gloves, gowns for contact with infected patients or their immediate environment. Hands must be washed after removing gloves.

• Patients should not be transferred between wards or hospital unless it is absolutely essential. If transfer is essential, the ICT of the receiving hospital should be informed in advance.

• Bedpans and urinals should be disinfected using heat treatment. If a bedpan disinfector breaks down, it should be repaired as an emergency. Disposable bedpans and urinals can be used, if available.

• Communal equipment (especially if wet) may act as a source for these organisms, therefore ward equipment must be stored dry; soaking of instruments in disinfectant solution must be avoided.

• Urinary catheters must be inserted under aseptic procedure. Urine drainage bags must be emptied by the tap, for which single-use disposable gloves should be used and hands must be washed after the procedure. Do not break the circuit and reconnect the urinary system. A separate jug or container should be used for each patient when emptying urinary drainage bags.

**Suggested Antibiotic Prophylaxis for surgical procedures:**

**Surgical procedures**

**Antibiotics**

Cardiac surgery  Cefuroxime or cefazolin (three doses)

Neurosurgery  Cefuroxime or cefazolin (single dose)

Head and neck

(operation involving the Cefuroxime or cefazolin _ metronidazole

mucous membranes and (up to three doses) deep tissue

Biliary tract surgery  Cefuroxime or cefazolin or gentamicin

(single dose)

ERCP  Cefuroxime or cefazolin (single dose)
Gastroduodenal Cefuroxime or cefazolin (single dose)

Appendectomy Cefuroxime or cefazolin or gentamicin _ (simple) metronidazole (single dose)

Colorectal surgery Cefuroxime or cefazolin or gentamicin _ metronidazole (single dose)

Orthopaedic surgery

• Insertion of prosthetic Cefuroxime or cefazolin. Substitute vancomycin joints, open operation if history of penicillin or cephalosporin allergy (single dose)

• Lower limb amputation Benzylpenicillin 2 mega units IV 6 hourly.

Metronidazole or clindamycin for patient allergic to penicillin.

All antibiotics should be given for 24 h duration

Peripheral vascular surgery Cefuroxime or cefazolin (three doses)

Urological surgery IV antibiotic cover depends on sensitivity testing of screening urine. In an emergency situation,

give gentamicin 2–3 mg/kg body weight (single dose)

Hysterectomy Cefuroxime or cefazolin _ metronidazole or co-amoxiclav alone (single dose)

Caesarean section Cefuroxime or cefazolin or co-amoxiclav after umbilical cord is clamped (single dose)

Helpful hints

• All antibiotics should be administered at the induction of anaesthesia. Repeat dose of antibiotic should be given for the operations when the duration of operation exceeds 3 h or in the case of massive haemorrhage ( _2 litres of blood is lost in an adult). Do not give prophylactic antibiotic for more than 24 h.

• Prophylactic antibiotic dosage for adults: cefuroxime, 1.5 g IV (750mg if body weight 50 kg); cefazolin 1–2 g; clindamycin 600 mg IV; metronidazole 500 mg IV and co-amoxiclav 1.2 g IV.
Section 6

Protection of Health Workers Inside Hospitals
Definitions:

Health care personnel: all paid and unpaid persons working in health care settings who have the potential for exposure to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air.

Overview:

Because of their contact with patients or infective material from patients, many health-care workers (HCWs) (e.g., physicians, nurses, emergency medical personnel, dental professionals and students, medical and nursing students, laboratory technicians, hospital volunteers, and administrative staff) are at risk for exposure to and possible transmission of vaccine-preventable diseases (infectious diseases some of them are preventable by vaccine). Maintenance of immunity is therefore an essential part of prevention and infection control programs for HCWs.

Objectives of infection control program among HCW:

- Amplify the alertness of the HCWS about infectious diseases and their routes and modes of transmission, this will eventually lead to increased cautiousness and safeguard measures when encountering such risks.
- Empowering the HCWS to address the potential hazards of infections or outbreaks among health team and how to handle these infections effectively.
- Orient the attitude and approach of the HW during post exposure experience towards standard management and procedures.

To achieve these goals there should be dynamic, continuously updated mechanisms that ascertain health and safety education concurrently with immunization programs and counseling services that provide management skills for job related illnesses and exposures to infectious diseases.

Another effective element in infection control is the medical evaluations before placement to ensure that personnel are not placed in jobs that would pose undue risk of infection to them, other personnel, patients, or visitors. This usually includes determining immunization status and obtaining histories of any conditions that might predispose personnel to acquiring or transmitting communicable diseases. Physical
examination, another component of the medical evaluation, can be used to screen personnel for conditions that might increase the risk of transmitting or acquiring work-related diseases and can serve as a baseline for determining whether future diseases are work related.

Personnel are more likely to comply with an infection control program if they understand its rationale. Thus, personnel education is a cardinal element of an effective infection control program. Clearly written policies, guidelines, and procedures ensure uniformity, efficiency, and effective coordination of activities between departments. However, because the risk of infection varies by job category, infection control education should be modified accordingly. Educational materials need to be appropriate in content and vocabulary to the educational level, literacy, and language of the employee. The training should comply with existing federal, state, and local regulations regarding requirements for employee education and training. All health care personnel need to be educated about the ministry of health infection control policies and procedures.

