KING KHALID UNIVERSITY HOSPITAL

INFECTION CONTROL DEPARTMENT

INFECTION CONTROL MANUAL

1430 - 2009
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CHAPTER 1 INFECTION CONTROL PROGRAM

Introduction

Patients may develop infections before they come to a hospital (community-acquired infections), or after admission (hospital-acquired or nosocomial infections). The infection Control Program is designed in an attempt to solve the problem of nosocomial infections.

Patients are protected against infection in hospital by a system of methods, including surgical asepsis and hospital hygiene, the purpose of which can be summarized under three headings.

1. To remove the sources and reservoirs of infection (or more usually, to remove disease-producing microbes from potential sources or reservoirs of infection); this includes treatment of infected patients as well as sterilizing, disinfection, and cleaning of contaminated materials and surfaces.
2. To block the routes of transfer of infectious agents from these sources and reservoirs to uninfected patients which include isolation of infected and susceptible patients, barrier nursing, aseptic operation and “no touch” dressing techniques.
3. To enhance the patients’ resistance to infection – e.g. during operations, by careful handling of issues and removal of slough and foreign bodies; also by enhancing the general defenses, reinforcement of immunity.
4. The use of antibiotics should be guided by the local antimicrobial resistant pattern and antimicrobial hospital policy.

1.1 Personnel and Organization

Control of infection within the hospital will be the overall responsibility of the Infection Control Committee appointed by, and responsible to the Chief of Staff. The day-to-day implementation of policies of the Infection Control Committee will be delegated to an Infection Control Team.

1.1.1 Infection Control Committee

A. Members of Infection Control Committee are representatives from different departments including:

- Department of Medicine
- Pediatrics
- Surgery
- Intensive Care Units
- Anesthesia
- Microbiology
- Community Medicine
- Nursing Department
- Pharmacy
- Quality Management
- Members of the Infection Control Team
Other members with special interest may be appointed at discretion of the committee (ad hoc appointment).

The Chairman of the committee is appointed by the Chief of Staff. The committee meets monthly to deal with current developments and problem.

B. Responsibility

The committee has the responsibility for the design and implementation of policies and procedures to reduce nosocomial infections and to prevent transmission of infection.

The following areas form the committee’s responsibility:

1. Design of infection control policies, procedures and updating them.
2. Supervision of standards of professional care in regard to infections.
3. Education and orientation programs for professional staff.
4. Surveillance of nosocomial infections
5. Surveillance of staff health
6. Supervision of standards of hospital housekeeping and food services.
7. Matters of general hospital organization and purchasing where these may affect infection control.
8. Establishment and supervision of Infection Control Team

C. Authority

The Committee has the authority to implement the policies and procedures in decides desirable for the hospital in matters of infection control. It has the authority to investigate potential or real episodes of serious nosocomial infection and, where necessary, to close wards and redirect patients.

1.1.2 Infection Control Team

A. Membership

1. Practitioner who may be a microbiologist or a clinical physician with an interest to infectious disease (Infection Control Practitioner)
2. Epidemiologist
3. Infection Control Nurses
4. Microbiology technician (Infection Control Technician)

B. Responsibilities

The Infection Control Team implements the guidelines and protocols of the Infection Control Department to which they are responsible.

1.1.3 Infection Control Practitioner

The team is headed by a practitioner who is responsible for the day-to-day administration of the group. This is not a full time appointment, but is an important and vital post within the hospital.
The practitioner must be available at all times for matters of infection control and in the event of his/her absence must pass the duties to a deputy, approved by the Infection Control Committee.

His/Her principal duties are to supervise the infection control nurses, to liaise with the chairman of the Infection Control Committee, and with the infection control technician. He/she must be able to make day-to-day decisions on infection control where these are within the guidelines of Infection Control Manual. All the duties of the infection control technician he/she must provide a continual update on patterns of antibiotic resistance. He/she must have a detailed knowledge of the Hospital Infection Control Policies and Procedures.

1.1.4 Hospital Epidemiologist

A doctor with the post – graduate degree in epidemiology. He/she is responsible for hospital infection surveillance, analysis of outbreak investigation.

1.1.5 Infection Control Nurses

Infection control nurses must be nurses with some year’s seniority, preferable with experience in infection control and have some knowledge of microbiology. A detailed orientation course should be provided for them.

Their duties include the following:

1. Checking wards and clinics to detect and record nosocomial infections.
2. Investigation of hospital based infections to determine if inadequate procedures may have been contributory.
3. Pursuing apparent incidents of cross infection in conjunction with the infection control technician.
4. Surveillance of isolation precautions.
5. Surveillance of nursing practices where they relate to infection (e.g. sterile techniques).
6. Monitoring food hygiene and health of food handling staff.
7. Monitoring collection and disposal of infectious waste.
8. Conducting education programs in infection control for all new nursing and paramedical staff, in conjunction with the infection control practitioner and technician.
10. Liaising directly with the infection control practitioner and technician.

1.1.6 Infection Control Technician

Infection control technician should be a microbiology technician who is designated by the Department of Microbiology for infection control work. This work does not need a full-time job but, in conjunction with the infection control practitioner, he/she will provide surveillance for unusual
microorganisms and for patterns of antibiotic susceptibility; he/she will coordinate the infection control data collection within the laboratory.

1.2 **Surveillance and Infection Control Measures**

There are three circumstances where the Infection Control Team must act with speed to prevent or to control an outbreak of infection.

a. Where more than one patient has contracted the same infection in close proximity, and/or is cared for by the same staff (e.g., *staphylococcal infections*).

b. When a patient is identified as having a communicable disease (e.g., *active pulmonary tuberculosis*).

c. When an infection is shown to be caused by an organism resistant to the usual antibiotics (e.g., *methicillin-resistant staphylococcus*).

In all instances members of the Infection Control Team should notify the senior clinical staff taking care of the patient and the chairman of the Infection Control Committee. In rare instances, stringent measures might be necessary such as closure of wards, or postponement of admissions.

A detailed record of incidents and emergency actions must be kept by the Infection Control Team and summarized at monthly intervals.

1.2.1 **Cross-Infection**

The Infection Control Team must investigate each incident where cross-infection is suspected to confirm the suspension, to try to identify possible contributing factors and to rectify the situation.

Sterile techniques, nursing care, isolation precautions, and placement of beds must be evaluated.

Appropriate isolation precautions must be instituted immediately.

1.2.2 **Communicable Diseases**

Communicable disease can be managed within the hospital provided isolation precautions are followed. These must immediately be instituted. (see Isolation Precautions for Hospitalized Patients, chapter 5).

1.2.3 **Antibiotic-Resistant Organisms**

Appropriate isolation precautions must be instituted. Scrupulous attention is needed to sterile techniques and to be disposal of specimens or materials likely to be contaminated with the offending organisms.

A formal record of the fate of the organism should be kept as part of the Antibiotic Review Policy.

1.3 **Infection Control Manual and Education**

Formal policies and procedures of the Infection Control Committee are printed in a manual which is distributed to all hospital wards and outpatient departments. All hospital personnel should be aware
of and implement the infection control policies and procedures. It is only through the cooperative
efforts of each member of the hospital staff that nosocomial infection can be prevented.

Members of the Infection Control Committee will serve as liaison between their department or
division and the Infection Control Committee in the implementation of infection control policies
and procedures. Any changes in infection control policies and procedures will be notified to staff by
way of as Infection Control Newsletter.

References:
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Haley RW, Garner JS. Infection surveillance and control programs. In Bennett JV, Brachman PS eds. Hospital Infections 2nd

Updated 03 Nov. 2009/IC Team
CHAPTER 2 SURVEILLANCE OF HEALTH CARE-ASSOCIATED INFECTIONS (HAIs)

The primary aim of HAIs Surveillance is to lower the number of infections acquired in our hospitals. The program is coordinated by the Infection Control Department, with cooperation of Microbiology Department and hospital staff in the wards. The Infection Control Team which collects and analyses data on hospital acquired (nosocomial) infections, and reports are presented to the infection control committee in the monthly meeting.

Since 1st of January 2009, we started to modify our surveillance program to adapt the new NHSN/CDC protocol-March 2009. The surveillance definitions were reviewed and modified modules will be used gradually depending on the priority. Hospital areas with high risk patients were the focus to start with the improved system. An improvement plan for the surveillance will include the all modules in the all hospital locations.

Using NHSN/CDC protocol as a reference will enable our facilities to:

- Collect and use data about:
  - healthcare-associated infections,
  - adherence to clinical practices known to prevent healthcare-associated infections,
  - the incidence or prevalence of multidrug-resistant organisms, and other adverse events.

- Perform a meaningful comparison with the published NHSN hospitals reports.

2.1 HAIs Surveillance modules:

- Device-associated Module:
  - CLABSI - Central line-associated bloodstream infection
  - VAP - Ventilator-associated pneumonia
  - CAUTI - Catheter-associated urinary tract infection
  - DE - Dialysis Event

- Procedure-associated Module:
  - SSI - Surgical site infection

- Medication-associated Module:
  - AUR - Antimicrobial use and resistance options

- Multidrug-Resistant Organisms/ Clostridium difficile-associated Disease (MDRO/CDAD) Module

2.1.1 Surveillance Techniques:

2.1.1.a Some of the modules require active, patient-based, prospective surveillance of events and their corresponding denominator data by a trained Infection Preventionist (IP). This means that the IP shall seek out infections during a patient’s stay by screening a variety
of data sources, such as laboratory, pharmacy, admission/discharge/transfer, radiology/imaging, and pathology databases, and patient charts, including history and physical exam notes, nurses/physicians notes, temperature charts, etc.

2.1.1.b Laboratory-based surveillance should not be used alone, unless all possible criteria for identifying an infection are solely determined by laboratory evidence (e.g., LabID event detection in the MDRO & CDAD Module).

2.1.1.c Retrospective chart reviews should be used only when patients are discharged before all information can be gathered.

2.1.1.d Structured forms should be used to collect all required data, using the particular definitions of each data field. To minimize the IP's data collection burden, others may be trained to collect the denominator data and process of care data (e.g., central line insertion information).

2.1.2 Identifying Healthcare-associated Infections (HAI)

2.1.2.a Any infection must meet the definition of an NHSN healthcare-associated infection (HAI) to be included in KKHU surveillance data, that is, a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s).

2.1.2.b There must be no evidence that the infection was present or incubating at the time of admission to the care setting.

2.1.2.c Clinical evidence may be derived from direct observation of the infection site or review of information in the patient chart or other clinical records.

2.1.2.d For certain, but not all, infection sites, a physician’s or surgeon’s diagnosis of infection derived from direct observation during a surgical operation, endoscopic examination, or other diagnostic studies or from clinical judgment may be an acceptable criterion for an NHSN infection, unless there is compelling evidence to the contrary.

2.1.2.e NOTE: Physician’s diagnosis of pneumonia alone is not an acceptable criterion for healthcare-associated pneumonia.

2.1.2.f HAIa may be caused by infectious agents from endogenous or exogenous sources:

2.1.2.g Endogenous sources are body sites, such as the skin, nose, mouth, GI tract, or vagina that are normally inhabited by microorganisms.

2.1.2.h Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the healthcare environment.

2.1.3 The following special considerations are important when identifying HAIs:

Infections occurring in infants that result from passage through the birth canal are considered HAIs.

2.1.3.a The following infections are not considered healthcare associated:

- Infections associated with complications or extensions of infections already present on admission, unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection.
- Infections in infants that have been acquired transplacentally (e.g., herpes simplex, toxoplasmosis, rubella, cytomegalovirus, or syphilis) and become evident ≤ 48 hours after birth.
- Reactivation of a latent infection (e.g., herpes zoster [shingles], herpes simplex, syphilis, or tuberculosis).

2.1.3.b The following conditions are not infections:
Colonization, which means the presence of microorganisms on skin, on mucous membranes in open wounds, or in excretions or secretions but which are not causing adverse clinical signs or symptoms.

Inflammation that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals.

2.2 Central Line-Associated Bloodstream Infection (CLABSI) Event

It is believed that a large proportion of bloodstream infections are associated with the presence of a central vascular catheter, for the purposes of surveillance, such infections are termed central line-associated bloodstream infections (CLABSI).

Bloodstream infections are usually serious infections typically causing a prolongation of hospital stay and increased cost and risk of mortality.

CLABSI can be prevented through proper management of the central line.

2.2.1 Settings:

2.2.1.a Surveillance will occur in any of four types of inpatient locations:

1. Intensive Care Units (ICUs),
2. Specialty care areas (SCAs) (includes hematology/oncology wards, bone marrow transplant units, solid organ transplant units, inpatient dialysis units, long term acute care areas,
3. neonatal intensive care units (NICUs),
4. any other inpatient location in the institution where denominator data can be collected (e.g., surgical or medical wards).

NOTE: Surveillance for CLABSI after the patient is discharged from the facility is not required, however, if discovered, these infections should be reported. No additional central line days are reported.

2.2.1.b Requirements:

Surveillance for CLABSI in one inpatient location for at least one calendar month.

2.2.1.c Definitions:

- **Primary bloodstream infections (BSI)** are classified according to the criteria used, as:
  - laboratory-confirmed bloodstream infection (LCBI) or
  - clinical sepsis (CSEP), (used only in neonates: < 30 days old and infants: < 1 year old).

- **Central line-associated** (i.e., a central line or umbilical catheter was in place at the time of, or within 48 hours before, onset of the event).

NOTE: There is no minimum period of time that the central line must be in place in order for the BSI to be considered central line-associated.

- **Location of attribution**: The location where the patient was assigned on the date when the first clinical evidence appeared or the date the specimen used to meet the BSI criteria was collected, whichever came first.

  EXAMPLE(1): Patient has a central line inserted in the Emergency Department and then is admitted to the MICU. Within 24 hours of admission to the MICU, patient meets criteria for BSI.
This is reported as a CLABSI for the MICU, because the Emergency Department is not an inpatient location and no denominator data are collected there.

- **EXAMPLE(2):** Patient on the urology ward of Hospital A had the central line removed and is discharged home a few hours later. The IP from Hospital B calls the next day to report that this patient has been admitted to Hospital B with a BSI. This CLABSI should be reported for, and by, Hospital A and attributed to the urology ward. No additional catheter days are reported.

- **Transfer Rule:** If a CLABSI develops within 48 hours of transfer from one inpatient location to another in the same facility, the infection is attributed to the transferring location.

- **Central line:** An intravascular catheter that terminates at or close to the heart or in one of the great vessels which is used for infusion, withdrawal of blood, or hemodynamic monitoring, i.e.: Aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, external iliac veins, common femoral veins, and in neonates, the umbilical artery/vein.

  **NOTE:** Neither the insertion site nor the type of device may be used to determine if a line qualifies as a central line. The device must terminate in one of these vessels or in or near the heart to qualify as a central line.

  **NOTE:** An introducer is considered an intravascular catheter.

- **Infusion:** The introduction of a solution through a blood vessel via a catheter lumen. This may include continuous infusions such as nutritional fluids or medications, or it may include intermittent infusions such as flushes or IV antimicrobial administration, or blood, in the case of transfusion or hemodialysis.

- **Umbilical catheter:** A central vascular device inserted through the umbilical artery or vein in a neonate.

- **Temporary central line:** A non-tunneled catheter.

- **Permanent central line:** Includes:
  - Tunneled catheters, including certain dialysis catheters
  - Implanted catheters (including ports)

### 2.3 Laboratory-confirmed bloodstream infection (LCBI): Must meet 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. (See Notes 1 and 2 below.)

**Criterion 2:**
Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (i.e., diphtheroids [Corynebacterium spp.], Bacillus [not B. anthracis] spp., Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.

Patient < 1 year of age has at least one of the following signs or symptoms: fever (>38°C core) hypothermia (<36°C core), apnea, or bradycardia and signs and symptoms and positive laboratory results are not related to an infection at another site and common skin contaminant (i.e., diphtheroids [Corynebacterium spp.], Bacillus [not B. anthracis] spp., Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions. (See Notes 3, 4 and 5 below.)
**Clinical sepsis (CSEP):** Must meet the following criterion:

Patient < 1 year of age has at least one of the following clinical signs or symptoms with no other recognized cause: fever (>38°C core), hypothermia (<36°C, core), apnea, or bradycardia and blood culture not done or no organisms detected in blood and no apparent infection at another site and physician institutes treatment for sepsis.

**NOTES:**

1. In criterion 1, the phrase “one or more blood cultures” means that at least one bottle from a blood draw is reported by the laboratory as having grown organisms (i.e., is a positive blood culture).

2. In criterion 1, the term “recognized pathogen” does not include organisms considered common skin contaminants (see criteria 2 and 3 for a list of common skin contaminants). A few of the recognized pathogens are *S. aureus*, *Enterococcus* spp., *E. coli*, *Pseudomonas* spp., *Klebsiella* spp., *Candida* spp., etc.

3. In criteria 2 and 3, the phrase “two or more blood cultures drawn on separate occasions” means:
   - That blood from at least two blood draws were collected within two days of each other.
   - That at least one bottle from each blood draw is reported by the laboratory as having grown the same common skin contaminant organism (i.e., is a positive blood culture). (See Note 4 for determining sameness of organisms.)

4. There are several issues to consider when determining sameness of organisms:
   - If common skin contaminant organisms from the cultures are speciated but no antibiograms are done or they are done for only one of the isolates, it is assumed that the organisms are the same.
   - Ideally, blood specimens for culture should be obtained from two to four blood draws from separate venipuncture sites (e.g., right and left antecubital veins), not through a vascular catheter.

<table>
<thead>
<tr>
<th>Culture Report</th>
<th>Companion Culture Report</th>
<th>Report as…</th>
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<tbody>
<tr>
<td><em>S. epidermidis</em></td>
<td>Coagulase-negative staphylococci</td>
<td><em>S. epidermidis</em></td>
</tr>
<tr>
<td><em>Bacillus</em> spp. (not anthracis)</td>
<td><em>B. cereus</em></td>
<td><em>B. cereus</em></td>
</tr>
<tr>
<td><em>S. salivarius</em></td>
<td><em>Strep viridans</em></td>
<td><em>S. salivarius</em></td>
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<table>
<thead>
<tr>
<th>Culture Report</th>
<th>Isolate A</th>
<th>Isolate B</th>
<th>Interpret as…</th>
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<td><em>S. epidermidis</em></td>
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<td>Same</td>
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<tr>
<td><em>S. epidermidis</em></td>
<td>OX R</td>
<td>OX $</td>
<td>Different</td>
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<td>GENT R</td>
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<tr>
<td><em>Corynebacterium</em> spp.</td>
<td>PEN G R</td>
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<td>Different</td>
</tr>
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<td></td>
<td>CIPRO S</td>
<td>CIPRO R</td>
<td></td>
</tr>
<tr>
<td><em>Strep viridans</em></td>
<td>All drugs $ $</td>
<td>All drugs $ except ERYTH (R)</td>
<td>Same</td>
</tr>
</tbody>
</table>
2.3.1 Reporting Instructions:
- Purulent phlebitis confirmed with a positive semiquantitative culture of a catheter tip, but with either negative or no blood culture is considered a CVS-VASC, not a BSI.
- Report organisms cultured from blood as BSI – LCBI when no other site of infection is evident.
- Occasionally a patient with both peripheral and central IV lines develops a primary bloodstream infection (LCBI) that can clearly be attributed to the peripheral line (e.g., pus at the insertion site and matching pathogen from pus and blood). In this situation, considered peripheral line related. You should, however, count the patient’s central line days.