Personnel education goes hand in hand with counseling. Health counseling allows personnel to receive individually targeted information regarding

(a) The risk and prevention of occupationally acquired infections,

(b) The risk of illness or other adverse outcome after exposures,

(c) Management of exposures, including the risks and benefits of post exposure prophylaxis regimens,

(d) The potential consequences of exposures or communicable diseases for family members, patients, or other personnel, both inside and outside the health care facility.

In this context we cannot emphasize more the importance of good Management of job-related illnesses and exposures. One of the Primary functions of the personnel health service are to arrange for prompt diagnosis and management of job-related illnesses and to provide appropriate post exposure prophylaxis after job related Exposures.
<table>
<thead>
<tr>
<th>What you should know about</th>
<th>What can your employer do?</th>
<th>What can you do?</th>
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<tbody>
<tr>
<td>Infectious Diseases</td>
<td>provide a written “Routine Practices” document that is easily accessible • ensure availability of gloves and other protective equipment and cleansing agents • establish a sharps program • establish an immunization program for all workers</td>
<td>wash hands frequently (proper handwashing is the best way to prevent communicable diseases) • follow “Routine Practices” at all times for all patients • check with your Occupational Health Nurse regarding immunizations</td>
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<tr>
<td>Infectious diseases can be caused by coming into contact with bacteria, viruses, funguses or parasites when handling patients, contaminated objects, body secretions, tissue or fluids.</td>
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<tr>
<td>Hepatitis B, Hepatitis C and Human Immunodeficiency Virus (HIV) can be spread by infected blood and body fluids when they come into direct contact with broken, scraped, chapped or inflamed skin or when skin is punctured by a sharp object such as a needle</td>
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**Infections Transmitted between Patients and Health Care Workers:**

Healthcare personnel are at risk of occupational exposure to blood borne pathogens, including human immunodeficiency virus (HIV) hepatitis B virus (HBV) and hepatitis C virus (HCV). Exposures occur through needle sticks or cuts from other sharp instruments contaminated with an infected patient's blood or through contact of the eye, nose, mouth, or skin with a patient's blood. Studies in the Middle East showed that the prevalence of HBsAg ranges from 16% to 20% in Sudan and the prevalence of HIV is 1.6% among the population of Sudan.6

A recent study in Khartoum state (2008) was conducted to explore and highlight the risk of acquiring blood borne infection through percutaneous exposure among
Sudanese dentists, but due to its validity and correspondence with the global literature on the subject, its results and recommendations can be confidently generalized to all sectors of health workers.

This study unveiled that 58.1% of the study population (a total of 216 HW) had needle sticks, and the majority of the needle sticks (53.2%) occurred among the junior or less trained personnel. The frequency of being injured varied with expertise and preventive measures and precautions but however a substantial percentage of 27% were injured twice and furthermore 16% had it twice. In spite of their different positions and background all of the HW who had needle sticks or sharp injury did not report their injury.

Their reactions to this sort of injury is quite interesting varying from doing nothing (4%) to washing with antiseptic (63%) or washing with water and soap (6%).

With regard to prevention the same study results showed that 96.8% of the dentists always wear gloves, 60.4% of the dentists always wear mask, 79.7% of the dentists have been immunized against hepatitis B and 20.3% were not immunized.

And hence the judicious recommendations of the study strongly support raising awareness and educating categories at risk and producing a national protocol for effective management of needle-stick injury, safe handling and collection of used needles and sharps.

- If ANY Sharps Injury occurs:
  1. ENCOURAGE Bleeding
  2. WASH the injured area
  3. COVER affected area with a fully occlusive waterproof dressing
  4. REPORT the incident
  5. CONTACT the infection control department for advice.
  6. Incidents must be reported
  7. Recommended post exposure prophylaxis:
     a. If source is known or unknown positive to HBV
<table>
<thead>
<tr>
<th>Employee status</th>
<th>Source patient status</th>
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<th>Source patient status</th>
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<tr>
<td></td>
<td>HBsAg +ve</td>
<td>HBsAg –ve</td>
<td>Unvaccinated</td>
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<td>Prevacinated:</td>
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<td>a) known responder</td>
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<td>Give HB Ig *1 and</td>
<td>Start HB</td>
<td>Start HB vaccine</td>
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<td>start HB vaccine</td>
<td>Vaccine series</td>
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<td>b) known non responder</td>
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<td></td>
<td>Give HB Ig *1 and</td>
<td>No treatment</td>
<td>If known high risk</td>
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<td>initiate revaccination</td>
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<td>source; treat as if</td>
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<td></td>
<td>or HB Ig *2</td>
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<td>source were HBsAg</td>
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<td>Ability to response</td>
<td>Test the exposed</td>
<td>No treatment</td>
<td>Test exposed person</td>
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<td>unknown</td>
<td>person to HBsAb</td>
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<td>for HBsAB</td>
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<td></td>
<td>HBIG*1 &amp;</td>
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<td>administer booster</td>
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<td></td>
<td>Vaccine booster</td>
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<td>vaccine and recheck</td>
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<td>titre in 1-2 months</td>
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b) If source is known HCV positive