2.3.2 Numerator Data:
The Primary Bloodstream Infection (BSI) form is used to collect and report each CLABSI that is identified during the month selected for surveillance. The Instructions for Completion of Primary Bloodstream Infection Form contains brief instructions for collection of each data element on the form.

2.3.3 Denominator Data:
- Device days and patient days are used for denominators.
- The number of patients with one or more central lines of any type is collected daily, at the same time each day, during the month and recorded on the specific form.
- If a patient has both a temporary and a permanent central line, count the day only a temporary line day.
- In NICUs, if a patient has both an umbilical catheter and a central line, count the day only as an umbilical catheter day.

NOTE: The weight of the infant at the time of BSI is not used and should not be reported. For example, if a neonate weighs 1006 grams at birth but remains in the NICU for two months and has a body weight of 1650 grams when it develops a CLABSI, record the birth weight of 1006 grams on the BSI form.

2.3.4 Data Analyses:
- The CLABSI rate per 1000 central line days is calculated as: \[
\frac{\text{number of CLABSI}}{\text{number of central line days}} \times 1000
\]
- The Central Line Utilization Ratio is calculated as: \[
\frac{\text{number of central line days}}{\text{number of patient days}}
\]

- These calculations will be performed separately for different types of ICUs, specialty care areas, and other locations in the institution.
- Separate rates and ratios will also be calculated for different types of catheters in specialty care areas and NICUs, and for birthweight categories in NICUs, as appropriate.

2.4 Ventilator-Associated Pneumonia (VAP) Event

Patients with mechanically-assisted ventilation have a high risk of developing healthcare-associated pneumonia.
From 2006-2007, within NHSN facilities almost 5,400 VAPs were reported and incidence for various types of hospital units ranged from 2.1-11.0 per 1,000 ventilator days.

2.4.1 Settings:

Surveillance will occur in any of four types of inpatient locations:

1. intensive care units (ICUs),
2. specialty care areas (SCAs) (includes hematology/oncology wards, bone marrow transplant units, solid organ transplant units, inpatient dialysis units, long term acute care areas,
3. neonatal intensive care units (NICUs),
4. any other inpatient location in the institution where denominator data can be collected (e.g., surgical or medical wards).

NOTE: Surveillance for VAP after the patient is discharged from the facility is not required, however, if discovered, these infections should be reported. No additional central line days are reported.

2.4.2 Requirements:

Surveillance for VAP in at least one inpatient location for at least one calendar month.

2.4.3 Definitions:

• Pneumonia (PNEU) is identified by using a combination of radiologic, clinical and laboratory criteria.

• PNEUs that are ventilator-associated (i.e., patient was intubated and ventilated at the time of or within 48 hours before the onset of the event).

NOTE: There is no minimum period of time that the ventilator must be in place in order for the PNEU to be considered ventilator-associated.

2.4.3.a Location of attribution: The inpatient location where the patient was assigned on the date of the PNEU event, which is further defined as the date when the first clinical evidence appeared or the date the specimen used to meet the PNEU criterion was collected, whichever came first.

EXAMPLE(1): Patient is intubated and ventilated in the Operating Room and then is admitted to the MICU. Within 24 hours of admission to the MICU, patient meets criteria for PNEU. This is reported as a VAP for the MICU, because the Operating Room is not an inpatient location and no denominator data are collected there.

• EXAMPLE(2): Patient on the Respiratory ICU (RICU) of Hospital A had the endotracheal tube and ventilator removed and is discharged home a few hours later. The ICP from Hospital B calls the next day to report that this patient has been admitted to Hospital B with a PNEU. This VAP should be reported for, and by, Hospital A and attributed to the RICU. No additional ventilator days are reported.

2.4.3.b Transfer Rule: If a VAP develops within 48 hours of transfer from one inpatient location to another in the same facility, the infection is attributed to the transferring location.

2.4.3.c Ventilator: A device to assist or control respiration continuously, inclusive of the weaning period, through a tracheostomy or by endotracheal intubation.

NOTE: Lung expansion devices such as intermittent positive-pressure breathing (IPPB); nasal positive end-expiratory pressure (PEEP); and continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP).
2.4.4 General Comments Applicable to All Pneumonia Specific Site Criteria:

1. Physician’s diagnosis of pneumonia alone is **not** an acceptable criterion for healthcare associated pneumonia.

2. Although specific criteria are included for infants and children, pediatric patients may meet any of the other pneumonia specific site criteria.

3. Ventilator-associated pneumonia (i.e., pneumonia in persons who had a device to assist or control respiration continuously through a tracheostomy or by endotracheal intubation within the 48-hour period before the onset of infection, inclusive of the weaning period) should be so designated when reporting data.

4. When assessing a patient for presence of pneumonia, it is important to:
   a) distinguish between changes in clinical status due to other conditions such as myocardial infarction, pulmonary embolism, respiratory distress syndrome, atelectasis, malignancy, chronic obstructive pulmonary disease, hyaline membrane disease, bronchopulmonary dysplasia, etc.
   b) Also, care must be taken when assessing intubated patients to distinguish between tracheal colonization, upper respiratory tract infections (e.g., tracheobronchitis), and early onset pneumonia.
   c) Finally, it should be recognized that it may be difficult to determine healthcare-associated pneumonia in the elderly, infants, and immunocompromised patients since such conditions may mask typical signs or symptoms associated with pneumonia. Alternate specific criteria for the elderly, infants and immunocompromised patients have been included in this definition of healthcare-associated pneumonia.

5. Healthcare-associated pneumonia can be characterized by its onset: early or late.
   a) Early onset pneumonia occurs during the first four days of hospitalization and is often caused by *Moraxella catarrhalis*, *H. influenzae*, and *S. pneumoniae*.
   b) Causative agents of late onset pneumonia are frequently gram negative bacilli or *S. aureus*, including methicillin-resistant *S. aureus*.
   c) Viruses (e.g., Influenza A and B or Respiratory Syncytial Virus) can cause early and late onset healthcare-associated pneumonia, whereas yeasts, fungi, legionellae, and *Pneumocystis carinii* are usually pathogens of late onset pneumonia.

6. Pneumonia due to gross aspiration (for example, in the setting of intubation in the emergency room or operating room) is considered healthcare-associated if it meets any specific criteria and was not clearly present or incubating at the time of admission to the hospital.

7. Multiple episodes of healthcare-associated pneumonia may occur in critically ill patients with lengthy hospital stays. When determining whether to report multiple episodes of healthcare associated pneumonia in a single patient:
   a) look for evidence of resolution of the initial infection.
   b) The addition of or change in pathogen alone is not indicative of a new episode of pneumonia.
   c) The combination of new signs and symptoms and radiographic evidence or other diagnostic testing is required.

8. Positive Gram stain for bacteria and positive KOH (potassium hydroxide) mount for elastin fibers and/or fungal hyphae from appropriately collected sputum specimens are important clues that point toward the etiology of the infection. However, sputum samples are frequently contaminated with airway colonizers and therefore must be interpreted...
cautiously. In particular, *Candida* is commonly seen on stain, but infrequently causes healthcare associated pneumonia.

<table>
<thead>
<tr>
<th>Table 1. Abbreviations used in PNEU laboratory criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAL – bronchoalveolar lavage</td>
</tr>
<tr>
<td>EIA – enzyme immunoassay</td>
</tr>
<tr>
<td>FAMA – fluorescent-antibody staining of membrane antigen</td>
</tr>
<tr>
<td>IFA – immunofluorescent antibody</td>
</tr>
</tbody>
</table>

### 2.4.5 Reporting Instructions:
- There is a hierarchy of specific categories within the major site pneumonia. Even if a patient meets criteria for more than one specific site, report only one:
  - If a patient meets criteria for both PNU1 and PNU2, report PNU2
  - If a patient meets criteria for both PNU2 and PNU3, report PNU3
  - If a patient meets criteria for both PNU1 and PNU3, report PNU3
- Report concurrent lower respiratory tract infection (e.g., abscess or empyema) and pneumonia with the same organism(s) as pneumonia
- Lung abscess or empyema *without* pneumonia are classified as LUNG
- Bronchitis, tracheitis, tracheobronchitis, or bronchiolitis *without* pneumonia are classified as BRON.

### Table 2. Specific Site Algorithms for Clinically Defined Pneumonia (PNU1)

<table>
<thead>
<tr>
<th>Radiology</th>
<th>Signs/Symptoms/Laboratory</th>
</tr>
</thead>
</table>
| Two or more serial chest radiographs with at least **one** of the following: New or progressive and persistent infiltrate Consolidation Cavitation Pneumatoceles, in infants ≤ 1 year old | FOR ANY PATIENT, at least **one** of the following: 
  - Fever (>38°C or >100.4°F) with no other recognized cause
  - Leukopenia (<4000 WBC/mm3) or leukocytosis (>12,000 WBC/mm3)
  - For adults >70 years old, altered mental status with no other recognized cause and at least **two** of the following: 
  - New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements
  - New onset or worsening cough, or dyspnea, or tachypnea
  - Rales or bronchial breath sounds
  - Worsening gas exchange (e.g., PaO2/FiO2 < 240)7, increased oxygen requirements, or increased ventilator demand |
**NOTE:** In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.

**ALTERNATE CRITERIA, for infants <1 year old:**

Worsening gas exchange (e.g., O2 desaturations, increased oxygen requirements, or increased ventilator demand)

and

at least **three** of the following:

- Temperature instability with no other recognized cause
- Leukopenia (<4000 WBC/mm3) or leukocytosis (>15,000 WBC/mm3) and left shift (>10% band forms)
- New onset of purulent sputum or change in character of sputum, or increased respiratory secretions or increased suctioning requirements.
- Apnea, tachypnea, nasal flaring with retraction of chest wall or grunting
- Wheezing, rales, or rhonchi
- Cough
- Bradycardia (<100 beats/min) or tachycardia (>170 beats/min)

**ALTERNATE CRITERIA, for child >1 year old or ≤ 12 years old, at least **three** of the following:**

- Fever (>38.4°C or >101.1°F) or hypothermia (<36.5°C or <97.7°F) with no other recognized cause
- Leukopenia (<4000 WBC/mm3) or leukocytosis (≥15,000 WBC/mm3)
- New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements
- New onset or worsening cough, or dyspnea, apnea, or tachypnea.
- Rales or bronchial breath sounds.
- Worsening gas exchange (e.g. O2 desaturations, increased oxygen requirements, or increased ventilator demand)
<table>
<thead>
<tr>
<th>Radiology</th>
<th>Signs/Symptoms</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two or more serial chest radiographs with at least one of the following:</td>
<td>At least one of the following:</td>
<td>At least one of the following:</td>
</tr>
<tr>
<td>New or progressive and persistent infiltrate</td>
<td>New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements</td>
<td>Positive growth in blood culture not related to another source of infection</td>
</tr>
<tr>
<td>Consolidation</td>
<td>New onset or worsening cough, or dyspnea or tachynea</td>
<td>Positive growth in culture of pleural fluid</td>
</tr>
<tr>
<td>Cavitation</td>
<td>Rales or bronchial breath sounds</td>
<td>Positive quantitative culture from minimally contaminated LRT specimen (e.g., BAL or protected specimen brushing)</td>
</tr>
<tr>
<td>Pneumatoceles, in infants ≤ 1 year old</td>
<td>Worsening gas exchange (e.g., O2 desaturations [e.g., PaO2/FiO2 &lt; 240], increased oxygen requirements, or increased ventilator demand)</td>
<td>≥5% BAL-obtained cells contain intracellular bacteria on direct microscopic exam (e.g., Gram stain)</td>
</tr>
<tr>
<td>NOTE: In patients without underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.</td>
<td></td>
<td>Histopathologic exam shows at least one of the following evidences of pneumonia:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive quantitative culture of lung parenchyma Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae</td>
</tr>
</tbody>
</table>
### Table 4. Specific Site Algorithms for Viral, Legionella, and other Bacterial Pneumonias with Definitive Laboratory Findings (PNU2)

<table>
<thead>
<tr>
<th>Radiology</th>
<th>Signs/Symptoms</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two or more serial chest radiographs with at least one of the following: New or progressive and persistent infiltrate Consolidation Cavitation Pneumatoceles, in infants ( \leq 1 ) year old</td>
<td>At least one of the following: Fever (( &gt;38^\circ C ) or ( &gt;100.4^\circ F )) with no other recognized cause Leukopenia ((&lt;4000\text{WBC/mm}\text{3}) or leukocytosis ((&gt;12,000\text{WBC/mm}\text{3})) For adults ( &gt;70 ) years old, altered mental status with no other recognized cause and at least one of the following: New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements New onset or worsening cough or dyspnea, or tachypnea Rales or bronchial breath sounds Worsening gas exchange (e.g. ( \text{O}2 ) desaturations [e.g., ( \text{PaO}2/\text{FiO}2 &lt; 240 )], increased oxygen requirements, or increased ventilator demand)</td>
<td>At least one of the following: Positive culture of virus or <em>Chlamydia</em> from respiratory secretions Positive detection of viral antigen or antibody from respiratory secretions (e.g., EIA, FAMA, shell vial assay, PCR) Fourfold rise in paired sera (IgG) for pathogen (e.g., influenza viruses, <em>Chlamydia</em>) Positive PCR for <em>Chlamydia</em> or <em>Mycoplasma</em> Positive micro-IF test for <em>Chlamydia</em> Positive culture or visualization by micro-IF of <em>Legionella</em> spp, from respiratory secretions or tissue. Detection of <em>Legionella pneumophila</em> serogroup 1 antigens in urine by RIA or EIA Fourfold rise in <em>L. pneumo</em> phila serogroup 1 antibody titer to ( \geq 1:128 ) in paired acute and convalescent sera by indirect IFA.</td>
</tr>
<tr>
<td>NOTE: In patients without underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.</td>
<td>----------</td>
<td>----------</td>
</tr>
</tbody>
</table>

At least one of the following: Positive culture of virus or *Chlamydia* from respiratory secretions Positive detection of viral antigen or antibody from respiratory secretions (e.g., EIA, FAMA, shell vial assay, PCR) Fourfold rise in paired sera (IgG) for pathogen (e.g., influenza viruses, *Chlamydia*) Positive PCR for *Chlamydia* or *Mycoplasma* Positive micro-IF test for *Chlamydia* Positive culture or visualization by micro-IF of *Legionella* spp, from respiratory secretions or tissue. Detection of *Legionella pneumophila* serogroup 1 antigens in urine by RIA or EIA Fourfold rise in *L. pneumo* phila serogroup 1 antibody titer to \( \geq 1:128 \) in paired acute and convalescent sera by indirect IFA.
Table 5. Specific Site Algorithm for Pneumonia in Immunocompromised Patients (PNU3)

<table>
<thead>
<tr>
<th>Radiology</th>
<th>Signs/Symptoms</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two or more serial</td>
<td>Patient who is</td>
<td>At least one of the following:</td>
</tr>
<tr>
<td>chest radiographs</td>
<td>immunocompromised has at least one of the following:</td>
<td>Matching positive blood and sputum cultures with <em>Candida</em> spp.</td>
</tr>
<tr>
<td>with at least one of the</td>
<td>Fever (&gt;38°C or &gt;100.4°F) with no other recognized cause</td>
<td>Evidence of fungi or <em>Pneumocystis carinii</em> from minimally contaminated</td>
</tr>
<tr>
<td>following:</td>
<td>For adults &gt;70 years old, altered mental status with no other recognized cause</td>
<td>LRT specimen (e.g., BAL or protected specimen brushing) from one of the</td>
</tr>
<tr>
<td>New or progressive</td>
<td>New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or</td>
<td>following:</td>
</tr>
<tr>
<td>and persistent</td>
<td>increased suctioning requirements</td>
<td>- Direct microscopic exam</td>
</tr>
<tr>
<td>infiltrate</td>
<td>New onset or worsening cough, or dyspnea, or tachypnea</td>
<td>- Positive culture of fungi</td>
</tr>
<tr>
<td>Consolidation</td>
<td>Rales or bronchial breath sounds</td>
<td>Any of the following from</td>
</tr>
<tr>
<td>Cavitation</td>
<td>Worsening gas exchange (e.g., O₂ desaturations [e.g., PaO₂/FiO₂ &lt; 240], increased oxygen requirements,</td>
<td>LABORATORY CRITERIA DEFINED</td>
</tr>
<tr>
<td>Pneumatoceles, in</td>
<td>increased ventilator demand)</td>
<td>UNDER PNU</td>
</tr>
<tr>
<td>infants ≤ 1 year old</td>
<td>Hemoptysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pleuritic chest pain</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** In patients without underlying pulmonary or cardiac disease (e.g. respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.

2.4.6 Footnotes to Algorithms:

1. Occasionally, in patients with pulmonary or cardiac disease (for example, interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. Other non-infectious conditions (for example, pulmonary edema from decompensated congestive heart failure) may simulate the presentation of pneumonia. In these more difficult cases, serial chest radiographs must be examined to help separate infectious from non-infectious pulmonary processes.

2. Note that there are many ways of describing the radiographic appearance of pneumonia. Examples include, but are not limited to, “air-space disease”, “focal opacification”, “patchy areas of increased density”.

3. Purulent sputum is defined as secretions from the lungs, bronchi, or trachea that contain ≥25 neutrophils and ≤10 squamous epithelial cells per low power field (x100).

4. A single notation of either purulent sputum or change in character of the sputum, is not meaningful; repeated notations over a 24 hour period would be more indicative of the onset of an infectious process. Change in character of sputum refers to the color, consistency, odor and quantity.

5. In adults, tachypnea is defined as respiration rate >25 breaths per minute. Tachypnea is defined as >75 breaths per minute in premature infants born at <37 weeks gestation and until the 40th week; >60 breaths per minute in patients <2 months old; >50 breaths per minute in patients 2-12 months old; and >30 breaths per minute in children >1 year old.
6. Rales may be described as “crackles”.

7. This measure of arterial oxygenation is defined as the ratio of the arterial tension (PaO2) to the inspiratory fraction of oxygen (FiO2).