1. Send follow up testing for employee after 3 months and 6 months

2. No recommendation for the use of Immunoglobulin or Interferon.

c) If source is known HIV positive

1. Exposed employee should be referred immediately for post exposure prophylaxis.

2. Send follow up testing after 6 weeks, 3 months and 6 months

If diagnostic procedure, counseling and vaccination is refused, the employee will be asked to sign a disclaimer form by his/her supervisor and submit to Infection Control and Quality directorate.
Hepatitis B Virus:

- Acute or chronic inflammation of the liver
- Transmission: Occupational, sexual, perinatal and sharing contaminated needles
- May develop cirrhosis, hepatorenal syndrome, hepatocellular carcinoma
- Incubation Period: 45-180 days (60-90 days average)
- Prevention: Vaccine, Standard Precautions, Careful handling of sharps
- Isolation of hospitalized patients: Standard Precautions

Hepatitis C Virus:

- Incubation Period: 6-7 weeks
- Prevention: Standard Precautions, Careful handling of sharps
- Isolation of hospitalized patients: Standard Precautions

Human Immunodeficiency Virus

- Transmission: Occupational, sexual, perinatal, and sharing contaminated needles
- Incubation Period: Variable
- Prevention: Standard Precautions, Careful handling of sharps, Post Exposure Prophylaxis
- Isolation of hospitalized patients: Standard Precautions

Conjunctivitis

- Contaminated hands & instruments can spread infection from person-to-person
- Incubation Period: 5-12 days
- Prevention: Hand washing, glove use, decontamination of instruments
- Isolation of hospitalized patients: Standard Precautions
Cytomegalovirus (CMV)

- Incubation Period: unknown
- Prevention: Handwashing, Standard Precautions
- Isolation of hospitalized patients: Standard Precautions

Diphtheria:

- Transmitted by contact with respiratory droplets or contact with skin lesions, Caused by Corynebacterium diphtheriae
- Incubation Period: 2-5 days
- Prevention: Immunization with tetanus & diphtheria toxoid (Td) every 10 years
- Isolation of hospitalized patients: Droplet precautions

Gastrointestinal Infections

- May be caused by viruses, bacteria & protozoa
- Transmission by contact with infected patients
- Lab personnel may be exposed by specimens
- Incubation Period: Variable, depends on organism
- Prevention: Good personal hygiene, Hand washing, Standard Precautions
- Isolation of hospitalized patients: Standard Precautions, Contact Precautions for some organisms

Hepatitis A

- Caused by the Hepatitis A virus & transmitted by the oral-fecal route by sharing foods, beverages or by not washing hands after handling an infected patient
- Incubation Period: 15-50 days
- Prevention: Hand washing and Standard Precautions
- Isolation of hospitalized patients: Standard Precautions
Herpes Simplex

- Caused by herpes simplex virus
- Transmission occurs from contact with lesions or with virus containing secretions such as saliva, vaginal secretions or amniotic fluid
- Increased risk where minor cuts, abrasions or other skin lesions are present
- Incubation Period: 2-12 days
- Prevention: Handwashing, glove use, & Standard Precautions
- Isolation of hospitalized patients: Standard Precautions, Contact Precautions for neonatal or disseminated
- Viral disease spread by respiratory droplets and airborne
- Frequently misdiagnosed in the prodromal stage
- Incubation Period: 5-21 days
- Prevention: immunization against measles
- Isolation of hospitalized patients: Airborne Precautions

Rubella

- Rubella virus transmitted by naso-pharyngeal droplets
- Incubation Period: 12-23 days
- Prevention: Vaccine, Droplet Precautions
- Isolation of hospitalized patients: Droplet Precautions

Tuberculosis

- Causative organism: Mycobacterium tuberculosis
- Spread through the air from pulmonary or laryngeal TB
- Incubation Period: 4-12 weeks
- Prevention: Airborne Precautions, Preventative therapy if infected, BCG vaccination for high risk group particularly those on contact with MDR patients.
- Isolation of hospitalized patients: Airborne Precautions

**Varicella (Chickenpox)**

- Highly contagious viral disease
- Incubation Period: 14-21 days
- Prevention: Vaccine, Airborne & Contact Precautions
- Isolation of hospitalized patients: Airborne & Contact Precautions

**Influenza:**

- Incubation Period: 1-5 days
- Prevention: Vaccine, Droplet Precautions
- Isolation of hospitalized patients: Droplet Precautions

**Immunization programs**

Ensuring that personnel are immune to vaccine-preventable diseases is an essential part of successful personnel health programs. Optimal use of vaccines can prevent transmission of vaccine-preventable diseases and eliminate unnecessary work restriction.

**Hepatitis B Vaccine**

- For all health care personnel
- Efficacy: 85%-95% effective
- Route/Schedule: 3 doses i.m. at 0, 1 month, 6 months
- Booster: not recommended
- Major Precautions / Contraindications: History of anaphylactic reaction to bakers yeast
- Not contraindicated during pregnancy

**Tetanus-Diphtheria (Td)**

- for Persons without a history of immunization or an unknown history
- Efficacy: 95%-100% effective
- Route/Schedule: 3 doses i.m. at 0, 1-2 months, 6 months
- Booster: Every 10 years.
Major Precautions / Contraindications:
- First trimester of pregnancy
- History of neurological reaction or immediate hypersensitivity

Rubella:
- For un-immunized women of child bearing age
- Efficacy: 95%-98%
- Route/Schedule: 1 dose s.c
- Booster: none recommended

Major Precautions / Contraindications:
- Pregnancy
- Immunocompromised state
Use of Post-Exposure Prophylaxis in HIV/AIDS Following occupational exposure in health care settings

Post Exposure Prophylaxis (PEP):

Is short-term antiretroviral treatment to reduce the likelihood of HIV infection after potential exposure, either occupationally or through sexual intercourse. Within the health sector, PEP should be provided as part of a comprehensive universal precautions package that reduces staff exposure to infectious hazards at work.

PEP consists of medication, laboratory tests and counseling. Ideally PEP should be initiated within 2-24 hours.

Who Provides PEP Services?

The PEP services should be provided by a certified trained health care provider who received a specific training course on administrating PEP.

PEP should always be implemented side by side with voluntary counseling and testing which is important for follow up.

Managing occupational exposure to HIV:

1. Immediate action

Immediately following exposure whether or not the source is known to pose a risk of infection the site of exposure e.g. wound or non-intact skins should be washed liberally with soap and water but without scrubbing. Free bleeding of puncture wounds should be encouraged gently but wounds should not be sucked. Exposed mucous membranes, including conjunctivae, should be irrigated copiously with water, before and after removing any contact lenses.

The exposed health care worker should be aware about local arrangements for access to urgent advice about occupational exposure and PEP. A risk assessment needs to be made urgently by someone other than the exposed worker about the appropriateness of starting PEP. Consideration should also be given to risk of exposure to hepatitis B (if the exposed worker is not immune) and hepatitis C.

Baseline HIV testing should be performed on all persons seeking evaluation for potential nonoccupational HIV exposure.
2. **evaluation of exposure:**

The issue of PEP should be considered after an exposure with the potential to transmit HIV, based on the type of body fluid or substance involved, and the route and severity of the exposure.

There are three types of exposure in healthcare settings associated with significant risk, these are:

Percutaneous injury (from needles, instruments, bone fragments, significant bites which break the skin, etc).

Exposure of broken skin (abrasions, cuts, eczema etc).

Exposure of mucous membranes including the eye.

Body fluids and materials which may pose a risk of HIV transmission include:

- Amniotic fluid
- Cerebrospinal fluid
- Human breast milk
- Pericardial, Pleural & Peritoneal fluid.
- Saliva
- Synovial fluid
- Unfixed human tissues and organs
- Any other body fluid if visibly bloodstained
- Exudative or other tissue fluid from burns or skin lesions
- Vaginal secretions & semen.

Also, the exposure fluid should be assessed regarding the amount: small or large amount.

3. **evaluation of the HIV status of the source:**

If possible, source persons should be interviewed to determine his or her history of antiretroviral use because this information might provide information for the choice of PEP medications. Testing of source persons to assess the HIV status (-ve/+ve), the CD4 count (low/high), and the clinical symptoms (symptomatic/asymptomatic) should be done.
If there has been a significant exposure and a source patient cannot be identified, risk assessment should be on an individual basis. This will be informed by a consideration of the circumstances of the exposure, and the epidemiological likelihood of HIV in the source.

4. **Exposure risk reduction education should occur with counsellors reviewing the sequence of events that preceded the exposure in sensitive and non-judgmental way.**

5. **An exposure report and report on the follow up and outcome of PEP should be made and send to Sudan national AIDS program (SNAP) at FMoH.**

**Eligibility for PEP:**

The PEP treatment should be considered for persons who are exposed to HIV virus due to occupational accident or the sexual assault.

The PEP medication is not available for individuals who:

- a- are/may be already infected with HIV virus or
- b- Are/may be exposed to the HIV virus because of voluntary activities involving potential HIV transmission.

The PEP should be given on case by case following evaluation by a trained provider using the instructions in this guideline:

The patient consents, in writing, is a requirement to start PEP treatment

**Timing of PEP:**

PEP should be initiated as soon as possible within the first 72 hours, but it's not proved to be effective and hence not recommended after 2 weeks.