8. Care must be taken to determine the etiology of pneumonia in a patient with positive blood cultures and radiographic evidence of pneumonia, especially if the patient has invasive devices in place such as intravascular lines or an indwelling urinary catheter. In general, in an immunocompetent patient, blood cultures positive for coagulase negative staphylococci, common skin contaminants, and yeasts will not be the etiologic agent of the pneumonia.

9. Refer to Threshold values for cultured specimens (Table 6). An endotracheal aspirate is not a minimally contaminated specimen. Therefore, an endotracheal aspirate does not meet the laboratory criteria.

10. Once laboratory-confirmed cases of pneumonia due to respiratory syncytial virus (RSV), adenovirus, or influenza virus have been identified in a hospital, clinician’s presumptive diagnosis of these pathogens in subsequent cases with similar clinical signs and symptoms is an acceptable criterion for presence of healthcare-associated infection.

11. Scant or watery sputum is commonly seen in adults with pneumonia due to viruses and Mycoplasma although sometimes the sputum may be mucopurulent. In infants, pneumonia due to RSV or influenza yields copious sputum. Patients, except premature infants, with viral or mycoplasmal pneumonia may exhibit few signs or symptoms, even when significant infiltrates are present on radiographic exam.

12. Few bacteria may be seen on stains of respiratory secretions from patients with pneumonia due to Legionella spp, mycoplasma, or viruses.

13. Immunocompromised patients include those with neutropenia (absolute neutrophil count <500/mm³), leukemia, lymphoma, HIV with CD4 count <200, or splenectomy; those who are early post-transplant, are on cytotoxic chemotherapy, or are on high dose steroids (e.g., >40mg of prednisone or its equivalent (>160mg hydrocortisone, >32mg methylprednisolone, >6mg dexamethasone, >200mg cortisone) daily for >2 weeks).

14. Blood and sputum specimens must be collected within 48 hours of each other.

15. Semiquantitative or nonquantitative cultures of sputum obtained by deep cough, induction, aspiration, or lavage are acceptable. If quantitative culture results are available, refer to algorithms that include such specific laboratory findings.

<table>
<thead>
<tr>
<th>Specimen collection/technique</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung parenchyma*</td>
<td>&gt;104 cfu/g tissue</td>
</tr>
<tr>
<td>Bronchoscopically (B) obtained specimens</td>
<td></td>
</tr>
<tr>
<td>Bronchoalveolar lavage (B-BAL)</td>
<td>&gt;104 cfu/ml</td>
</tr>
<tr>
<td>Protected BAL (B-PBAL)</td>
<td>&gt;104 cfu/ml</td>
</tr>
<tr>
<td>Protected specimen brushing (B-PSB)</td>
<td>&gt;103 cfu/ml</td>
</tr>
<tr>
<td>Nonbronchoscopically (NB) obtained (blind) specimens</td>
<td></td>
</tr>
<tr>
<td>NB-BAL</td>
<td>&gt;104 cfu/ml</td>
</tr>
<tr>
<td>NB-PSB</td>
<td>&gt;103 cfu/ml</td>
</tr>
</tbody>
</table>

cfu = colony forming units

Table 6: Threshold values for cultured specimens used in the diagnosis of pneumonia

g = gram

ml = milliliter

* Open-lung biopsy specimens and immediate post-mortem specimens obtained by transthoracic or transbronchial biopsy.
2.4.7 Numerator Data:
The Pneumonia (PNEU) form is used to collect and report each VAP that is identified during the month selected for surveillance. The Instructions for Completion of Pneumonia Infection Form contains brief instructions for collection of each data element on the form.

2.4.8 Denominator Data:
- Ventilator days and patient days are used for denominators.
- Ventilator days, which are the number of patients managed with a ventilatory device, are collected daily, at the same time each day, during the month and recorded on the specific form.

2.4.9 Data Analyses:
- The VAP rate per 1000 ventilator days is calculated as: \( \frac{\text{number of VAPs}}{\text{number of ventilator days}} \times 1000 \)
- The Ventilator Utilization Ratio is calculated as: \( \frac{\text{number of ventilator days}}{\text{number of patient days}} \)
- These calculations will be performed separately for different types of ICUs, specialty care areas, and other locations in the institution.
- Separate rates and ratios will also be calculated for different types of catheters in specialty care areas and NICUs, and for birthweight categories in NICUs, as appropriate.

2.5 Catheter-Associated Urinary Tract Infection (CAUTI) Event

Introduction

The urinary tract is the most common site of healthcare-associated infection. Virtually all healthcare-associated urinary tract infections (UTIs) are caused by instrumentation of the urinary tract.

CAUTI can lead to such complications as cystitis, pyelonephritis, gram-negative bacteremia, prostatitis, epididymitis, and orchitis in males and, less commonly, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis in all patients.

Complications associated with CAUTI cause discomfort to the patient, prolonged hospital stay, and increased cost and mortality.

2.5.1 Settings:
Surveillance will occur in any of four types of inpatient locations:
1. intensive care units (ICUs),
2. specialty care areas (SCAs) (includes hematology/oncology wards, bone marrow transplant units, solid organ transplant units, inpatient dialysis units, long term acute care areas,
3. neonatal intensive care units (NICUs),
4. any other inpatient location in the institution where denominator data can be collected (e.g., surgical or medical wards).

   NOTE: Surveillance for CAUTI after the patient is discharged from the facility is not required, however, if discovered, these infections should be reported. No additional central line days are reported.

2.5.2 Requirements:
Surveillance for CAUTI in at least one inpatient location for at least one calendar month.

2.5.3 Definitions:

2.5.1.a Urinary tract infections (UTI) are defined using symptomatic urinary tract infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria.

2.5.1.b UTIs that are catheter-associated (i.e. patient had an indwelling urinary catheter at the time of onset or within 48 hours before onset of the event).

   NOTE: There is no minimum period of time that the catheter must be in place in order for the UTI to be considered catheter-associated.

2.5.4 Location of attribution:
The location where the patient was assigned on the date of the UTI event, which is further defined as the date when the first clinical evidence appeared or the date the specimen used to meet the criterion was collected, whichever came first.

   EXAMPLE(1): Patient has a Foley catheter inserted in the Emergency Department and then is admitted to the MICU. Within 24 hours of admission to the MICU, patient meets criteria for UTI. This is reported as a CAUTI for the MICU, because the Emergency Department is not an inpatient location and no denominator data are collected there.

   EXAMPLE(2): Patient on the urology ward of Hospital A had the Foley catheter removed and is discharged home a few hours later. The ICP from Hospital B calls the next day to report that this patient has been admitted to Hospital B with a UTI. This CAUTI should be reported for Hospital A and attributed to the urology ward.

   2.5.4.a Transfer Rule: If a CAUTI develops within 48 hours of transfer from one inpatient location to another in the same facility, the infection is attributed to the transferring location.

   2.5.4.b Indwelling catheter: a drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a closed collection system; also called a Foley catheter; does not include straight in-and-out catheters.

2.5.4.1 Numerator Data:
The Urinary Tract Infection (UTI) Form is used to collect and report each CAUTI that is identified during the month selected for surveillance. The Instructions for Completion of Urinary Tract Infection Form includes brief instructions for collection of each data element on the form.

2.5.4.2 Denominator Data:

- Device days and patient days are used for denominators.
- Indwelling urinary catheter days, which are the number of patients with an indwelling urinary catheter device, are collected daily, at the same time each day, during the month and recorded on the specific form.
2.5.4.3 Data Analyses:

- The CAUTI rate per 1000 urinary catheter days is calculated as: \[
\frac{\text{number of CAUTIs}}{\text{number of catheter days}} \times 1000
\]

- The Urinary Catheter Utilization Ratio is calculated as: \[
\frac{\text{number of catheter days}}{\text{number of patient days}}
\]

- These calculations will be performed separately for different types of ICUs, specialty care areas, and other locations in the institution, except for neonatal locations.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Symptomatic Urinary Tract Infection (SUTI) Must meet at least 1 of the following criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Patient had an indwelling urinary catheter in place at the time of specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (≥38°C), suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urine culture of ≥105 colony-forming units (CFU)/ml with no more than 2 species of microorganisms.</td>
</tr>
<tr>
<td>1b</td>
<td>Patient did not have an indwelling urinary catheter in place at the time of specimen collection nor within 48 hours prior to specimen collection and has at least 1 of the following signs or symptoms with no other recognized cause: fever (≥38°C) in a patient that is ≤65 years of age, urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urine culture of ≥105 CFU/ml with no more than 2 species of microorganisms.</td>
</tr>
<tr>
<td>2a</td>
<td>Patient had an indwelling urinary catheter in place at the time of specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (≥38°C), suprapubic tenderness, or costovertebral angle pain or tenderness and a positive urinalysis demonstrated by at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 white blood cells [WBC]/mm³ or ≥3 WBC/high power field of unspun urine) c. microorganisms seen on Gram stain of unspun urine and a positive urine culture of ≥103 and &lt;105 CFU/ml with no more than 2 species of microorganisms.</td>
</tr>
</tbody>
</table>
| Patient had indwelling urinary catheter removed within the 48 hours prior to specimen collection and at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C), urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness and 
| a positive urinalysis demonstrated by at least 1 of the following findings: 
| a. positive dipstick for leukocyte esterase and/or nitrite 
| b. pyuria (urine specimen with ≥10 white blood cells [WBC]/mm3 or ≥3 WBC/high power field of unspun urine) 
| c. microorganisms seen on Gram stain of unspun urine and 
| a positive urine culture of ≥10³ and <10⁵ CFU/ml with no more than 2 species of microorganisms. 
| 2b Patient did not have an indwelling urinary catheter in place at the time of specimen collection and has at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C) in a patient that is ≤65 years of age, urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness and 
| a positive urinalysis demonstrated by at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm³ or ≥3 WBC/high power field of unspun urine) c. microorganisms seen on Gram stain of unspun urine and 
| a positive urine culture of ≥10³ and <10⁵ CFU/ml with no more than 2 species of microorganisms. 
| 3 Patient ≤1 year of age with or without an indwelling urinary catheter has at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C core), hypothermia (<36°C core), apnea, bradycardia, dysuria, lethargy, or vomiting and 
| a positive urine culture of ≥10⁵ CFU/ml with no more than 2 species of microorganisms. 
| 4 Patient ≤1 year of age with or without an indwelling urinary catheter has at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C core), hypothermia (<36°C core), apnea, bradycardia, dysuria, lethargy, or vomiting and 
| a positive urinalysis demonstrated by at least one of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm³ or ≥3 WBC/high power field of unspun urine) c. microorganisms seen on Gram’s stain of unspun urine and 
| a positive urine culture of between ≥10³ and <10⁵ CFU/ml with no more than two species of microorganisms. 

| **Criterion** | **Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)** 
| --- | --- 
| Patient with or without an indwelling urinary catheter has no signs or symptoms (i.e., no fever (>38°C) for patients ≤65 years of age*; and for any age patient no urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness, OR for a patient ≤1 year of age, no fever (>38°C core), hypothermia (<36°C core), apnea, bradycardia, dysuria, lethargy, or vomiting) and a positive urine culture of >10⁵ CFU/ml with no more than 2 species of uropathogen microorganisms** and a positive blood culture with at least 1 matching uropathogen microorganism to the urine culture. |
Fever is not diagnostic for UTI in the elderly (>65 years of age) and therefore fever in this age group does not disqualify from meeting the criteria of an ABUTI.

**Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus* spp., yeasts, beta-hemolytic *Streptococcus* spp., *Enterococcus* spp., *G. vaginalis*, *Aerococcus urinae*, and *Corynebacterium* (urease positive).**

<table>
<thead>
<tr>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>• Urinary catheter tips should not be cultured and are not acceptable for the diagnosis of a urinary tract infection.</td>
</tr>
<tr>
<td>• Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization. Specimens from indwelling catheters should be aspirated through the disinfected sampling ports.</td>
</tr>
<tr>
<td>• In infants, urine cultures should be obtained by bladder catheterization or suprapubic aspiration; positive urine cultures from bag specimens are unreliable and should be confirmed by specimens aseptically obtained by catheterization or suprapubic aspiration.</td>
</tr>
<tr>
<td>• Urine specimens for culture should be processed as soon as possible, preferably within 1 to 2 hours. If urine specimens cannot be processed within 30 minutes of collection, they should be refrigerated, or inoculated into primary isolation medium before transport, or transported in an appropriate urine preservative. Refrigerated specimens should be cultured within 24 hours.</td>
</tr>
<tr>
<td>• Urine specimen labels should indicate whether or not the patient is symptomatic.</td>
</tr>
<tr>
<td>• Report secondary bloodstream infection = “Yes” for all cases of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI).</td>
</tr>
<tr>
<td>• Report <em>Corynebacterium</em> (urease positive) as either <em>Corynebacterium species unspecified (COS)</em> or, as <em>C. urealyticum (CORUR)</em> if so speciated.</td>
</tr>
</tbody>
</table>

### Criterion

<table>
<thead>
<tr>
<th>Other Urinary Tract Infection (OUTI) (kidney, ureter, bladder, urethra, or tissue surrounding the retroperineal or perinephric space) Other infections of the urinary tract must meet at least 1 of the following criteria:</th>
</tr>
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<tbody>
<tr>
<td>1 Patient has microorganisms isolated from culture of fluid (other than urine) or tissue from affected site.</td>
</tr>
<tr>
<td>2 Patient has an abscess or other evidence of infection seen on direct examination, during a surgical operation, or during a histopathologic examination.</td>
</tr>
<tr>
<td>3 Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C), localized pain, or localized tenderness at the involved site and at least 1 of the following:</td>
</tr>
<tr>
<td>a. purulent drainage from affected site</td>
</tr>
<tr>
<td>b. microorganisms cultured from blood that are compatible with suspected site of infection</td>
</tr>
<tr>
<td>c. radiographic evidence of infection (e.g., abnormal ultrasound, CT scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]).</td>
</tr>
<tr>
<td>4 Patient &lt; 1 year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever (&gt;38°C core), hypothermia (&lt;36°C core), apnea, bradycardia, lethargy, or vomiting and at least 1 of the following:</td>
</tr>
<tr>
<td>a. purulent drainage from affected site</td>
</tr>
<tr>
<td>b. microorganisms cultured from blood that are compatible with suspected site of infection</td>
</tr>
<tr>
<td>c. radiographic evidence of infection, (e.g., abnormal ultrasound, CT scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]).</td>
</tr>
</tbody>
</table>

### Comment

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

---

\* Fever is not diagnostic for UTI in the elderly (>65 years of age) and therefore fever in this age group does not disqualify from meeting the criteria of an ABUTI.

\** Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus* spp., yeasts, beta-hemolytic *Streptococcus* spp., *Enterococcus* spp., *G. vaginalis*, *Aerococcus urinae*, and *Corynebacterium* (urease positive).**
2.6 Dialysis Event (DE)

**Introduction:**

- Hemodialysis patients require a vascular access, which can either be a large blood vessel or catheter that can be punctured to remove and replace blood.
- Bacteremias and localized infections of the vascular access site are common in hemodialysis patients.
- The vascular access types, which are ordered according to increasing risk of infection, include:
  - arteriovenous fistulas created from the patient's own blood vessels;
  - arteriovenous grafts constructed from synthetic materials;
  - permanent central lines;
  - temporary central lines.
- Port access devices for hemodialysis have been removed from the market, but some existing ports may still be used.
- The risk of infection is relatively high in these devices.
- Because of frequent hospitalizations and receipt of antimicrobial drugs, hemodialysis patients are at high risk for infection with drug-resistant bacteria.

**2.6.1 Settings:**

Surveillance will occur in patients who are treated in outpatient hemodialysis center.

**2.6.2 Requirements:**

Surveillance for Dialysis Events (Des) for at least one month among chronic hemodialysis patients at an outpatient hemodialysis center.

**2.6.3 Definitions:**

2.6.3.a **Hospitalization:** The patient stayed overnight in a hospital, not just those related to infections or those where the patient was directly admitted from the dialysis unit. Each time a patient is hospitalized (no matter how soon after the last hospitalization), will considered as a new event. If the patient was hospitalized and returns to the dialysis unit on IV antimicrobials, both will be included in the same event not considered as a second event.

2.6.3.b **IV antimicrobial start:** Include all IV antimicrobial starts, not just those with vancomycin or for a vascular access problem. If IV antimicrobials are stopped for less than 21 days and then restarted, this is NOT considered a new event. However, if IV antimicrobials are stopped for \( \geq 21 \) days and then restarted, this is considered a new event.

2.6.3.c **Positive blood culture:** Include all patients with a positive blood culture even if they did not have an associated hospitalization or in-unit IV antimicrobial start. Include blood cultures taken as an outpatient or within 1 day after a hospital admission. If the patient had an associated hospitalization or in-unit IV antimicrobial start, use the appropriate rule (above) for reporting the event; if the patient had neither, report a new event for positive blood cultures occurring 21 days or more after a previous positive blood culture.

2.6.3.d **Local access infection:** Pus, redness, or swelling of the vascular access site and access-associated bacteremia was not present and patient was hospitalized or had initiation of an IV antimicrobial agent.

2.6.3.e **Access-associated bacteremia:** Blood culture positive with source identified as the vascular access site or unknown.

2.6.3.f **Vascular access infection:** Either local access infection or access-associated bacteremia.
2.6.4 Numerator Data:

For each patient with a hospitalization, outpatient IV antimicrobial start, or positive blood culture, infection control practitioners will complete one Dialysis Event form. The Instructions for Completion of Dialysis Event form includes brief instructions for collection of each data element on the form.

2.6.5 Denominator Data:

- The number of chronic hemodialysis patients with each access type who received hemodialysis at the center during the first two working days of the month is recorded on the Denominators for Outpatient Dialysis Form.
- These data are used to estimate the number of patient-months.
- Only chronic hemodialysis outpatients are included.
- The Instructions for Completion of Denominators for Outpatient Dialysis includes brief instructions for collection of each data element on the form.

2.6.6 Data Analyses:

- The numbers of various events are tabulated, and rates of these events per 100 patient-months calculated as:
  \[
  \frac{\text{number of events}}{\text{number of patient-months}} \times 100.
  \]
- These rates are stratified by vascular access type.
2.7 Surgical Site Infection (SSI) Event

Introduction:

In United States 2002, among the “big four” healthcare-associated infections (i.e., PNEU, SSI, UTI, BSI) SSIs were the second most common healthcare-associated infection, accounting for 17% of all HAIs among hospitalized patients.

While advances have been made in infection control practices, including improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis, SSIs remain a substantial cause of morbidity and mortality among hospitalized patients. Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk.

A successful surveillance program includes the use of epidemiologically sound infection definitions and effective surveillance methods, stratification of SSI rates according to risk factors associated with SSI development, and data feedback.

2.7.1 Settings:

Surveillance will occur with surgical patients in any inpatient/outpatient setting where the selected NHSN operative procedure(s) are performed.