**Duration of Treatment**

The optimal duration of PEP is 4 weeks (a full course of PEP is at least 28 days)

**PEP regimen:**

Two regimens are recommended as PEP based of the severity of the exposures and status of the sources. These are:

- Basic regimen
- Expanded regimen

*Note: refer to SNAP guidelines for more information*
**Guidelines for work restrictions for employees with infectious disease**

<table>
<thead>
<tr>
<th>Disease/Problem</th>
<th>Work restriction</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis</td>
<td>Restrict from patient contact</td>
<td>Until discharge ceases</td>
</tr>
<tr>
<td>CMV infection</td>
<td>No restriction</td>
<td></td>
</tr>
<tr>
<td>Diarrhea</td>
<td>- Restrict from patient contact or food handling.</td>
<td>Until symptoms resolve</td>
</tr>
<tr>
<td></td>
<td>- Restrict from care of high risk patients</td>
<td>Until symptoms resolve</td>
</tr>
<tr>
<td></td>
<td>Exclude from duty</td>
<td></td>
</tr>
<tr>
<td>Diphtheria</td>
<td>Restrict from care of infants, neonates and immunocomprised pts</td>
<td>Until antimicrobial therapy completed and 2 negative cultures (24 hrs apart)</td>
</tr>
<tr>
<td>Enteroviral infection</td>
<td>Restrict from patient contact or food handling</td>
<td>Until symptoms resolve</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Restrict personnel who perform exposure-prone invasive procedures from duty</td>
<td>Until 7 days after onset of jaundice</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>No restrictions for employees who not have exposure-prone duties</td>
<td>Until expert review council has been consulted</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>No recommendations</td>
<td></td>
</tr>
<tr>
<td>Herpes simples</td>
<td>no restriction</td>
<td>until lesions heal</td>
</tr>
<tr>
<td></td>
<td>restrict from patient contact</td>
<td>until lesions heal</td>
</tr>
<tr>
<td></td>
<td>until lesions heal</td>
<td>until lesions heal</td>
</tr>
<tr>
<td>Disease</td>
<td>Precaution</td>
<td>Duration</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>orofacial</td>
<td>restrict from care of high risk patient contact</td>
<td></td>
</tr>
<tr>
<td>HIV</td>
<td>Restrict personnel who perform exposure-prone invasive procedures from duty</td>
<td>Until expert review council has been consulted</td>
</tr>
<tr>
<td>Measles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>No restrictions for employees who do not perform exposure prone procedures</td>
<td>Until 7 days after rash appears</td>
</tr>
<tr>
<td>Post-exposure (susceptible personnel)</td>
<td>Exclude from duty</td>
<td>From day 5 through day 21 after last exposure and 7 days after rash appears</td>
</tr>
<tr>
<td>Meningococcal infection</td>
<td>Exclude from duty</td>
<td>Until 24 hours after start of effective therapy</td>
</tr>
<tr>
<td>Mumps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Active</td>
<td>Exclude from duty</td>
<td>Until 9 days after onset of parotitis</td>
</tr>
<tr>
<td>b. Post-exposure (susceptible personnel)</td>
<td>Exclude from duty</td>
<td>Until 9 days after onset of parotitis</td>
</tr>
<tr>
<td>Pediculosis</td>
<td>Exclude from duty</td>
<td>Until treated and observed to be free of adult and immature lice (nits)</td>
</tr>
<tr>
<td>Pertussis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Active</td>
<td>Exclude from duty</td>
<td>From beginning of catarrhal state through 3rd week after onset of paroxysms or until 5</td>
</tr>
<tr>
<td>b. Post exposure</td>
<td>No restriction but</td>
<td></td>
</tr>
<tr>
<td>Disease</td>
<td>Precautionary Measures</td>
<td>Duration</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Rubella</td>
<td>Exclude from duty</td>
<td>Until 5 days after rash appears</td>
</tr>
<tr>
<td></td>
<td>Exclude from duty</td>
<td>From day 7 after first exposure through day 21 after last exposure</td>
</tr>
<tr>
<td>Scabies</td>
<td>Restrict from patient contact</td>
<td>Until cleared by medical evaluation after treatment</td>
</tr>
<tr>
<td>Staphylococcal aureus</td>
<td>Restrict from contact with patients or food handling</td>
<td>Until 24 hours after adequate treatment started</td>
</tr>
<tr>
<td></td>
<td>No restriction until personnel are epidemiologically linked to transmission of the organism</td>
<td>Until proven non infectious</td>
</tr>
<tr>
<td>Streptococcal infection</td>
<td>Restrict from patient contact or food handling</td>
<td></td>
</tr>
<tr>
<td>TB</td>
<td>Exclude from duty</td>
<td>Until proven non infectious</td>
</tr>
<tr>
<td></td>
<td>No restriction</td>
<td></td>
</tr>
<tr>
<td>Varicella Zoster (chicken)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Rubella**
  - **Active**
  - **Post exposure (susceptible personnel)**
    - Exclude from duty
    - Exclude from duty
    - Until 5 days after rash appears
    - From day 7 after first exposure through day 21 after last exposure

- **Scabies**
  - Exclude from duty
  - Until cleared by medical evaluation after treatment

- **Staphylococcal aureus**
  - **Active draining lesion**
    - Exclude from duty
    - Until 24 hours after adequate treatment started
  - **Carrier state**
    - No restriction until personnel are epidemiologically linked to transmission of the organism
    - Until proven non infectious

- **Streptococcal infection**
  - **Group A**
    - Exclude from duty
    - No restriction
    - Until proven non infectious

- **TB**
  - **Active pulmonary disease**
    - Exclude from duty
    - No restriction
  - **PPD converter**
    - Sputum smears from 3 consecutive days are negative for acid fast bacilli (AFBs)

- **Varicella Zoster (chicken)**
  - Exclude from duty
  - No restriction
  - Until proven non infectious
<table>
<thead>
<tr>
<th>Disease</th>
<th>Exclusion Criteria</th>
<th>Duration of Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicella Zoster (Shingles)</td>
<td>- a. Localized in healthy personnel</td>
<td>- Until all lesions are dry and crusted</td>
</tr>
<tr>
<td></td>
<td>- b. Generalized or localized in immunocompromised person</td>
<td>- Until all lesions are dry and crusted</td>
</tr>
<tr>
<td></td>
<td>- c. Post exposure (susceptible personnel)</td>
<td>- From day 10 to day 21 (day 28 if VZIG was given) after last exposure or if varicella occurs, until all lesions dry and crusted</td>
</tr>
<tr>
<td>Viral respiratory infections (acute febrile)</td>
<td>- Restrict from care of high risk patients</td>
<td>- Until acute symptoms resolve</td>
</tr>
<tr>
<td></td>
<td>- Restrict from patient contact</td>
<td>- Until all lesions are dry and crusted</td>
</tr>
<tr>
<td></td>
<td>- Restrict from patient contact</td>
<td>- Until all lesions are dry and crusted</td>
</tr>
<tr>
<td></td>
<td>- Restrict from patient contact</td>
<td>- From day 10 to day 21 (day 28 if VZIG was given) after last exposure or if varicella occurs, until all lesions dry and crusted</td>
</tr>
</tbody>
</table>
Section 7

special consideration
Dental Clinic

Cleaning & disinfection of Dental Unit:

After treatment of each patient, and at the end of daily work activities all dental unit & clinical contact surfaces that may become contaminated with patient’s material should be:

- Cleaned with detergent and water.
- Then disinfected by a chemical germicide.

Water supplies:

Most dental unit water lines will harbor biofilm, which will act as a reservoir of microbial contamination. These may be a source of known pathogens (e.g. legionella) so for control of microbial contamination:

1) Use of a bottled water system.

2) Water and air lines fitted with anti-retraction valves (to avoid aspiration of infective material back into the tubing).

3) Incorporating an air gap in the water supply to prevent back flow from the spitoon

Saliva ejectors:

- Backflow in low-volume suction lines can occur and microorganisms be present in the lines retracted into patient’s mouth when a seal around the saliva ejector is created (e.g. by a patient closing lips around the tip of the ejector, creating a partial vacuum).

This backflow can be a potential source of cross-contamination

Dental Handpieces and Other Devices Attached to Air and Waterlines:

* These are semi-critical dental devices that touch mucous membranes (e.g. high- & low- speed handpieces, ultrasonic scaling tips, air & water syringe tips…) & can be removed from the dental unit, cleaned, lubricated & heat sterilized.
* Discharge water & air from the device for a minimum of 20 – 30 seconds after each patient to flush out patient material.

* Some components are permanently attached to dental unit waterlines do not enter the patients oral cavity, they are likely to become contaminated with oral fluids (e.g. handles or dental unit attachments of Saliva ejectors, high or speed air evacuators …). Should be:

1. Covered with impervious barriers that are changed after each use (e.g., plastic wrap, bags, sheets..)

2. If the item becomes visibly contaminated it should be cleaned & disinfect before use on the next patient.

Handling of Extracted Teeth for educational purposes

1) Before handling extracted teeth, the teeth must first be cleaned by scrubbing with detergent & water. Then immersed in a fresh solution of sodium hypochlorite.

2) Persons dealing with extracted teeth must use barrier techniques:

   (gloves, Eye wear, mask etc..)

3) Place extracted teeth in a leak-proof container, labeled with a biohazard symbol, for transport to educational institutions.

Dental Laboratory:

1) Laboratory heat - sensitive materials that have been used in the mouth (e.g wax bite registration, fixed & removable prostheses, etc…) should be cleaned & disinfected before manipulation in the dental lab. according to manufacturers’ instructions.

2) These items should also be cleaned & disinfected after manipulation in the lab and before placement in the patients mouth.

3) Clean and heat-sterilize heat-tolerant items used in the mouth (e.g., metal impression trays and face-bow forks).
Dental Radiology

1) Use heat-tolerant or disposable intra oral devices (semi-critical devices) whenever possible (e.g., film-holding and positioning devices).

2) Transport and handle exposed intra oral films in an aseptic manner to prevent contamination of developing equipment.

3) Radiography equipment (e.g., radiograph tube head and control panel) should be protected with surface barriers that are changed after each patient.