2.7.2 Requirements:

A numerator and denominator data on all selected procedures will be collected for at least one month.

The International Classification of Diseases, 9th Revision Clinical Modifications (ICD 9-CM) codes:

Which are defined by the ICD 9 Coordination and Maintenance Committee of the National Center for Health Statistics and the Centers for Medicare and Medicaid Services (CMS), are developed as a tool for classification of morbidity data. The preciseness of the data, as well as their wide use, allows their use in grouping surgery types for the purpose of determining surgical site infection (SSI) rates. ICD9-CM codes are updated annually in October and NHSN operative procedure categories are subsequently updated. operative procedures and their grouping into NHSN operative procedure categories according to ICD 9-CM codes are available in NHSN MANUAL 2009 which we follow. A brief description of the types of operations contained in the NHSN operative procedure categories is also provided.

*NOTE: If the incision is not entirely closed at procedure’s end (i.e., if wires or tubes extrude through the incision) then the procedure does not meet the criteria of an NHSN operative procedure.

2.7.3 Definitions:

2.7.3.a An NHSN operative procedure is a procedure:

1) that is performed on a patient who is an NHSN inpatient or an NHSN outpatient; and

2) takes place during an operation (defined as a single trip to the operating room (OR) where a surgeon makes at least one incision through the skin or mucous membrane, including laparoscopic approach, and closes the incision before the patient leaves the OR; and

3) that is included in (Table 1) in NHSN MANUAL 2009.

2.7.3.b NHSN Inpatient: A patient whose date of admission to the healthcare facility and the date of discharge are different calendar days.

2.7.3.c NHSN Outpatient: A patient whose date of admission to the healthcare facility and date of discharge are the same calendar day.
2.7.3.d **OR**: A patient care area that meets the American Institute of Architects (AIA) criteria for an operating room. This may include an operating room, C-Section room, interventional radiology room, or a cardiac catheterization lab.

2.7.3.e **Implant**: A nonhuman-derived object, material, or tissue that is permanently placed in a patient during an operative procedure and is not routinely manipulated for diagnostic or therapeutic purposes. Examples include: porcine or synthetic heart valves, mechanical heart, metal rods, mesh, sternal wires, screws, cements, and other devices.

2.7.3.f **Transplant**: Human cells, tissues, organs, or cellular- or tissue-based products that are placed into a human recipient via grafting, infusion, or transfer. Examples include: heart valves, organs, ligaments, bone, blood vessels, skin, corneas, and bone marrow cells.

2.7.3.g **Autologous or “autograft”** transplants are products that originate from the patient’s own body.

2.7.3.h **Non-autologous or “allograft”** transplants are tissues or other products derived from another human body, either a donor cadaver or a live donor.

2.7.4 **Reporting Instructions:**

Some products are a combination of human- and nonhuman-derived materials, such as demineralized human bone matrix with porcine gel carrier. When placed in a patient during an operative procedure, indicate “Yes” for both the Implant and Non-autologous Transplant fields.

Some operative procedures involve placement of both autologous and non-autologous products. For these procedures, indicate “Yes” for Non-autologous Transplant field.

2.7.5 **Types of Incisions:**

<table>
<thead>
<tr>
<th>1) <strong>Superficial Incisional SSI</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>must meet one of the following criteria:</td>
</tr>
<tr>
<td>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:</td>
</tr>
<tr>
<td>a. purulent drainage from the superficial incision.</td>
</tr>
<tr>
<td>b. organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.</td>
</tr>
<tr>
<td>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, and is culture-positive or not cultured. A culture-negative finding does not meet this criterion.</td>
</tr>
<tr>
<td>d. diagnosis of superficial incisional SSI by the surgeon or attending physician.</td>
</tr>
</tbody>
</table>

**Note**

There are two specific types of superficial incisional SSIs:

1. **Superficial Incisional Primary (SIP)** – a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)

2. **Superficial Incisional Secondary (SIS)** – a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB)

**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. While it would be considered either a skin (SKIN) or soft tissue (ST) infection, depending on its depth, it is not reportable under this module.
- “Cellulitis”, by itself, does not meet the criteria for Superficial Incisional SSI.
• 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.
• An infected circumcision site in newborns is classified as CIRC. Circumcision is not an NHSN operative procedure. CIRC is not reportable under this module.
• An infected burn wound is classified as BURN and is not reportable under this module.

2) **Deep Incisional SSI**

**must meet one of the following criteria:**

| 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 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 and is culture-positive or not cultured when the patient has at least one of the following signs or symptoms: fever (>38°C), or localized pain or tenderness. A culture-negative finding does not meet this criterion. |
| 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. |

**Note**

There are two specific types of deep incisional SSIs:

1. **Deep Incisional Primary (DIP)** – a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)

2. **Deep Incisional Secondary (DIS)** – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB)

**Reporting Instructions**

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

3) **Organ/Space SSI**

<table>
<thead>
<tr>
<th>involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific sites are assigned to organ/space SSI to further identify the location of the infection.</td>
</tr>
<tr>
<td>The (Table 2) below lists the specific sites that must be used to differentiate organ/space SSI.</td>
</tr>
<tr>
<td>An example is appendectomy with subsequent subdiaphragmatic abscess, which would be reported as an organ/space SSI at the intraabdominal specific site (SSI-IAB).</td>
</tr>
<tr>
<td>Specific sites of organ/space (Table 2) have specific criteria which must be met in order to qualify as an NHSN event, <em>(These criteria are in addition to the general criteria for and can be found in Chapter 17, NHSN MANUAL 2009).</em></td>
</tr>
</tbody>
</table>

An **organ/space SSI** must meet one of the following criteria:

| 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 of 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, classify it as a deep incisional SSI.
- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.
- If meningitis (MEN) and a brain abscess (IC) are present together after operation, report as SSI-IC.
- Report CSF shunt infection as SSI-MEN if it occurs ≤ 1 year of placement; if later or after manipulation/access, it is considered CNS-MEN and is not reportable under this manual.
- Report spinal abscess with meningitis as SSI-MEN following spinal surgery.
- Episiotomy is not considered an operative procedure in NHSN.

<table>
<thead>
<tr>
<th>Table 2. Specific sites of an organ/space SSI.</th>
</tr>
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<tbody>
<tr>
<td><strong>Code</strong></td>
</tr>
<tr>
<td>BONE</td>
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<td>BRST</td>
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<td>CARD</td>
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</table>

**2.7.6 Numerator Data:**

All patients having a selected operation are monitored for signs of SSI. The *Surgical Site Infection (SSI)* form is completed for each such patient found to have an SSI.

**NOTES:**

1. If a patient has several NHSN operative procedures prior to an infection, report the operative procedure code of the operation that was performed most closely in time prior to the infection date, unless there is evidence that the infection is associated with a different operation.

2. If more than one NHSN operative procedure was done through a single incision, attempt to determine the procedure that is thought to be associated with the infection. If it is not clear (as is often the case when the infection is a superficial incisional SSI), or if the infection site being reported is not an SSI, use the NHSN Principal Operative Procedure Selection Lists (Table 3) to select which operative procedure to report.

<table>
<thead>
<tr>
<th>Table 3. NHSN Principal Operative Procedure Selection Lists</th>
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<tbody>
<tr>
<td><strong>Priority</strong></td>
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### 2.7.7 Denominator Data:

For all patients having a procedure selected for surveillance during the month, complete the Denominator for Procedure form. The data are collected individually for each operative procedure performed during the month specified on the Surveillance Plan.

**NOTES:**

1. If more than one NHSN operative procedure is performed during the same trip to the OR, a Denominator for Procedure record is reported for each operative procedure being monitored. Even if more than one NHSN operative procedure is done through the same incision (e.g., CARD and CBGC), a Denominator for Procedure record is reported for each.

2. If more than one NHSN operative procedure is performed through the same incision, record the combined duration of all procedures, which is the time from skin incision to primary closure.

3. If a patient had a coronary artery bypass graft with a chest incision and a donor site incision it is a CBGB. The CBGC is only used when there is only a chest incision. CBGB and CBGC are never reported for the same patient for the same trip to the OR.

4. For bilateral operative procedures (e.g., KPRO), two separate Denominator for Procedure are completed. To document the duration of the procedure, indicate the incision time to closure time for each procedure separately or, alternatively, take the total time for both procedures and split it evenly between the two.

5. If a patient goes to the OR more than once during the same admission and another procedure is performed through the same incision within 24 hours of the original operative incision, report only one procedure on the Denominator for Procedure combining the durations for both procedures.

**For example,** a patient has a CBGB lasting 4 hours. He returns to the OR six hours later to correct a bleeding vessel. The surgeon reopen the initial incision, makes the repairs, and recloses in 1.5 hours. Record the operative procedure as one CBGB and the duration of operation as 5 hour 30 minutes. If the wound class has changed, report the higher wound class. If the ASA class has changed, report the higher ASA class.
2.7.8 Data Analyses:
SSI rates per 100 operative procedures are calculated as: 
\[
\text{SSI rate per 100 operative procedures} = \frac{\text{number of SSI}}{\text{number of specific operative procedures}} \times 100
\]
- These calculations will be performed separately for the different types of operative procedures and stratified by risk index.

2.7.9 Basic SSI Risk Index:
The index used in NHSN assigns surgical patients into categories based on the presence of three major risk factors:
1. Operation lasting more than the duration cut point hours, where the duration cut point is the approximate 75th percentile of the duration of surgery in minutes for the operative procedure.
2. Contaminated (Class 3) or Dirty/infected (Class 4) wound class.
3. ASA classification of 3, 4, or 5.
The patient’s SSI risk category is simply the number of these factors present at the time of the operation.

2.8 Antimicrobial Use and Resistance (AUR) Option

Introduction
Rates of resistance to antimicrobials agents are increasing rapidly at.
The two main reasons for this increase are patient-to-patient transmission of resistant organisms and selection of resistant organisms because of antimicrobial receipt.
Previous studies have shown that feedback of rates of antimicrobial use and resistance to clinicians can improve the appropriateness of antimicrobial prescription.
Use of the AUR Option will assist hospitals in collecting data on antimicrobial resistance and/or antimicrobial use so that this information can be used for prevention purposes.
The AUR Option does not collect data on healthcare-associated infections. Therefore, the simultaneous collection of data using the Device-Associated Event Module for the same months and in the same locations as followed in the AUR Option is encouraged.

2.8.1 Settings:
All data are collected for all three of the following:
1) at least one intensive care unit or specialty care area (ICU/SCA exclusive of pediatric locations),
2) all non-ICU/SCA areas combined, and
3) all outpatient areas combined.
EXCEPTION: No pharmacy data are collected on outpatient areas.

2.8.2 Requirements:
2.8.2.a If the AUR Option is chosen, either or both microbiology laboratory and pharmacy data may be reported for the locations specified below in item 2 for a minimum of 6 months per calendar year.
2.8.2.b Collection of fewer than 6 months will not be adequate to accurately measure antimicrobial resistance or use rates.
   1. The unit of data collection is one month.
   2. An acceptable month of data includes:
a. at least one ICU/SCA,
b. all non-ICU/SCA inpatient areas combined, and
c. all outpatient areas combined.

2.8.3 Definitions:

2.8.3.a **No duplicate isolates** or surveillance cultures are included when reporting monthly counts of organisms and their susceptibilities.

2.8.3.b **Duplicate isolate**: An isolate of the same species of bacteria, regardless of antimicrobial susceptibility pattern, in the same patient, regardless of specimen site, during a given reporting period.

2.8.3.c For AUR, the reporting period is one month. Do not count duplicate isolates.

2.8.3.d **Surveillance cultures**: Those cultures performed as part of infection control surveillance, such as stool cultures for vancomycin-resistant enterococci (VRE).

2.8.4 Numerator Data:

2.8.4.a **Microbiology**:

- Antimicrobial susceptibility test results on all nonduplicate, clinical isolates processed by the laboratory during each study month are reported.
- Susceptible (S), intermediate (I), and resistant (R) isolates are stratified by ICU/SCA, combined non-ICU inpatient areas, and combined outpatient areas.
- All nonduplicate isolates, whether responsible for hospital-associated or community-associated infection or for colonization, are reported, with the exception of surveillance cultures. Antimicrobial resistance rates are calculated by using the number of resistant isolates as the numerator.

2.8.4.b **Pharmacy**:

- The number of grams or million international units (mill. I. U.), as appropriate, are reported monthly for inpatients for selected oral and parenteral antimicrobial agents.
- These amounts are converted to defined daily doses (DDD) for each antimicrobial agent by dividing the amount used in the inpatient location by the appropriate DDD conversion value.
- Antimicrobial use rates are calculated by using the number of DDD of antimicrobial agent as the numerator.

2.8.5 Denominator Data:

- Antimicrobial resistance rates are calculated by using the number of tested isolates as the denominator.
- Antimicrobial use rate denominators are patient-days per time period of analysis stratified by area of utilization.
- If a screening test is used to eliminate susceptible isolates for further testing to a specific antimicrobial, the total number of isolates screened or tested should be used in the denominator.

2.8.6 Data Analyses:

- Antimicrobial resistance data are expressed as prevalence resistance rates per 100 isolates tested:

\[
\text{Prevalence rate} = \frac{\text{number of resistant isolates}}{\text{number of isolates tested}} \times 100
\]

- Antimicrobial use data are expressed as incidence density rates of DDD per 1000 patient-days stratified by hospital area according to the formula below. Antimicrobials with similar spectrum or clinical indications are grouped prior to analysis.
DDD per 1,000 patient-days = \( \frac{\text{DDD of antimicrobial number of patient-days}}{1000} \)

<table>
<thead>
<tr>
<th>Class</th>
<th>Group</th>
<th>Antimicrobial Agent</th>
<th>DDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>β-lactams</td>
<td>Penicillin group</td>
<td>Penicillin G</td>
<td>1.2 x 10^6 U*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Procaine Penicillin G</td>
<td>2.4 x 10^6 U*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Penicillin G benzathine</td>
<td>1.2 x 10^6 U*</td>
</tr>
<tr>
<td></td>
<td>Ampicillin group</td>
<td>Ampicillin (parenteral)</td>
<td>2 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ampicillin (oral)</td>
<td>2 g</td>
</tr>
<tr>
<td>Antistaphylococcal</td>
<td>penicillins (Methicillin group)</td>
<td>Dicloxacillin (oral)</td>
<td>2 g</td>
</tr>
<tr>
<td>Antipseudomonal</td>
<td>penicillins</td>
<td>Piperacillin</td>
<td>14 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Piperacillin/Tazobactam</td>
<td>14 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ticarcillin</td>
<td>15 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ticarcillin/Clavulanic Acid</td>
<td>15 g</td>
</tr>
<tr>
<td>1st-Generation</td>
<td>Cefazolin</td>
<td></td>
<td>3 g</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td></td>
<td>Cephalothin</td>
<td>4 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cefadroxil (oral)</td>
<td>2 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cephalexin (oral)</td>
<td>2 g</td>
</tr>
<tr>
<td>2nd-Generation</td>
<td>Cefotetan</td>
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<td>4 g</td>
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<tr>
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<td>Cefmetazole</td>
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<tr>
<td></td>
<td>Cefuroxime axetil (oral)</td>
<td></td>
<td>1 g*</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>Cefixime (oral)</td>
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<td>Carbapenems</td>
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<td>Imipenem cilastatin</td>
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<td>Glycopeptides</td>
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<td>Vancomycin (oral)</td>
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<tr>
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<td>Levofloxacin (oral)</td>
<td></td>
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</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>Trovafloxacin (oral)</td>
<td></td>
<td>0.2 g</td>
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<td>Sparfloxacin (oral)</td>
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<td></td>
<td>Norfloxacin (oral)</td>
<td></td>
<td>0.8 g</td>
</tr>
<tr>
<td></td>
<td>Moxifloxacin (oral)</td>
<td></td>
<td>0.4 g</td>
</tr>
</tbody>
</table>
Moxifloxacin (Parenteral) 0.4 g
Lomefloxacin 0.4 g

Trimethoprim/(oral) component 0.4 g
Trimethoprim compound (parenteral) 0.4 g

Tigecycline (Parenteral) 0.1 g


2.9 Multidrug-Resistant Organism & Clostridium difficile-Associated Disease (MDRO/CDAD) Module

2.9.1 Background

Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* spp. (VRE) and certain gram-negative bacilli have increased in prevalence in hospitals over the last three decades, and have important implications for patient safety.

A primary reason for concern about these multidrug-resistant organisms (MDROs) is that options for treating patients with these infections are often extremely limited, and MDRO infections are associated with increased lengths of stay, costs, and mortality. Many of these traits have also been observed for *Clostridium difficile*-associated disease (CDAD).

*Clostridium difficile* is responsible for a spectrum of *C. difficile* infections (CDI) [originally referred to as *C. difficile*-associated disease or CDAD], including uncomplicated diarrhea, pseudomembranous colitis, and toxic megacolon which can, in some instances, lead to sepsis and even death.

Current CDC definitions for healthcare-associated infections, while adequate for the site of infection, do not take into account the special characteristics of disease caused by *C. difficile*. Although CDI represents a subset of gastroenteritis and gastrointestinal tract infections, specific standard definitions for CDI should be incorporated to obtain a more complete understanding of how *C. difficile* is being transmitted in a healthcare facility.

(Please note that the term CDI is replacing CDAD)

- As outlined in the HICPAC guideline, these pathogens may require specialized monitoring to evaluate if intensified infection control efforts are required to reduce the occurrence of these organisms and related infections. The goal of this module is to provide a mechanism to report and analyze these data that will inform infection control staff of the impact of targeted prevention efforts. This module contains two components:

  I. **Focused on MDROs**
  
  II. **Focused on CDAD or CDI**

  - Each component of these two components has two reporting options:

    I. **Infection Surveillance:** *(Location Specific for \( \geq 3 \) months)* Choose \( \geq 1 \) organism i.e., for each patient care area selected, surveillance for all NHSN-defined healthcare-associated infections caused by at least one MDRO.

    II. **Proxy Infection Measures:** Laboratory-Identified (LabID) Event *(Location Specific for \( \geq 3 \) consecutive months)* Choose \( \geq 1 \) organism (by using primarily laboratory data). Laboratory testing results can be used without clinical evaluation of the patient, allowing for a much less labor-intensive means to track MDROs.)
NOTES:

- No surveillance for CDI will be performed in Neonatal Intensive Care Units (NICU).

- Method (minimum requirement is 3 months for Infection Surveillance or 3 consecutive months for LabID Event reporting, using one of the 3 methods:
  A. Facility-wide by location. (Requires the most effort but provides the most detail for local and national statistical data).
  B. Selected locations within the facility (1 or more). (Acceptable method, ideal for use during targeted prevention programs).
  C. Overall facility-wide. (Acceptable method, ideal for CDI or MDRO infrequently encountered).