4) Digital radiography sensors and other high-technology instruments (e.g., intra oral camera, electronic periodontal probe, occlusal analyzers, and lasers) come into contact with mucous membranes and are considered semi-critical devices:
   a) Clean and heat-sterilize, or high-level disinfect, between patients.
   b) Use barriers if items cannot be reprocessed.

Remember:

- Rubber dam isolation should be used whenever practicable, it abolishes saliva/blood splatter and aerosols.
- Pour blood, suctioned fluids or other liquid waste carefully into a drain connected to a sanitary sewer system.
Endoscope Reprocessing

**Rules for manual reprocessing flexible endoscope:**

Step performed immediately after the endoscopy procedure:

1- Pre-cleaning

- Only this step should be performed in the patient care area
- Exterior of the endoscope is wiped with an enzymatic solution (detergent*)
- Channels are purged or aspirated with solution to wet and loosen any debris (through the suction channel and through the air / water channel according to the manufacturer’s instructions)

2- Leak testing

- Bubbles coming from the interior scope indicates a leak
- Pressurize the endoscope before immersing it
- Observe or palpate the bending rubber at the distal tip for distension
- Angulate the distal tip of the endoscope in all directions to open any small holes

3- Cleaning

- Use a fresh enzymatic solution (detergent) for cleaning each scope
  
  Means that the solution is changed after one cleaning
  
  Be careful to accurately measure the amount prescribed good concentration, not too weak, not too strong)

- Use an appropriate adaptors (all channel irrigator) to fill the channels with the enzymatic solution

  Soak for the time required (minimum 15 min)

- While the endoscope is soaking
  
  o Insert the brush into the channels
  
  o Continue brushing each channel until the brush appears clean when it exits the channel
  
  o Clean the valve ports, all valves and attachments and the exterior of the endoscope with soft cloth, sponge or brush

- After the endoscope has soaked
Flush all the channels with the enzymatic solution

4- Rinsing:

• Before disinfecting because detergent may be not compatible with the disinfectant

• Use fresh clear water

  Thoroughly rinse the exterior

  Purge all channels with the adaptor

  Rinse all valves and attachments

• Purge all channels with air to remove water that could dilute the disinfectant

5- Disinfection

• Wear proper PPE when handling disinfectants (mask, gloves and eyewear)

• Keep disinfectant container covered at all times and label as a biohazard

• Use appropriate disinfectant for flexible endoscope

  - Labelled with expiration date

  - Tested with specific test strips

• Perfuse all channels of the endoscope with the disinfectant

  - Using appropriate adaptors

  - Until no bubbles exiting the channels

• Ensure the endoscope completely immersed in the disinfectant

• Cover the container and set a timer for the required time

6- Rinsing

• Quality of water used for final rinsing

  Endoscope considered as critical item -

  Sterile water (that means rinsing in a sterile container and in “surgical” conditions)

  - Bronchoscope

  Filtered water
GI endoscope -

Tape water (but potable quality and without Pseudomonas aeruginosa)

- Submerge the endoscope completely in the basin or the sterile container
- Rinse all channels

7- Drying

- purge all channels with air to remove all water
- use forced air to dry insertion tube and channels
- Wipe the exterior of the endoscope dry and the valves and attachments

8- Storage

Endoscope should be stored hanging vertically in a well ventilated cabinet
Laboratory

Purpose:

for those personnel involved in collecting, transporting and processing of specimen in the clinical laboratory and to provide standard rules of practice in order to prevent infection transmission among the personnel and inpatients.

1. During Collection
   A. Risk
      1. Transmission of microorganism to personnel from patients.
      2. Contaminated equipment or improper preparation of the site may introduce microorganism to the patient.
   B. Intervention
      1. Use appropriate barrier techniques
      2. Use aseptic techniques and disposable equipments between patients and during preparation of site.
      3. Avoid multiple venipunctures at the same site
      4. Use sterile collecting vials.
      5. Avoid collection of intravascular lines.
      6. Dispose off syringes with needle without recapping into the yellow puncture-proof container. If recapping is necessary use scoop technique.
      7. Tourniquets should be disinfected with 10% isopropyl alcohol.
      8. Clean gauze pads should be placed over the puncture site, if necessary; limit the use of cotton balls in patients with dermatitis.

2. During Transport
   A. Risk
      1. Spillage and hand contamination with body fluids.
         a. If not properly closed
         b. If not double bagged from patients with isolation precautions
   B. Intervention
      1. Use containers with secure closure.
      2. All hazardous specimens from isolation-precaution patients should be double bagged.
      3. Periodic CME for personnel involved in transporting regarding proper transport, prevention of spills, and handling of leaks or contamination
4. If any grossly leaking container is received reject the specimen.
5. If only the external surface is contaminated, use alcohol or 1:10 diluted of 5.25% bleach to decontaminate it.