2.9.1. MDRO component:

2.9.1a Methodology: Facility may choose to monitor one or more of the following MDROs:

- MRSA,
- MRSA and MSSA,
- VRE,
- Multidrug-resistant *Klebsiella* spp., and
- Multidrug-resistant *Acinetobacter* spp.

- For *S. aureus*, both the resistant (MRSA) and the susceptible (MSSA) phenotypes can be tracked to provide concurrent measures of the susceptible pathogens as a comparison to those of the resistant pathogens in a setting of active prevention efforts targeted at the resistant pathogen.

2.9.2 Data Collections:

- The data collections in the MDRO component will enable facility to calculate several measures. Specific forms should be used to collect all required data, using the definitions of each data field as outlined in the “Instructions for Completion of MDRO/CDAD Forms”.

- Active, patient-based, prospective surveillance of the chosen MDRO infections by a trained infection preventionist (IP) is required for MDRO infection surveillance. This means that the IP shall seek to confirm and classify infections caused by the MDRO(s) chosen for monitoring during a patient’s stay in at least one patient care location during the surveillance period. Some process measures require direct observation.


a Settings: Surveillance will occur in any of 4 types of inpatient locations:

(1) intensive care units (ICU),
(2) specialty care areas (includes hematology/oncology wards, bone marrow transplant units, inpatient dialysis units, solid organ transplant units, long term acute care areas),
(3) neonatal intensive care units (NICU), and
(4) any other inpatient care location in the institution (e.g., surgical wards).
b. **Definitions:**

- MDROs included in this module are defined below:
  
  - **MRSA**: Includes *S. aureus* cultured from any specimen that tests oxacillin-resistant by standard susceptibility testing methods, or by a positive result from molecular testing for meca and PBP2a; these methods may also include positive results of specimens tested by any other FDA approved PCR test for MRSA.
  
  - **MSSA**: *S. aureus* cultured from any specimen testing as oxacillin-intermediate or -susceptible by standard susceptibility testing methods, or by a negative result from molecular testing for meca and PBP2a.
  
  - **VRE**: Any *Enterococcus spp.* (regardless of whether identified to the species level), that is resistant to vancomycin.
  
  - **MDR- Klebsiella spp.** testing non-susceptible (i.e., resistant or intermediate) to ceftazidime or ceftriaxone.
  
  - **MDR-Acinetobacter spp.** testing resistant to all agents (for which testing was done) in at least 3 antimicrobial classes including β-lactams, aminoglycosides, carbapenems, and fluoroquinolones.

<table>
<thead>
<tr>
<th>β-lactams</th>
<th>Aminoglycosides</th>
<th>Carbapenems</th>
<th>Fluoroquinolones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin/sulbactam</td>
<td>Amikacin</td>
<td>Imipenem</td>
<td>Ciprofloxacin</td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td>Gentamicin</td>
<td>Meropenem</td>
<td>Levofloxacin</td>
</tr>
<tr>
<td>Cefepime</td>
<td>Tobramycin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceftazidime</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c. **Numerator Data:**

Number of infections, by MDRO type.

d. **Denominator Data:**

Number of patient days.

e. **Data Analysis:**

Data are stratified by time (e.g., month, quarter, etc.) and patient care location.

\[
\text{MDRO Infection Incidence Rate} = \frac{\text{Number of infections by MDRO type}}{\text{Number of patient days}} \times 1000
\]

2.9.2.2. **Option 2. Laboratory-Identified (LabID) Event**

a. **Introduction:**

- To calculate proxy measures of MDRO infections, exposures, and healthcare acquisition, facility may choose to monitor laboratory-identified MDRO events. This method allows the facility to rely almost exclusively on easily obtained data from the clinical microbiology laboratory. However, some data elements, such as date admitted to the patient care location and facility may require other data sources.

- Laboratory and admission data elements can be used to calculate four distinct proxy measures including:

• Admission prevalence rate and overall prevalence rate based on clinical testing (measures of exposure burden),

• MDRO bloodstream infection incidence rate (measure of infection burden), and

• Overall MDRO infection/colonization incidence rate (measure of healthcare acquisition).

• MDRO positive laboratory results can be reported for one or more than one organism.

• For *S. aureus*, both the resistant (MRSA) and the susceptible (MSSA) phenotypes can be tracked to provide concurrent measures of the susceptible pathogens as a comparison to those of the resistant pathogens in a setting of active prevention efforts targeted at the resistant pathogen.

b. Settings:

Surveillance can occur in any location: inpatient or outpatient (except outpatient dialysis centers).

c. Requirements:

• For each MDRO being monitored, all MDRO test results are evaluated using the algorithm in Figure 1 to determine reportable LabID events for each calendar month, for each facility location as determined by the method chosen.

• All first MDRO isolates (chronologically) per month are reported as a LabID event for each unique patient regardless of specimen source (excludes tests related to active surveillance testing);

• if a duplicate MDRO isolate is from blood, it is reported as a LabID event only if it represents a unique blood source (i.e., no prior isolation of the MDRO in blood from the same patient in ≤ 2 weeks, even across calendar months) (Figure 1).

• As a general rule, at a maximum, there should be no more than 2 blood isolates (which would be very rare) reported and 1 first MDRO isolate reported on any patient during a calendar month for each location chosen for reporting.

• Report a single LabID Event per form.
d. Definitions:

- **MDRO Isolate**: Any specimen obtained for clinical decision making testing positive for a MDRO (as defined above). (Excludes tests related to active surveillance testing for *S. aureus* or MRSA)

- **Duplicate MDRO Isolate**: Any MDRO isolate from the same patient after an initial isolation of the specific MDRO during a calendar month, regardless of specimen source except unique blood source (Figure 1).

- **Laboratory-Identified (LabID) Event**: All non-duplicate MDRO isolates from any specimen, regardless of specimen source (excludes tests related to active surveillance testing for *S. aureus* or MRSA); and unique blood source MDRO isolates.

- **MSSA**: *S. aureus* cultured from any specimen testing as oxacillin-intermediate or -susceptible by standard susceptibility testing methods, or by a negative result from molecular testing for mecA and PBP2a.
• **Unique Blood Source:** A MDRO isolate from blood in a patient with no prior positive blood culture for the same MDRO in ≤ 2 weeks, even across calendar months (Figure 1).

  e. **Numerator Data:**

  Data will be reported using specific form.

  f. **Denominator Data:**

  Patient days, admissions, and encounters (for ER and outpatient locations) are reported using specific form.

  g. **Data Analysis:**

  Based on data provided on the LabID Event form, each event can be categorized to populate different measures; as healthcare facility-onset vs. community-onset to ensure that all healthcare facility-onset cases have been hospitalized at least a full 48 hours. Considering:

  1) variable times of day that admissions occur, and

  2) the absence of clinical data to confirm if cultures represent infection incubating at the time of admission,

  This is operationalized by classifying positive cultures obtained on day 1 (admission date), day 2, and day 3 of admission as community-onset (CO) LabID Events and positive cultures obtained on or after day 4 as healthcare facility-onset (HO) LabID Events.

  **Categorizing MDRO LabID Events:**

  • The following definitions and calculations based on date of admission to the facility and the date the specimen was collected.

  • **Community-Onset (CO):** LabID Event specimen collected as an outpatient or an inpatient ≤ 3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).

  • **Healthcare Facility-Onset (HO):** LabID Event specimen collected > 3 days after admission to the facility (i.e., on or after day 4).

  • **Proxy Measures for MDRO Exposure Burden:**

    o **Admission Prevalence Rate:**

      \[
      \frac{\# \text{ LabID Events per patient per month identified } \leq 3 \text{ days after admission to the location or facility}}{\# \text{ patient admissions to the location or facility}} \times 100
      \]

    o **Location Percent Admission Prevalence that is Community-Onset:**

      \[
      \frac{\# \text{ Admission Prevalent LabID Events to a location that are CO}}{\text{Total # Admission Prevalent LabID Events}} \times 100
      \]

    o **Location Percent Admission Prevalence that is Healthcare Facility-Onset:**

      \[
      \frac{\# \text{ Admission Prevalent LabID Events to a location that are HO}}{\text{Total # Admission Prevalent LabID Events}} \times 100
      \]

    o **Overall Prevalence Rate:**

      \[
      \frac{\# \text{ LabID Events per patient per month regardless of time spent in location or facility}}{\# \text{ patient admissions to the location or facility}} \times 100
      \]
• Proxy Measures for MDRO Bloodstream Infection:
  
  o **MDRO Bloodstream Infection Admission Prevalence Rate** =
    \[ \frac{\# \text{ all unique blood culture LabID Events per patient per month identified} \leq 3 \text{ days after admission to the location or facility}}{\# \text{ patient admissions to the location or facility}} \times 100 \]

  o **MDRO Bloodstream Infection Incidence or Incidence Density Rate** =
    \[ \frac{\# \text{ all unique blood culture LabID Events per patient per month identified} > 3 \text{ days after admission to the location or facility}}{\# \text{ patient admissions to the location or facility} \times 100} \]
    or
    \[ \frac{\# \text{ patient days for the location or facility}}{1,000} \]

• Proxy Measures for MDRO Healthcare Acquisition:
  
  o **Overall MDRO Infection/Colonization Incidence Rate** =
    \[ \frac{\# \text{ unique events per patient per month among those with no documented prior evidence of previous infection or colonization with this specific organism type and identified} > 3 \text{ days after admission to the location or facility}}{\# \text{ patient admissions to the location or facility}} \times 100 \]

  o **Overall MDRO Infection/Colonization Incidence Density Rate** =
    \[ \frac{\# \text{ unique events per patient per month among those with no documented prior evidence of previous infection or colonization with this specific organism type and identified} > 3 \text{ days after admission to the location or facility}}{\# \text{ patient days for the location or facility}} \times 1,000 \]
II. *Clostridium difficile*-Associated Disease (CDAD) Components

**Methodology:**

- The CDAD component also has 2 options. As with MDRO monitoring, if a facility chooses to monitor *C. difficile* it must use either Infection Surveillance or Laboratory-identified (LabID) Event reporting.

- *C. difficile* Infection (CDI) Surveillance, reporting on all NHSN-defined healthcare-associated CDIs from at least one patient care area.

- This method requires active, patient-based, prospective surveillance of healthcare-associated *C. difficile* infections by a trained infection preventionist (IP). This means that the IP shall seek to confirm and classify infections caused by *C. difficile* during a patient’s stay in at least one patient care location during the surveillance period.

- Laboratory-identified (LabID) Events reporting is the second surveillance component, and allows laboratory testing data to be used without clinical evaluation of the patient, allowing for a much less labor intensive method to track *C. difficile*.

- These provide proxy measures of *C. difficile* healthcare acquisition, exposure burden, and infection burden based solely on laboratory data and limited admission date data.

- Reporting of LabID Events for the entire facility (i.e., Overall facility-wide) can provide easily obtainable and valuable information for the facility. LabID Events can also be monitored for specific locations with unique denominator data required from each specific location (i.e., Facility-wide by location or Selected locations). This allows for both location-specific and facility-wide measures.

- specific forms used to collect all required data, using the definitions of each data field as indicated in the Tables of Instructions.

**Option 1. *Clostridium difficile* Infection Surveillance**

**Settings:**

- Surveillance will occur in any of 3 types of inpatient locations:
  1. intensive care units (ICU),
  2. specialty care areas (includes hematology/oncology wards, bone marrow transplant units, inpatient dialysis units, solid organ transplant units, long term acute care areas), and
  3. any other inpatient care location in the institution (e.g., surgical wards).

- Surveillance will not be performed in Neonatal Intensive Care Units (NICU).

**Requirements:** Surveillance for CDI should be performed in at least one location in the healthcare institution for at least 3 calendar months.

**Definitions:**

- Report all healthcare-associated infections where *C. difficile* is the associated pathogen.

- Cases of CDI that are not present or incubating at the time of admission (i.e., meets criteria for a healthcare associated infection) should be reported as gastroenteritis (GI-GE) or gastrointestinal tract (GI-GIT) infections, whichever is appropriate. Report the pathogen as *C. difficile* on the MDRO or CDAD Infection Event form.
• If the patient develops both GI-GE and GI-GIT CDI, report only GI-GIT using the date of onset as that of GI-GE CDI. (This corresponds to surveillance for healthcare-onset, healthcare facility-associated (HO-HCFA) CDI in recently published recommendations.)

• CDAD (or CDI) Complications: CDI in a case patient within 30 days after CDI symptom onset with the following: Admission to an intensive care unit for complications associated with CDI (e.g., for shock that requires vasopressor therapy); Surgery (e.g., colectomy) for toxic megacolon, perforation, or refractory colitis; AND/OR Death caused by CDI within 30 days after symptom onset and occurring during the hospital admission.

Numerator and Denominator Data:

• The numerator data are reported on the MDRO or CDAD Infection Event form.

• The patient day denominator data are reported using specific form.

• **Difficile Infections:** Numerator: The total number of CDI cases identified during the surveillance month.

• Denominator: The total number of patient days during the surveillance month.

Data Analysis:

Data are stratified by time (e.g., month, quarter, etc.) and by patient care location.

\[
C_{\text{difficile Infection rate}} \times 10,000 = \frac{\text{Number of CDI cases}}{\text{Number of patient days}} \times 10,000
\]

Option 2. *Clostridium difficile* Laboratory-identified Event

Settings:

• Surveillance must be performed either Overall facility-wide or in multiple locations.

• Consider including *C. difficile* positive laboratory assays from all available inpatient locations as well as all available outpatient locations where care is provided to patients post discharge or prior to admission (e.g., emergency departments, and outpatient clinics)

• Surveillance will **not** be performed in neonatal intensive care units (NICU) or outpatient dialysis centers.

Requirements:

Facility can choose one or more of three reporting choices:

A. report LabID Events for the entire facility, but by each location (facility-wide by location), requiring separate denominator submissions for each location,

B. report LabID Events for only Selected locations, and

C. Overall facility-wide (with only one denominator for the entire facility)

• Surveillance for positive laboratory results must be reported for 3 consecutive months to provide meaningful measures.
Definitions:

- **CDI-positive laboratory assay**: A positive result for a laboratory assay for *C. difficile* toxin A and/or B,

  OR

  A toxin-producing *C. difficile* organism detected in the stool sample by culture or other laboratory means.

- **Duplicate *C. difficile*-positive test**: Any *C. difficile* positive laboratory assay from the same patient following a previous *C. difficile* positive laboratory assay within the past two weeks.

- **Laboratory-Identified (LabID) Event**: All non-duplicate *C. difficile* positive laboratory assays. (See Figure 2)

*Figure 2. C. difficile Test Result Algorithm for Laboratory Identified (LabID) Events*

Numerator and Denominator Data:

**Numerator**: Data will be reported using specific form

**Denominator**: Patient days, admissions, and encounters (for ER and outpatient locations) are reported using specific form

**CDI Data Analysis**:

- Data are stratified by time (e.g., month, quarter, etc.), incident or recurrent, and either aggregated across the entire facility or stratified by patient care location.

- Based on data submitted on appropriate forms, LabID Events will be categorized as follows:

  a. **Incident CDI Assay**: Any LabID Event from a specimen obtained > 8 weeks after the most recent LabID Event (or with no previous LabID Event documented).

  b. **Recurrent CDI Assay**: Any LabID Event from a specimen obtained > 2 weeks and ≤ 8 weeks after the most recent LabID Event for that patient.
• All incident or recurrent LabID Events are further categorized utilizing timing of specimen collection, setting where collected, and previous discharge or future admission.

Categorization Based on Date Admitted to Facility and Date Specimen Collected:
• **Community-Onset (CO):** LabID Event collected as an outpatient or an inpatient ≤ 3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).
• **Community-Onset Healthcare Facility-Associated (CO-HCFA):** LabID Event collected from a patient who was discharged from the facility ≤ 4 weeks prior to date stool specimen collected.
• **Healthcare Facility-Onset (HO):** LabID Event collected > 3 days after admission to the facility (i.e., on or after day 4).

**Calculated CDI Prevalence Rates:**

- **Admission Prevalence Rate =**
  \[
  \frac{\text{# non-duplicate CDI LabID Events per patient per month identified } \leq 3 \text{ days after admission to the location or facility}}{\text{# patient admissions to the location or facility}} \times 100
  \]
- **Location Percent Admission Prevalence that is Community-Onset =**
  \[
  \frac{\text{# Admission Prevalent LabID Events to a location that are CO}}{\text{Total # Admission Prevalent LabID Events}} \times 100
  \]
- **Location Percent Admission Prevalence that is Community-Onset Healthcare Facility-Associated =**
  \[
  \frac{\text{# Admission Prevalent LabID Events to a location that are CO-HCFA}}{\text{Total # Admission Prevalent LabID Events}} \times 100
  \]
- **Location Percent Admission Prevalence that is Healthcare Facility-Onset =**
  \[
  \frac{\text{# Admission Prevalent LabID Events to a location that are HO}}{\text{Total # Admission Prevalent LabID Events}} \times 100
  \]
- **Overall Prevalence Rate =**
  \[
  \frac{\text{# non-duplicate CDI LabID Events per patient per month regardless of event to location or facility}}{\text{# patient admissions to the location or facility}} \times 100
  \]

**Calculated CDI Incidence Rates:**
(see categorization of Incident, HO, and CO-HCFA above).

- **CDI Incidence Rate =**
  \[
  \frac{\text{# non-duplicate and Incident CDI LabID Events per patient per month identified } > 3 \text{ days after admission to the location or facility}}{\text{# patient days for the location or facility}} \times 10,000
  \]
- **Facility CDI Healthcare Facility-Onset Incidence Rate =**
  \[
  \frac{\text{# all Incident HO CDI LabID Events per patient per month}}{\text{# patient days for the facility}} \times 10,000
  \]
- **Facility CDI Combined Incidence Rate =**
  \[
  \frac{\text{# all Incident HO and CO-HCFA CDI LabID Events per patient per month}}{\text{# patient days for the facility}} \times 10,000
  \]
REFERENCE:


UPDATED 11 Nov 2009
CHAPTER 3  HAND HYGIENE

3.1 Types of Hand Hygiene:

3.1.1 Handwashing - the single most important intervention to prevent nosocomial infection with the use of plain soap and water for 10 - 15 seconds of vigorous hand rub.

3.1.1.1 Indications for Hand Washing and Hand Antisepsis

1. When hands are visibly dirty or contaminated with proteinaceous materials or soiled with blood or other body fluids.
2. Before having direct contact with patients.
3. Before and after gloving when doing invasive procedures.
4. After contact with body fluids excretions, mucous membranes, non-intact skin and wound dressings.
5. If moving from a contaminated body site to a clean body site during patient care.
6. Before eating and after using the restroom.
7. With the use of unmedicated soap or detergent and running water, dirt and loose transient flora is removed through brisk rubbing of hands.

3.1.1.2 Hand Washing Technique (See Newsletter of Infection Control, 2nd edition)

1. Palm to palm
2. Right palm over left dorsum and left palm over right dorsum.
3. Palm to palm fingers interfaced.
4. Back of fingers to opposing palms with fingers interlocked.
5. Rotational rubbing of right thumb clasped in left palm and vice versa.
6. Rotational rubbing backwards and forwards with clasp fingers of right hand in left palm and vice versa.
7. Thorough rinsing is done under running water and dry hands with a paper towel. Turn off faucet using towel paper lining.
Figure 1  Hand Washing Technique

1. Palm to palm
2. Right palm over left dorsum and left palm over right dorsum
3. Palm to palm fingers interfaced
4. Backs of fingers to opposing palms with fingers interlocked
5. Rotational rubbing of right thumb clapped in left palm and vice versa
6. Rotational rubbing backwards and forwards with clasped fingers of right hand in left palm and vice versa
3.1.2 Hand disinfection (Hygienic Hand wash)

This process has an additional antiseptic agent to the use of detergent/soap leading to significant reduction in numbers of microorganisms e.g. Triclosan, 4% Chlorhexidine detergent.

3.1.3 Waterless Hand Disinfection

The use of 60-95% alcohol which have excellent and rapid antibactericidal action. It is preferably used in between patient care when hands are visibly clean. Alcohol hand sanitizers are available in several formats: (liquid, thick gels, foams)

3.1.4 Hand Scrub for surgical interventions

Hands and arms scrubs with Chlorhexidine, iodophors, or hexachlorophene are done at least 5 minutes before the first procedure of the day and 2 to 5 minutes between subsequent procedures e.g. Chlorhexidine, Iodophors, or Hexachlorophene.

3.1.1.3 Factors affecting poor compliance for hand hygiene.

1. Skin irritation and dryness
2. Time priority for patient care over hand hygiene.
3. Inconveniently placed or absent wash basins.
4. Misconception that gloves are substitute for hand washing.
5. High workload and understaffing
6. Lack of interest or awareness and guidelines for hand hygiene.
7. Ignorance of the role of hand in cross-infection.
8. Lack of role models.

Billions of riyals spent for hospital acquired infections can be saved when health providers will adhere to hand hygiene.

3.2 Different Types of Hand Decontaminants

3.2.1 Soap solution – plain non-antimicrobial

This has detergent effect, removing microorganisms physically but has no direct anti-microbial effect. Its effect is limited because it does not kill microorganisms nor inhibit their growth.

3.2.2 Aqueous Antiseptic Solution

• Compared to soap, antiseptic solutions cause a greater reduction in the number of transient and resident flora on the skin. This is achieved either by killing or inhibiting their growth. They are also more effective against pathogenic bacteria.

• Chosen solution used should contain chlorhexidine gluconate, triclosan or povidine iodine as an active agent. E.g. Chlorhexidine, Povidine Iodine, Triclosan

• Hand hygiene is the cornerstone of infection prevention. Its high compliance among health workers are associated with decreased cross transmission of infections. The choice of product must be agreed and approved by the Infection Control Committee

• The availability of wash sinks and/or hand scrub solutions within the proximity of the working area will improve compliance.
CHAPTER 4 STANDARD PRECAUTIONS

Standard Precautions combine the features of universal precautions and body substance isolation. **Standard Precautions apply to all patients** in all situations regardless of their diagnosis or suspected infection status. Standard Precautions apply to the following:

- Blood
- All body fluids, secretions and excretions except sweat whether or not they contain visible blood
- Nonintact skin
- Mucous membranes

4.1 **Hand Hygiene** —

- During the delivery of healthcare, avoid unnecessary touching of surfaces in close proximity to the patient to prevent both contamination of clean hands from environmental surfaces and transmission of pathogens from contaminated hands to surfaces.
- When hands are visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or body fluids, wash hands with either a nonantimicrobial soap and water or an antimicrobial soap and water.
- If hands are not visibly soiled, or after removing visible material with nonantimicrobial soap and water, decontaminate hands with an alcohol-based hand rub. Alternatively, hands may be washed with an antimicrobial soap and water.
- Frequent use of alcohol-based hand rub immediately following handwashing with nonantimicrobial soap may increase the frequency of dermatitis. Perform hand hygiene.

4.1.1 **Perform hand hygiene:**

- Before having direct contact with patients, in between different procedures for the same patient and from one patient to another.
- After contact with blood, body fluids or excretions, mucous membranes, nonintact skin, or wound dressings.
- After contact with a patient's intact skin (e.g., when taking a pulse or blood pressure or lifting a patient).
- If hands will be 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.
- After removing gloves.
- Wash hands with non-antimicrobial soap and water or with antimicrobial soap and water if contact with spores (e.g., *C. difficile* or *Bacillus anthracis*) is likely to have occurred. The physical action of washing and rinsing hands under such circumstances is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores.
- Do not wear artificial fingernails or extenders if duties include direct contact with patients at high risk for infection and associated adverse outcomes (e.g., those in ICUs or operating rooms).
- See hand hygiene policy for procedure.
4.8 **Gloves**

- Wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, nonintact skin, or potentially contaminated intact skin (e.g., of a patient incontinent of stool or urine) could occur.
- Wear gloves with fit and durability appropriate to the task.
- Wear disposable medical examination gloves for providing direct patient care.
- Wear disposable medical examination gloves or reusable utility gloves for cleaning the environment or medical equipment.
- Remove gloves after contact with a patient and/or the surrounding environment (including medical equipment). Do not wear the same pair of gloves for the care of more than one patient.
- Do not wash gloves for the purpose of reuse since this practice has been associated with transmission of pathogens.
- Change gloves during patient care if the hands will move from a contaminated body-site (e.g., perineal area) to a clean body-site (e.g., face).

4.9 **Mouth, nose, eye protection**

- When performing procedures that may be likely to generate splashes or sprays of blood, body fluids, secretions or excretions, wear a mask and eye protection or a face shield. This will protect the mucous membranes of the eyes, nose and mouth.
- Use PPE to protect the mucous membranes of the eyes, nose and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and excretions. Select masks, goggles, face shields, and combinations of each according to the need anticipated by the task performed.
- During aerosol-generating procedures (e.g., bronchoscopy, suctioning of the respiratory tract [if not using in-line suction catheters], endotracheal intubation) in patients who are not suspected of being infected with an agent for which respiratory protection is otherwise recommended (e.g., *M. tuberculosis*, SARS or hemorrhagic fever viruses), wear one of the following: a face shield that fully covers the front and sides of the face, a mask with attached shield, or a mask and goggles (in addition to gloves and gown).

4.4 **Gowns**

- When performing procedures that may be likely to generate splashes or sprays of blood, body fluids, secretions or excretions, wear a gown to protect the skin and to prevent soiling of clothing. Always remove the soiled gown as soon as possible and wash hands.

4.5 **Patient Care Equipment and instruments/devices**

- All patient care equipment that is soiled with blood, body fluids, secretions or excretions shall be handled in a manner that will prevent skin and mucous membrane exposures.
- Single use, disposable items must be disposed of properly.
- Establish policies and procedures for containing, transporting, and handling patient-care equipment and instruments/devices that may be contaminated with blood or body fluids.
- Remove organic material from critical and semi-critical instrument/devices, using recommended cleaning agents before high level disinfection and sterilization to enable effective disinfection and sterilization processes.
• Wear PPE (e.g., gloves, gown), according to the level of anticipated contamination, when handling patient-care equipment and instruments/devices that is visibly soiled or may have been in contact with blood or body fluids.
• Make sure that reusable equipment has been cleaned and reprocessed appropriately, prior to use on another patient.

4.6 Environmental Controls

• Establish guidelines for routine and targeted cleaning of environmental surfaces as indicated by the level of patient contact and degree of soiling.
• Clean and disinfect surfaces that are likely to be contaminated with pathogens, including those that are in close proximity to the patient (e.g., bed rails, over bed tables) and frequently-touched surfaces in the patient care environment (e.g., door knobs, surfaces in and surrounding toilets in patients' rooms) on a more frequent schedule compared to that for other surfaces (e.g., horizontal surfaces in waiting rooms).
• Use hospital approved disinfectants that have microbiocidal activity against the pathogens most likely to contaminate the patient-care environment. Use in accordance with manufacturer's instructions.
• Management of blood and body fluid spillage
• Include multi-use electronic equipment in policies and procedures for preventing contamination and for cleaning and disinfection, especially those items that are used by patients, those used during delivery of patient care, and mobile devices that are moved in and out of patient rooms frequently.

4.7 Textiles and laundry

• Handle used textiles and fabrics with minimum agitation to avoid contamination of air, surfaces and persons.
• Used linen soiled with blood, body fluids, secretions and excretions will be handled, transported and processed in a way that prevents skin and mucous membrane exposure, contamination of clothing and the transfer of microorganisms to other patients and the environment. They should be placed in transparent water soluble bags.
• Use non-infected linen should be placed in a blue plastic bag.

4.8 Occupational Health and Blood borne Pathogens

Avoid injuries if at all possible when using needles, scalpels and other sharp instruments. Place all contaminated needles, syringes, scalpel blades and other sharp items in designated puncture-resistant containers. These containers should be located as close as possible to the area where the items are used.

Needles should not be recapped or broken by hand or removed from disposal syringes.

Mouth pipetting/suctioning of blood or other infectious materials is strictly prohibited.

4.9 Engineering Control

• Used to eliminate or minimize staff member exposure to pathogens such as mouthpieces, resuscitation bags or other ventilation devices, needleless intravascular devices.

4.10 Safe injection practices

The following recommendations apply to the use of needles, cannula that replace needles, and, where applicable intravenous delivery systems.
• Use aseptic technique to avoid contamination of sterile injection equipment.
• Do not administer medications from a syringe to multiple patients, even if the needle or cannula on the syringe is changed. Needles, cannula and syringes are sterile, single-use items; they should not be reused for another patient nor to access a medication or solution that might be used for a subsequent patient.
• Use fluid infusion and administration sets (i.e., intravenous bags, tubing and connectors) for one patient only and dispose appropriately after use. Consider a syringe or needle/cannula contaminated once it has been used to enter or connect to a patient's intravenous infusion bag or administration set.
• Use single-dose vials for parenteral medications whenever possible.
• Do not administer medications from single-dose vials or ampules to multiple patients or combine leftover contents for later use.
• If multidose vials must be used, both the needle or cannula and syringe used to access the multidose vial must be sterile.
• Do not keep multidose vials in the immediate patient treatment area and store in accordance with the manufacturer's recommendations; discard if sterility is compromised or questionable.
• Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients.
• Infection control practices for special lumbar puncture procedures Wear a surgical mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture and spinal or epidural anesthesia.
• Worker safety Adhere to federal and state requirements for protection of healthcare personnel from exposure to blood borne pathogens.

4.11 Respiratory Hygiene/Cough Etiquette-

• Applied to all persons who enter the health care setting including health care personnel, patients and visitors with signs and symptoms of respiratory tract infections.
• Educate healthcare personnel on the importance of source control measures to contain respiratory secretions to prevent droplet and fomite transmission of respiratory pathogens, especially during seasonal outbreaks of viral respiratory tract infections (e.g., influenza, RSV, adenovirus, parainfluenza virus).
• Persons with symptoms of a respiratory infection should cover their mouths/noses when coughing or sneezing, use disposable tissues, disposed the contaminated tissues properly and perform hand hygiene after hands have been in contact with respiratory secretions.

4.12 Safe disposal of waste-

• Clinical waste is defined as that which may cause infection to any person coming into contact with it.
• When bags are no more than ¾ full, labels according to local policy and tie or use a tag and place in a clinical waste container.

Note: See Health Care Waste Management policy and procedures.
CHAPTER 5 ISOLATION PRECAUTIONS
(Transmission Based Precautions)

Nosocomial infections are major cause of morbidity and mortality in hospitalized patients, particularly those in intensive care units. Procedures and policies for prevention of these infections include routine hygienic practices employed in the care of all patients, such as handwashing and isolation precautions for patients known to be potential sources of transmission of infection. Transmission of infection within a hospital requires three elements.

a. A source of infecting microorganism.
b. A susceptible host,
c. A means of transmission for the microorganism.

Transmission of microorganisms transmitted in hospitals by the following routes.

5.4 Contact Transmission

- **Direct-contact transmission** involves a direct body surface-to-body surface contact.
- **Indirect-contact transmission** involves contact with a contaminated intermediate object, usually inanimate, such as contaminated instruments, or needles, also contaminated hands especially of HCW.

5.2. Droplet Transmission

Transmission of droplets (>5 μ) containing microorganisms as in Neisseria meningitidis. These droplets do not remain suspended in the air; they tend to drop within 3 feet.

5.3 Airborne Transmission

Occurs by dissemination of airborne droplet nuclei (small-particle <5 μ). These small particles remain suspended in the air for a period of time e.g. Mycobacterium tuberculosis, rubella and varicella viruses.

5.4 Protective Environment

Transmission –Based Isolation Precautions

_Airborne, Contact, and Droplet_ precautions are designed for patients known or suspected to be infected with highly transmissible or epidemiologically important pathogens for which additional precautions beyond _Standard Precautions_ are needed to interrupt transmission in hospitals. These isolation categories are to be combined for diseases that have multiple route of transmission. Whether _Transmission –Based Isolation Precautions_ are used singly or in combination, they are all designed to be used in addition to _Standard Precautions_

While Standard Precautions (SP) applies to all patients, _Transmission –Based Isolation Precautions_ apply to selected patients, based on either a suspected or confirmed clinical syndrome or specific diagnosis. _Transmission –Based Isolation Precautions_ are divided into three categories that reflect the major modes of transmission of infectious agents within the health care setting: airborne, contact, and droplet. Some diseases require more than one isolation category.

5.1 Contact Precautions

Contact Precautions are used in addition to _Standard Precautions_ for specified patients who have poorly controlled body fluids, respiratory secretions or are known or suspected to be infected or colonized with epidemiologically significant microorganisms transmitted by direct or indirect contact. _Direct transmission_ involves skin – to – skin contact and physical transfer of microorganisms to a susceptible host from an infected or colonized person. Direct transmission
may occur in routine patient care activities. **Indirect transmission** involves contact of a susceptible host with a contaminated intermediate object, such as contaminated hands, instruments or equipment that have not been adequately cleansed and disinfected between patients.

### 5.1.1 Patients Requiring the Precautions:
In addition to **Standard Precautions**, use **Contact Precautions** for patients known or suspected to have serious illnesses easily transmitted by direct patient contact or by contact with items in the patient's environment.

**Examples of such illnesses include:**

- Infections or Colonization with Multi-Drug Resistant Bacteria (MRSA, MDRO, VRE, etc.).
- Enteric infections with a low infectious dose or prolonged environmental survival, including *Clostridium difficile*.
- For diapered or incontinent patients infected with: *Enterohemorrhagic Escherichia coli O157:H7*, *Shigella*, *Hepatitis A*, or *Rotavirus*.
- Respiratory syncytial virus, Para-influenza virus, Enteroviral infections in infants and young children.
- Skin infections that are highly contagious or that may occur on dry skin, including:
  - Diphtheria (cutaneous).
  - Herpes simplex virus (neonatal or mucocutaneous).
  - Impetigo.
  - Major (noncontained) abscess, cellulites, or decubiti.
  - Pediculosis.
  - Scabies
  - *Staphylococcal Furunculosis* in infant and young children.
  - Zoster (disseminated or in the immunocompromised host).
  - Viral /hemorrhagic conjunctivitis.
  - Viral hemorrhagic fevers (Lassa, Marburg, and Ebola).
  - Group A *Streptococcal* major skin, burn, or wound infection.

### 5.1.2 Patient Isolation Requirements:

#### a. Patient placement:

- Place the patient in a private room when available
- Patients with conditions that may facilitate transmission (i.e., un-controlled drainage, stool incontinence) shall be prioritized for single patient room placement.
- When a private room is not available, place the patient in a room with a patient who has active infection with the same micro-organisms but with no other infection (cohorting).
- When a private room is not available and cohorting is not achievable, consider the epidemiology of the micro-organisms and the patient population when determining patient placement.
- Avoid placing patients on Contact Precautions in the same room with patients who have conditions that may increase the risk of adverse outcome from infection or that may facilitate transmission (i.e., those who are immunocompromised, have open wounds, or have anticipated prolonged lengths of stay).
- Ensure the patients are physically separated (i.e., greater than three (3) feet apart from each other). Draw the privacy curtain between beds to minimize opportunities for direct contact.
- Change protective attire and perform hand hygiene between contacts with patients in the same room, regardless of whether one or both patients are on Contact Precautions.
- Affix yellow “Contact Precautions” sign to the door with instructions for HCW and visitors.
- Consultation with infection control team is advised before patient placement.
b. **Gloves and Handwashing:**

- In addition to wearing gloves as outlined under Standard Precaution, wear gloves (clean, nonsterile gloves are adequate) when entering the patient room.
- During the course of providing care for patients, change gloves after having contact with infective material that may contain high concentration of microorganism (e.g., fecal material, wound drainage).
- Remove gloves before leaving the patient’s room and wash hands with an antimicrobial agent or waterless antiseptic agent.
- After gloves removal and Handwashing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient’s room to avoid transfer of microorganisms to other patients or environments.

c. **Gowns:**

- In addition to wearing gown as outlined under Standard Precaution, wear gown (clean, nonsterile gown is adequate) when entering the patient room if you anticipate that your clothing will have substantial contact with the patient, environmental surfaces, or items in the patient’s room, or if the patient is incontinent or has diarrhea, an ileostomy, a colostomy or wound drainage not contained by a dressing.
- Remove gown before leaving the patient’s environment.
- After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients or environments. Wash hands with an antimicrobial agent or waterless antiseptic agent.

d. **Patient Transport:**

- Limit the movements and transport of the patient from the room to essential medically purposes only.
- If the patient is transported out of the room, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or equipments (infected or colonized areas of the patient's body contained and covered).
- Any contaminate PPE shall be removed and disposed, and hand hygiene shall be performed prior to transporting patients on Contact Precautions.
- Clean PPE shall be donned to handle the patient at transport destination.

e. **Patient – Care Equipment:**

- When possible, dedicate the use of non-critical patient care equipment to a single patient (or cohort of patients infected or colonized with the pathogen requiring precautions to avoid sharing between patients).
- If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use for another patient.
- Single used items should be discarded in the appropriate waste container.

f. **Linen:**

a. Linen should be handled according to the **Standard Precautions** and linen laundering policies. double bagging of linen is not necessary.
5.1.3 **Regulated Medical Waste:**

Unbagged waste should be handled by staff wearing appropriate isolation garb. After waste has been bagged, it is to be handled according to the Standard Precautions and Regulated Medical Waste policies.