3. During Processing
Clean your working area with 1:10 of diluted bleach before and after the work

**Instruction for dilution of bleach for laboratory use as disinfectant**

<table>
<thead>
<tr>
<th>Nature of disinfectant required</th>
<th>Volume of Bleach</th>
<th>Volume of water</th>
<th>Dilution Ratio</th>
<th>Sodium hypochloride %</th>
<th>Available chloride mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bench Tops /surfaces</td>
<td>1 part</td>
<td>9 parts</td>
<td>1:10</td>
<td>0.5%</td>
<td>5000</td>
</tr>
<tr>
<td>Spills</td>
<td>1 part</td>
<td>4 parts</td>
<td>1:5</td>
<td>1%</td>
<td>10000</td>
</tr>
</tbody>
</table>

**NOTE: Prepare and use within a week**

A. Risk
1. Accidental ingestion of infectious agents
2. Inoculation or contact with infectious agents
B. Intervention
1. No mouth pipetting
2. Do not prepare bacterial suspension by bubbling air through liquid by means of pipettes.
3. Dispose of pipettes into the disinfecting compound (1% sodium hypochloride)
4. Prepare spill kit ready for use in each section. (refer to housekeeping for management of spills).
4. Safe work practices

1. Remove lab coat when going to the cafeteria or out of the building.

2. Eating, drinking or smoking is not permitted in lab area.

3. Do not store food in the refrigerators used for specimens or reagents.

4. All people who process laboratory specimens should wear gloves. Gloves should be changed and hands washed if gloves grossly contaminated or damaged after completion of specimen processing.

5. Unfixed or unstained slides should be considered infectious.

6. All personnel should wash their hands after completion of activities and leaving the laboratory.

7. Evaluate exposure to communicable disease agents.

8. Report all work related accidents/exposures to Infection Control practitioner or officer.

5. Handling Blood/Body fluids

1. All laboratory specimens should be handled as potentially infectious high-risk items.

2. Personnel at high risk are those working in Hematology, Biochemistry and Serology sections.

A. Intervention

a. All employees should be immunized for Hepatitis B

b. No mouth pipetting.

c. Wear gloves while processing the samples. Gloves should be removed before touching pens, registers, telephone and other items.

d. Avoid aerosol production

e. Discard all the samples in yellow bags and sharps in the yellow puncture-proof containers.

f. The positive samples for HBV, HCV, HIV should be rendered non infectious with 1% sodium hypochloride before final discard into the yellow bags.

g. Wash hands before and after use of gloves

h. Dispose off syringes with needle without recapping into the yellow puncture-proof container. If recapping is necessary, use “scoop technique”
6. Transport of Biohazard material
1. Use “triple containment packaging” ie the primary container accompanied by enough absorbent to contain the whole sample, a water proof container, and an outer container.
2. Sample identification document must be located outside the secondary containment.
3. On the outside label mention the volume and the name of infectious agent.
4. There should be a document containing the name of the responsible person who is accountable for the transport.

7. Infectious waste management
1. Dispose non infectious waste in the black bag. Eg wrappers, papers, gloves without soil etc.
2. Dispose infectious waste in the yellow bag.
   Eg. Loop (disposable) after inoculation sterilize in the flame and dispose.

   All the culture plates and date expired plates

   All blood culture bottles and date expired bottles

   The remaining specimens are cultured

   The remaining broth media after antibiotic sensitivity and after biochemical tests.

   The cards used for agglutination

   Strips used in biochemical identification of the isolates

   Autoclave the media with culture in the universal bottles and tubes, discard the material before wash

   All expired kits

   * Autoclave all infectious waste before its disposal from laboratory

3. Dispose of sharp/glassware in plastic resistant yellow container.

   Eg. Dispose all glass tubes, Broken glasses, Syringe with needle (do not try to remove the needle from the syringe), All glass slides
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Appendix
Your 5 moments for HAND HYGIENE

1. BEFORE PATIENT CONTACT
2. BEFORE ASEPTIC TASK
3. AFTER BODY FLUID EXPOSURE RISK
4. AFTER PATIENT CONTACT
5. AFTER CONTACT WITH PATIENT SURROUNDINGS
Hand hygiene technique:

**How to Handwash?**

*Wash hands when visibly soiled! Otherwise, use handrub*

1. Wet hands with water;
2. Apply enough soap to cover all hand surfaces;
3. Rub hands palm to palm;
4. Right palm over left dorsum with interlaced fingers and vice versa;
5. Palm to palm with fingers interlaced;
6. Backs of fingers to opposing palms with fingers interlocked;
7. Rotational rubbing of left thumb clasped in right palm and vice versa;
8. Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;
9. Rinse hands with water;
10. Dry hands thoroughly with a single use towel;
11. Use towel to turn off faucet;

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**SAVE LIVES**

Clean Your Hands
How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

Duration of the entire procedure: 20-30 seconds

1a. Apply a palmful of the product in a cupped hand, covering all surfaces;
1b. Rub hands palm to palm;

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. Once dry, your hands are safe.

World Health Organization
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SAVE LIVES
Clean Your Hands
HAND DECONTAMINATION
areas most frequently missed during handwashing

back of hand

palm of hand

= most frequently missed
= frequently missed
= less frequently missed

based on work by Taylor L (1978) an evaluation of handwashing techniques, Nursing Times Jan 12, 1978 pp 54-55