5.1.4 **Diagnostic Tests/Interventional Procedures:**

The following steps should be followed whenever a patient **MUST** have any type of diagnostic test or interventional procedure away from the isolation room (in addition to the Patient Transport steps).

- Diagnostic staffs are to be notified that the patient is in Contact Precautions.
- The patient should be transferred to the diagnostic equipment/table, and covered with a clean sheet obtained from the linen cart.
- Diagnostic staff should remove gloves used in transferring patient and wash hands **BEFORE** donning clean gloves to proceed with test.
- After test is completed, transportation staff should be notified before patient pick up, that the patient requires **Contact Precautions**.
- The diagnostic equipment/table is to be cleaned according to routine cleaning policy. refer to the standard precautions, cleaning/disinfection, and sterilization policies.

5.1.5 **Discontinuing Contact Precautions:**

Contact Precautions may be discontinued under the following conditions:

- The patient is no longer considered infectious based on clinical and/or laboratory data
- The patient meets specific decolonization criteria
- The isolation is discontinued by the infection control team.

**Cleaning:**

Daily detail and discharge cleaning is the same for all isolation rooms.

5.2 **Droplet Precautions**

Droplet Precautions are used in addition to **Standard Precautions** for patients known or suspected to be infected or colonized with epidemiologically significant microorganisms transmitted by large-particle droplets (5 µ) not carried by air currents and drop within three feet. Droplet transmission occurs when droplets are generated by an infected or colonized patient during coughing, sneezing, talking, or the performance of procedures such as suctioning, and are deposited on the conjunctivae or the mucous membranes of the nose or mouth of a susceptible person.

5.2.1 **Patients Requiring the Precautions**

In addition to **Standard Precautions**, use **Droplet Precautions** for patients known or suspected to have serious illnesses transmitted by large particle droplets. Examples of such illnesses include:

- Invasive *Haemophillus influenza* type b disease, including Meningitis, Pneumonia, Epiglottis, and Sepsis
- Invasive *Neisseria Meningitidis* disease, including Meningitis, Pneumonia, and Sepsis.

Other serious **Bacterial Respiratory Infections** spread by Droplet Transmission, including:

- Diphtheria (pharyngeal)
- Mycoplasma pneumonia
- Pertussis
- Pneumonic plague
- Streptococcal (group A) Pharyngitis, Pneumonia, or Scarlet Fever in infants and young children.

**Serious Viral Infections** spread by Droplet Transmission including:

- Adenovirus infection.
- Influenza.
- Mumps.
- Parvovirus B19 infection.
- Rubella
5.2.2 **Patient Isolation Requirements:**

**a. Patient Placement:**

- Place the patient in a private room.
- When a private room is not available, place the patient in a room with a patient who has active infection with the same micro-organisms but with no other infection (cohorting).
- When a private room is not available and cohorting is not achievable, maintain spatial separation of at least 3 feet between the infected patient and other patients and visitors.
- Avoid placing patients on Contact Precautions in the same room with patients who have conditions that may increase the risk of adverse outcome from infection or that may facilitate transmission (i.e., those who are immunocompromised have open wounds or have anticipated prolonged lengths of stay).
- Ensure the patients are physically separated (i.e., greater than three (3) feet apart from each other). Draw the privacy curtain between beds to minimize opportunities for direct contact.
- Change protective attire and perform hand hygiene between contacts with patients in the same room, regardless of whether one or both patients are on Contact Precautions.
- Special air handling and ventilation are not necessary.
- Affix blue “Droplet Precautions” sign to the door with instructions for HCW and visitors.

**b. Visitors**

- Visitors will be educated regarding the transmission of droplet-borne diseases:
  a) Hand hygiene with alcohol-based hand rub or soap and water should be performed regularly and always upon leaving the patient’s room.
  b) Risk of acquisition of droplet-borne diseases is reduced through the use of personal protective equipment (i.e., surgical mask with eye shield or goggles). This equipment will be available for visitors who choose to wear it.
- Visitors with upper respiratory symptoms are restricted from visiting. Special consideration may be given to close family members. Please consult with Infection Control.
- Nursing staff must instruct family/visitors to clean hands after contact with patient secretions or contact with immediate patient environment.

**c. Mask**

- A face mask required to enter the patient’s room or cubicle. (Standard surgical mask is adequate).
- Wear a mask when working within 3 feet of the patients.
- Remove mask before leaving room.

**d. Patient Transport:**

- Limit the movement and transport of the patient from the room to essential purposes only.
- If transport or movement is necessary, minimize patient dispersal of droplet nuclei by placing masking the patient, if possible and follow Respiratory Hygiene/Cough Etiquette.
- No mask is required for persons transporting patients on Droplet Precautions.

**e. Linen:** Linen should be handled according to the *Standard Precautions* and linen laundering policies. Double bagging of linen is not necessary.
f. **Patient–Care Equipment**

No specific requirements beyond *Standard Precautions*. Routine cleaning acceptable.

5.2.3 **Regulated Medical Waste**

Waste is to be handled according to the *Standard Precautions* and regulated medical waste policies.

5.2.4 **Diagnostic Tests / Interventional Procedures:**

The following steps should be followed whenever a patient *MUST* have any type of diagnostic test or interventional procedure away from their room (in addition to the patient transport steps);

- Diagnostic staff is to be notified that the patient is in *Droplet Precautions*.
- The patient is to remain masked for the entire procedure. If the patient must be unmasked for the procedure, staff must wear appropriate protective barrier equipments (PPE).
- After test is completed, transportation staff should be notified before patient pick up, that the patient requires *Droplet Precautions*.
- The diagnostic equipment/table is to be cleaned according to routine cleaning policy. refer to the standard precautions, cleaning/ disinfection, and sterilization policies.

5.2.4 **Discontinuing Droplet Precautions:**

*Droplet Precautions* may be discontinued under the following conditions:

- The patient is no longer considered infectious based on clinical and/or laboratory data; or
- The isolation is discontinued by the Infection Control team.

Contact the infection control program for further information regarding discontinuation of Droplet Precautions.

a. **Cleaning:** Daily, detail, and discharge cleaning are the same for all isolation rooms.

5.3 **Airborne Precautions**

*Airborne precautions* are used in addition to *Standard Precautions* for patients known or suspected to be infected with microorganisms transmitted by small droplet nuclei (<5μm) that remain suspended in the air for long period of time. These nuclei become dispersed widely by air currents within a room or over a long distance. Airborne transmission occurs when the widely dispersed nuclei containing microorganisms become inhaled by a susceptible host.

5.3.1 **Patients requiring the precautions:**

In addition to *Standard Precautions*, use *Airborne Precautions* for patients known or suspected to have serious illnesses transmitted by airborne droplet nuclei. Examples of such illnesses include:

- Measles (Rubeola).
- Varicella (including Disseminated Zoster).
- Tuberculosis (including Pulmonary & Laryngeal TB).

5.3.2 **Patient Isolation Requirements:**

a. **Patient Placement:**

- Place the patient in an Airborne Infection Isolation Room (AIIR) that has been constructed in accordance with current guidelines.
- At least six (6) (existing facility) or 12 (new construction/renovation) air changes per hour shall be provided. Room supplied with negative pressure.
Exhaust of air shall be directed to the outside. If it is not possible to exhaust air from an AIIR directly to the outside, the air may be returned to the air-handling system or adjacent spaces if all air is directed through HEPA filters.

The AIIR door shall be kept closed when not required for entry and exit.

When an AIIR is not available, the patient shall be transferred to a facility that has an available AIIR.

Affix pink “Airborne Precautions” sign to the door with instructions for HCW and visitors.

b. Respiratory Protection:

- Wear a fit tested Respiratory Protection (N95 or higher level respirator) when entering the room of a patient with known or suspected infectious pulmonary or laryngeal tuberculosis.
- Susceptible persons should not enter the room of patients known or suspected to have measles (Rubeola) or Varicella (chickenpox) if other immune caregiver is available.
- If susceptible persons must enter the room of patients known or suspected to have measles (Rubeola) or Varicella (chickenpox), they should wear Respiratory Protection (N95 respirator).
- Persons immune to measles (rubeola) or varicella need not wear respiratory Protection when dealing with measles or Varicella patients respectively.
- Remove mask AFTER leaving room.
- To assure good seal take a deep breath. Mask should collapse during inhalation and expand during exhalation.

c. Patient Transport:

- Limit the movement and transport of the patient from the room to essential purposes only.
- If transport or movement is necessary, minimize patient dispersal of droplet nuclei by placing a surgical mask on the patient, if possible and observe Respiratory Hygiene/Cough Etiquette.
- Healthcare personnel transporting patients who are on Airborne Precautions do not need to wear a mask or respirator during transport if the patient is wearing a mask and infectious skin lesions are covered.
- Inform the receiving department about the type of that patient.

d. Linens: Linen should be handled according to the Standard Precautions and Linen Laundering policies. Double bagging of linen is not necessary.

e. Patient – Care Equipment:

No specific requirements beyond Standard Precautions, Routine cleaning acceptable.

f. Regulated Medical Waste

Waste is to be handled according to the Standard Precautions and Regular Medical Waste policies.

g. Diagnostic Tests / Interventional Procedures:

The following steps should be followed whenever a patient MUST have any type of diagnostic test or interventional procedure away from the isolation room (in addition to the Patient Transport steps):

- Diagnostic staff is to be notified that the patient is in Airborne Precautions.
• The patient is to remain masked for the entire procedure unless it's done in the negative air-flow room. If procedure is done in a negative air flow room and patient is unmasked, staff must wear appropriate personal protective equipments (PPE).
• After test is completed, transportation staff should be notified before patient is picked up, that the patient requires Airborne Precautions.
• The diagnostic equipment/table is to be cleaned according to routine cleaning policy. (Refer to the standard precautions, cleaning/ disinfection, and sterilization policies).

5.3.3 **Discontinuing Airborne Precautions**

Airborne precautions may be discontinued under the following conditions:
• The patient is no longer considered infectious based on clinical and/or laboratory data; or
• For pulmonary TB patients, three (3) negative sputum smear must be obtained usually after 2 weeks from starting effective treatment.
• The isolation is discontinued by the infection control team.

a. **Cleaning**

Daily, detail, and discharge cleaning is the same for all isolation rooms. Terminal cleaning can be done after one safely hour without precaution.

**NOTE** For patients with diseases transmitted by multiple routes, follow additional isolation requirements in addition to Airborne Precautions. (Example: for varicella zoster (chicken pox) or disseminated varicella zoster (shingles) Contact Precautions should be followed as well as Airborne Precautions).

5.4 **Protective Environment**

In addition to Standard Precautions, use **Protective Isolation Precaution** for immunocompromised patients which include:-

• Recipients of bone marrow or organ transplant
• Patients with neutropenia, lymphoma or leukemia.
• Patients with extensive breakdown of the skin (e.g., sever burns or dermatitis)
• Patients receiving immunosuppressive therapy. (e.g., total body irradiation, large doses of steroids or antimetabolite).

5.4.1 **Environmental Controls:**

Place immunocompromised patients in a Protective Environment to reduce exposure to environmental fungi (i.e., Aspergillus sp).

• Incoming air shall be filtered using central or point-of-use high efficiency particulate (HEPA) filters capable of removing 99.97% of particles greater than 0.3 μm in diameter.
• There shall be positive air pressure in room relative to the corridor (pressure differential of greater than 12.5 Pa [0.01-inch water gauge]).
• Room shall be well-sealed to prevent infiltration of outside air.
• There shall be at least 12 air changes per hour.
• Dust levels shall be lowered by using smooth, nonporous surfaces and finishes that can be scrubbed, rather than textured material (i.e., upholstery). Horizontal surfaces shall be wet dusted whenever dust is detected, and routinely clean crevices and sprinkler heads where dust may accumulate.
• Carpeting in hallways and patient rooms shall be avoided.
• Dried and fresh flowers and potted plants shall be prohibited.
The length of time that patients who require a Protective Environment are outside their rooms for diagnostic procedures and other activities shall be minimized.

During periods of construction, to prevent inhalation of respirable particles that could contain infectious spores, respiratory protection shall be provided (i.e., N95 respirator) to patients who are medically fit to tolerate a respirator when they are required to leave the Protective Environment.

5.4.2 Use of Standard and Transmission-Based Precautions in a Protective Environment

- Transmission-Based Precautions for viral infections may need to be prolonged because of the patient’s immunocompromised state and prolonged shedding of viruses.

- Barrier precautions, (i.e., masks, gowns, gloves) are not required for healthcare personnel in the absence of suspected or confirmed infection in the patient, or if they are not indicated according to Standard Precautions.

- Airborne Precautions shall be implemented for patients who require a Protective Environment room and who also have an airborne infectious disease (i.e., pulmonary or laryngeal tuberculosis, acute varicella-zoster).

### Table 5.1

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type *</th>
<th>Type *</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abscess</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draining, major</td>
<td>C DI</td>
<td>C DI</td>
<td></td>
<td>No dressing or containment of drainage; until drainage stops or can be contained by dressing</td>
</tr>
<tr>
<td>Draining, minor or limited</td>
<td>S</td>
<td></td>
<td></td>
<td>Dressing covers and contains drainage</td>
</tr>
<tr>
<td>Acquired human immunodeficiency syndrome (HIV)</td>
<td>S</td>
<td></td>
<td>Post-exposure chemoprophylaxis for some blood exposures</td>
<td></td>
</tr>
<tr>
<td>Actinomycosis</td>
<td>S</td>
<td></td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Adenovirus infection (see agent-specific guidance under gastroenteritis, conjunctivitis, pneumonia)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoebiasis 1</td>
<td>S</td>
<td></td>
<td></td>
<td>Person to person transmission is rare. Transmission in settings for the mentally challenged and in a family group has been reported. Use care when handling diapered infants and mentally challenged persons</td>
</tr>
<tr>
<td>Anthrax</td>
<td>S</td>
<td></td>
<td></td>
<td>Infected patients do not generally pose a transmission risk.</td>
</tr>
<tr>
<td>Cutaneous</td>
<td>S</td>
<td></td>
<td></td>
<td>Transmission through non-intact skin contact with draining lesions possible, therefore use Contact Precautions if large amount of uncontained drainage. Handwashing with soap and water preferable to use of waterless alcohol based antiseptics since alcohol does not have sporicidal activity</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>S</td>
<td></td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Environmental: aerosolizable spore-containing powder or Other substance</td>
<td></td>
<td>DE</td>
<td>Until decontamination of environment complete. Wear respirator (N95 mask or PAPRs), protective clothing; decontaminate persons with powder on them. Hand hygiene: Handwashing for 30-60 seconds</td>
<td></td>
</tr>
</tbody>
</table>
with soap and water or 2% chlorhexidine gluconate after spore contact (alcohol handrubs inactive against spores).

**Post-exposure prophylaxis following environmental exposure:** 60 days of antimicrobials (either doxycycline, ciprofloxacin, or levofloxacin) and post-exposure vaccine under IND

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotic-associated colitis (see <em>Clostridium difficile</em>)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Arthropod-borne viral encephalitides</strong> (eastern, western, Venezuelan equine encephalomyelitis; St Louis, California encephalitis; West Nile Virus) and viral fevers (dengue, yellow fever, Colorado tick fever)</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person except rarely by transfusion, and for West Nile virus by organ transplant, breast milk or transplacentally. Install screens in windows and doors in endemic areas. Use DEET-containing mosquito repellants and clothing to cover extremities.</td>
</tr>
<tr>
<td><strong>Ascariasis</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Aspergillosis</strong></td>
<td>S</td>
<td></td>
<td>Contact Precautions and Airborne Precautions if massive soft tissue infection with copious drainage and repeated irrigations required</td>
</tr>
<tr>
<td><strong>Avian influenza (see influenza, avian below)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Babesiosis</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person except rarely by transfusion,</td>
</tr>
<tr>
<td><strong>Blastomycosis, North American, cutaneous or pulmonary</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Botulism</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Bronchiolitis (see respiratory infections in infants and young children)</strong></td>
<td>C DI</td>
<td></td>
<td>Use mask according to Standard Precautions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brucellosis (undulant, Malta, Mediterranean fever)</strong></td>
<td>S</td>
<td></td>
<td>spermatozoa and sexual contact. Provide antimicrobial prophylaxis following laboratory exposure</td>
</tr>
<tr>
<td><strong>Campylobacter gastroenteritis</strong> (see gastroenteritis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Candidiasis, all forms including mucocutaneous</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cat-scratch fever</strong> (benign inoculation lymphoreticulosis)</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Cellulitis</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chancroid (soft chancre)</strong> (<em>H. ducreyi</em>)</td>
<td>S</td>
<td></td>
<td>Transmitted sexually from person to person</td>
</tr>
<tr>
<td><strong>Chickenpox (see varicella)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chlamydia trachomatis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conjunctivitis</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Genital (lymphogranuloma venereum)</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pneumonia</strong> (infants &lt; 3 mos. of age)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chlamydia pneumoniae</strong></td>
<td></td>
<td></td>
<td>Outbreaks in institutionalized populations reported, rarely</td>
</tr>
<tr>
<td><strong>Cholera</strong> (see gastroenteritis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Closed-cavity infection</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Open drain in place; limited or minor drainage</strong></td>
<td>S</td>
<td></td>
<td>Contact Precautions if there is copious uncontained drainage</td>
</tr>
<tr>
<td>Infection/Condition</td>
<td>Type</td>
<td>Duration</td>
<td>Precaution</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>No drain or closed drainage system in place</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Clostridium</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>C. botulinum</em></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><em>C. difficile</em> (see Gastroenteritis, <em>C. difficile</em>)</td>
<td>C</td>
<td>DI</td>
<td></td>
</tr>
<tr>
<td><em>C. perfringens</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food poisoning</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Gas gangrene</td>
<td>S</td>
<td></td>
<td>Transmission from person to person rare; one outbreak in a surgical setting reported. Use Contact Precautions if wound drainage is extensive.</td>
</tr>
<tr>
<td><strong>Coccidioidomycosis</strong> (valley fever)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draining lesions</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person except under extraordinary circumstances because the infectious arthroconidial form of <em>Coccidioides immitis</em> is not produced in humans</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person except under extraordinary circumstances, (e.g., inhalation of aerosolized tissue phase endospores during necropsy, transplantation of infected lung) because the infectious arthroconidial form of <em>Coccidioides immitis</em> is not produced in humans</td>
</tr>
<tr>
<td>Colorado tick fever</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Congenital rubella</td>
<td></td>
<td>Until 1 year of age</td>
<td>Standard Precautions if nasopharyngeal and urine cultures repeatedly neg. after 3 mos. of age</td>
</tr>
<tr>
<td><strong>Conjunctivitis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute bacterial</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Chlamydia</em></td>
<td>S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS**

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Duration</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonococcal</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute viral (acute hemorrhagic)</td>
<td>C</td>
<td></td>
<td></td>
<td>Adenovirus most common; enterovirus, Coxsackie virus also associated with community outbreaks. Highly contagious; outbreaks in eye clinics, pediatric and neonatal settings, institutional settings reported. Eye clinics should follow Standard Precautions when handling patients with conjunctivitis. Routine use of infection control measures in the handling of instruments and equipment will prevent the occurrence of outbreaks in this and other settings.</td>
</tr>
<tr>
<td>Corona virus associated with SARS (SARS-CoV) (see severe acute respiratory syndrome)</td>
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<tr>
<td>Coxsackie virus disease (see enteroviral infection)</td>
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</tr>
<tr>
<td>Creutzfeldt-Jakob disease CJD, vCJD</td>
<td>S</td>
<td></td>
<td>Use disposable instruments or special</td>
<td></td>
</tr>
<tr>
<td>Infection/Condition</td>
<td>Precaution</td>
<td></td>
<td></td>
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<td>--------------------</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Croup (see respiratory infections in infants and young children)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crimean-Congo Fever (see Viral Hemorrhagic Fever)</td>
<td>S</td>
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</tr>
<tr>
<td>Cryptococcosis</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryptosporidiosis (see gastroenteritis)</td>
<td>S</td>
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<td></td>
<td></td>
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<tr>
<td>Cysticercosis</td>
<td>S</td>
<td></td>
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<tr>
<td>Cytomegalovirus infection, including in neonates and immunsuppressed patients</td>
<td>S</td>
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<tr>
<td>Decubitus ulcer (see Pressure ulcer)</td>
<td>S</td>
<td></td>
<td></td>
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<tr>
<td>Dengue fever</td>
<td>S</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Diarrhea, acute-infective etiology suspected (see gastroenteritis)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutaneous</td>
<td>CN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharyngeal</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ebola virus (see viral hemorrhagic fevers)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echinococcosis (hydatidosis)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echinococcosis (hydatidosis)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echovirus (see enteroviral infection)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encephalitis or encephalomyelitis (see specific etiologic agents)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endometritis (endomyometritis)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterobiasis (pinworm disease, oxyuriasis)</td>
<td>S</td>
<td></td>
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</tr>
</tbody>
</table>

<p>| TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS |
|------------------------------------------|---------------|</p>
<table>
<thead>
<tr>
<th><strong>Infection/Condition</strong></th>
<th><strong>Precaution</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Comments</strong></td>
<td></td>
</tr>
<tr>
<td><em>Enterococcus</em> species (see multidrug-resistant organisms if epidemiologically significant or vancomycin resistant)*</td>
<td></td>
</tr>
<tr>
<td>Enterocolitis, <em>C. difficile</em> (see <em>C. difficile</em>, gastroenteritis)</td>
<td></td>
</tr>
<tr>
<td>Enteroviral infections (i.e., Group A and B Coxsackie viruses and Echo viruses) (excludes polio virus)</td>
<td>S</td>
</tr>
<tr>
<td>Epiglottitis, due to <em>Haemophilus influenzae</em> type b</td>
<td>D</td>
</tr>
<tr>
<td>Epstein-Barr virus infection, including infectious mononucleosis</td>
<td>S</td>
</tr>
<tr>
<td>Erythema infectiosum (also see Parvovirus B19)</td>
<td></td>
</tr>
<tr>
<td><em>Escherichia coli</em> gastroenteritis (see gastroenteritis)</td>
<td></td>
</tr>
<tr>
<td>Food poisoning Botulism</td>
<td>S</td>
</tr>
<tr>
<td><em>C. perfringens or welchii</em></td>
<td>S</td>
</tr>
<tr>
<td>Staphylococcal</td>
<td>S</td>
</tr>
<tr>
<td>Furunculosis, staphylococcal</td>
<td>S</td>
</tr>
<tr>
<td>Infants and young children</td>
<td>C</td>
</tr>
<tr>
<td>C. perfringens or welchii</td>
<td>S</td>
</tr>
<tr>
<td>Staphylococcal</td>
<td>S</td>
</tr>
<tr>
<td>Furunculosis, staphylococcal</td>
<td>S</td>
</tr>
<tr>
<td>Infants and young children</td>
<td>C</td>
</tr>
</tbody>
</table>

sterilization/disinfection for surfaces, objects contaminated with neural tissue if CJD or vCJD suspected and has not been R/O; No special burial procedures
<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gangrene (gas gangrene)</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks for gastroenteritis caused by all of the agents below</td>
<td></td>
</tr>
<tr>
<td>Adenovirus</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
<td></td>
</tr>
<tr>
<td>Campylobacter species</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
<td></td>
</tr>
<tr>
<td>Cholera (Vibrio cholerae)</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
<td></td>
</tr>
<tr>
<td>C. difficile</td>
<td>C</td>
<td>DI</td>
<td>Discontinue antibiotics if appropriate. Do not share electronic thermometers; ensure consistent environmental cleaning and disinfection. Hypochlorite solutions may be required for cleaning if transmission continues. Handwashing with soap and water preferred because of the absence of sporicidal activity of alcohol in waterless antiseptic handrubs</td>
</tr>
<tr>
<td>Cryptosporidium species</td>
<td>S</td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
</tr>
<tr>
<td>E. coli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteropathogenic O157:H7 and other shiga toxin-Producing Strains</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
<td></td>
</tr>
<tr>
<td>Other species</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
<td></td>
</tr>
<tr>
<td>Giardia lamblia</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks</td>
<td></td>
</tr>
<tr>
<td>Noroviruses</td>
<td>S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Type and Duration of Precautions Recommended for Selected Infections and Conditions**

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>required when there is continued transmission. Alcohol is less active, but there is no evidence that alcohol antiseptic handrubs are not effective for hand decontamination. Cohorting of affected patients to separate airspaces and toilet facilities may help interrupt transmission during outbreak</td>
</tr>
</tbody>
</table>

**Type:**
- S: Standard
- C: Contact
- DI: Discontinue

**Duration of Precautions:**
- Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Isolation</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotavirus</td>
<td>C</td>
<td>Ensure consistent environmental cleaning and disinfection and frequent removal of soiled diapers. Prolonged shedding may occur in both immunocompetent and immunocompromised children and the elderly.</td>
</tr>
<tr>
<td><em>Salmonella</em> species (including <em>S. typhi</em>)</td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.</td>
</tr>
<tr>
<td><em>Shigella</em> species (Bacillary dysentery)</td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.</td>
</tr>
<tr>
<td><em>Vibrio parahaemolyticus</em></td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.</td>
</tr>
<tr>
<td><em>Viral (if not covered elsewhere)</em></td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.</td>
</tr>
<tr>
<td><em>Yersinia enterocolitica</em></td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.</td>
</tr>
<tr>
<td>German measles (see rubella; see congenital rubella)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giardiasis (see gastroenteritis)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gonococcal ophthalmia neonatorum (gonorrheal ophthalmia, acute conjunctivitis of newborn)</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Gonorrhea</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Granuloma inguinale (Donovanosis, granuloma venereum)</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Guillain-Barre's syndrome</td>
<td>S</td>
<td>Not an infectious condition.</td>
</tr>
<tr>
<td><em>Haemophilus influenzae</em> (see disease-specific recommendations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand, foot, and mouth disease (see enteroviral infection)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hansen's Disease (see Leprosy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hantavirus pulmonary syndrome</td>
<td>S</td>
<td>Not transmitted from person to person.</td>
</tr>
<tr>
<td><em>Helicobacter pylori</em></td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Hepatitis, viral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>S</td>
<td>Provide hepatitis A vaccine post-exposure as recommended.</td>
</tr>
<tr>
<td>Diapered or incontinent patients</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Type B-HBsAg positive; acute or chronic</td>
<td>S</td>
<td>See specific recommendations for care of patients in hemodialysis centers.</td>
</tr>
<tr>
<td>Type C and other unspecified non-A, non-B</td>
<td>S</td>
<td>See specific recommendations for care of patients in hemodialysis centers.</td>
</tr>
<tr>
<td>Type D (seen only with hepatitis B)</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Type E</td>
<td>S</td>
<td>Use Contact Precautions for diapered or incontinent individuals for the duration of illness.</td>
</tr>
<tr>
<td>Infection/Condition</td>
<td>Type</td>
<td>Precaution</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>Type G</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Herpangina (see enteroviral infection)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hookworm</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Herpes simplex (<em>Herpesvirus hominis</em>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encephalitis</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Mucocutaneous, disseminated or primary, severe</td>
<td>C</td>
<td>DI</td>
</tr>
<tr>
<td>Mucocutaneous, recurrent (skin, oral, genital)</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Neonatal</td>
<td></td>
<td>DI</td>
</tr>
<tr>
<td>Herpes zoster (varicella-zoster) (shingles)</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Disseminated disease in any patient</td>
<td>A, C</td>
<td>DI</td>
</tr>
<tr>
<td>Localized disease in immunocompromised patient until disseminated infection ruled out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Localized in patient with intact immune system with lesions that can be contained/covered</td>
<td>S</td>
<td>DI</td>
</tr>
<tr>
<td>Histoplasmosis</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Human immunodeficiency virus (HIV)</td>
<td>S</td>
<td>DI</td>
</tr>
<tr>
<td>Human metapneumovirus</td>
<td>C</td>
<td>DI</td>
</tr>
<tr>
<td>Impetigo</td>
<td>C</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Infectious mononucleosis</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human (seasonal influenza)</td>
<td>D</td>
<td>DI</td>
</tr>
<tr>
<td>Avian (e.g., H5N1, H7, H9 strains)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*DI = Duration indicated, HCW = Health care worker, HAI = Hospital-associated infection*
Pandemic influenza (also a human influenza virus) | D | 5 days from onset of symptoms | See [http://www.pandemicflu.gov](http://www.pandemicflu.gov) for current pandemic influenza guidance.  
Kawasaki syndrome | S | Not an infectious condition

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lassa fever (see viral hemorrhagic fevers)</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Legionnaires’ disease</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Leprosy</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Lice</td>
<td>S</td>
<td><a href="http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm">http://www.cdc.gov/ncidod/dpd/parasites/lice/default.htm</a></td>
<td></td>
</tr>
<tr>
<td>Head (pediculosis)</td>
<td>C</td>
<td>U 4 hrs</td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td>S</td>
<td>Transmitted person to person through infested clothing. Wear gown and gloves when removing clothing; bag and wash clothes according to CDC guidance above</td>
<td></td>
</tr>
<tr>
<td>Pubic</td>
<td>S</td>
<td>Transmitted person to person through sexual contact</td>
<td></td>
</tr>
<tr>
<td>Listeriosis (listeria monocytogenes)</td>
<td>S</td>
<td>Person-to-person transmission rare; cross-transmission in neonatal settings reported</td>
<td></td>
</tr>
<tr>
<td>Lyme disease</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Lymphocytic choriomeningitis</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Lymphogranuloma venereum</td>
<td>S</td>
<td>Not transmitted from person to person except through transfusion rarely and through a failure to follow Standard Precautions during patient care. Install screens in windows and doors in endemic areas. Use DEET-containing mosquito repellants and clothing to cover extremities</td>
<td></td>
</tr>
<tr>
<td>Malaria</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Marburg virus disease (see viral hemorrhagic fevers)</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Measles (rubeola)</td>
<td>A</td>
<td>4 days after onset of rash; DI in immune compromised</td>
<td></td>
</tr>
<tr>
<td>Susceptible HCWs should not enter room if immune care providers are available; no recommendation for face protection for immune HCW; no recommendation for type of face protection for susceptible HCWs, i.e., mask or respirator. For exposed susceptibles, post-exposure vaccine within 72 hrs. or immune globulin within 6 days when available. Place exposed susceptible patients on Airborne Precautions and exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine 17.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melioidosis, all forms</td>
<td>S</td>
<td>Not transmitted from person to person</td>
<td></td>
</tr>
<tr>
<td>Meningitis</td>
<td>S</td>
<td>Contact for infants and young children</td>
<td></td>
</tr>
<tr>
<td>Aseptic (nonbacterial or viral; also see enteroviral I infections)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial, gram-negative enteric, in neonates</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungal</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae, type b known or suspected</td>
<td>D</td>
<td>U 24 hrs</td>
<td></td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td>S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Type and Duration of Precautions Recommended for Selected Infections and Conditions

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Duration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus pneumoniae</em></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M. tuberculosis</em></td>
<td>S</td>
<td></td>
<td>Concurrent, active pulmonary disease or draining cutaneous lesions may necessitate addition of Contact and/or Airborne Precautions; For children, airborne precautions until active tuberculosis ruled out in visiting family members (see tuberculosis below)</td>
</tr>
<tr>
<td>Other diagnosed bacterial</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal disease: sepsis, pneumonia, meningitis</td>
<td>D</td>
<td>24 hrs</td>
<td>Postexposure chemoprophylaxis for household contacts, HCWs exposed to respiratory secretions; postexposure vaccine only to control outbreaks</td>
</tr>
<tr>
<td><em>Molluscum contagiosum</em></td>
<td>S</td>
<td></td>
<td>Use See <a href="http://www.cdc.gov/ncidod/monkeypox">www.cdc.gov/ncidod/monkeypox</a> for most current recommendations. Transmission in hospital settings unlikely. Pre and post-exposure smallpox vaccine recommended for exposed HCWs</td>
</tr>
<tr>
<td><em>Mucormycosis</em></td>
<td>S/C</td>
<td></td>
<td>MDROs judged by the infection control program, based on local, state, regional, or national recommendations, to be of clinical and epidemiologic significance. Contact Precautions recommended in settings with evidence of ongoing transmission, acute care settings with increased risk for transmission or wounds that cannot be contained by dressings. See recommendations for management options in Management of Multidrug-Resistant Organisms In Healthcare Settings. Contact state health department for guidance regarding new or emerging MDRO.</td>
</tr>
<tr>
<td>Mumps (infectious parotitis)</td>
<td>D</td>
<td>U 9 days</td>
<td>After onset of swelling; susceptible HCWs should not provide care if immune caregivers are available. Note: (Recent assessment of outbreaks in healthy year olds has indicated that salivary viral shedding occurred early in the course of illness and that 5 days of isolation after onset of parotitis may be appropriate in community settings; however the implications for healthcare personnel and high-risk patient populations remain to be clarified.)</td>
</tr>
<tr>
<td>Mycobacteria, nontuberculosis (atypical)</td>
<td>Not transmitted person-to-person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection/Condition</td>
<td>Type</td>
<td>Duration</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------</td>
<td>-------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Wound</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mycoplasma pneumonia</td>
<td>D</td>
<td>DI</td>
<td></td>
</tr>
<tr>
<td>Necrotizing enterocolitis</td>
<td>S</td>
<td></td>
<td>Contact Precautions when cases clustered temporally</td>
</tr>
<tr>
<td>Nocardiosis, draining lesions, or other presentations</td>
<td>S</td>
<td></td>
<td>Not transmitted person-to-person</td>
</tr>
<tr>
<td>Norovirus (see gastroenteritis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norwalk agent gastroenteritis (see gastroenteritis)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS**

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Duration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orf</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parainfluenza virus infection, respiratory in infants and young children</td>
<td>C</td>
<td>DI</td>
<td>Viral shedding may be prolonged in immunosuppressed patients. Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.</td>
</tr>
<tr>
<td>Parvovirus B19 (Erythema infectiosum)</td>
<td>D</td>
<td></td>
<td>Maintain precautions for duration of hospitalization when chronic disease occurs in an immunocompromised patient. For patients with transient aplastic crisis or red-cell crisis, maintain precautions for 7 days. Duration of precautions for immunosuppressed patients with persistently positive PCR not defined, but transmission has occurred</td>
</tr>
<tr>
<td>Pediculosis (lice)</td>
<td>C</td>
<td>U 24 hrs after treatment</td>
<td></td>
</tr>
<tr>
<td>Pinworm infection (Enterobiasis)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plague (Yersinia pestis)</td>
<td>S</td>
<td>U 48 hrs</td>
<td>Antimicrobial prophylaxis for exposed HCW.</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>D</td>
<td>U 48 hrs</td>
<td></td>
</tr>
<tr>
<td>Adenovirus</td>
<td>DC</td>
<td>DI</td>
<td>Outbreaks in pediatric and institutional settings reported. In immunocompromised hosts, extend duration of Droplet and Contact Precautions due to prolonged shedding of virus</td>
</tr>
<tr>
<td>Bacterial not listed elsewhere (including gram-negative bacterial)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. cepacia in patients with CF, including respiratory tract colonization</td>
<td>C</td>
<td>Unknown</td>
<td>Avoid exposure to other persons with CF; private room preferred. Criteria for D/C precautions not established. See CF Foundation guideline</td>
</tr>
<tr>
<td>B. cepacia in patients without CF(see Multidrug-resistant organisms)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlamydia</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungal</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infection/Condition</td>
<td>Type</td>
<td>Duration</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Haemophilus influenzae, type b</strong></td>
<td>Adults</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Infants and children</strong></td>
<td>D</td>
<td>U 24 hrs</td>
<td>See meningococcal disease above</td>
</tr>
<tr>
<td><strong>Legionella spp.</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Meningococcal</strong></td>
<td>D</td>
<td>U 24 hrs</td>
<td></td>
</tr>
<tr>
<td><strong>Multidrug-resistant bacterial (see multidrug-resistant organisms)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mycoplasma (primary atypical pneumonia)</strong></td>
<td>D</td>
<td>DI</td>
<td></td>
</tr>
</tbody>
</table>

**TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS**

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<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Duration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pneumococcal pneumonia</strong></td>
<td>S</td>
<td></td>
<td>Use Droplet Precautions if evidence of transmission within a patient care unit or facility 1</td>
</tr>
<tr>
<td><strong>Pneumocystis jiroveci (Pneumocystis carinii)</strong></td>
<td>S</td>
<td></td>
<td>Avoid placement in the same room with an Immunocompromised patient.</td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td>S</td>
<td></td>
<td>For MRSA, see MDROs</td>
</tr>
<tr>
<td><strong>Streptococcus, group A</strong></td>
<td>Adults</td>
<td>D</td>
<td>U 24 hrs</td>
</tr>
<tr>
<td><strong>Infants and young children</strong></td>
<td>D</td>
<td>U 24 hrs</td>
<td>Contact Precautions if skin lesions present</td>
</tr>
<tr>
<td><strong>Varicella-zoster (See Varicella-Zoster)</strong></td>
<td>Viral</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Poliomyelitis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pressure ulcer (decubitus ulcer, pressure sore) infected</strong></td>
<td>Major</td>
<td>C</td>
<td>DI</td>
</tr>
<tr>
<td></td>
<td>Minor or limited</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Prion disease (See Creutzfeld-Jacob Disease)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Psittacosis (ornithosis) (Chlamydia psittaci)</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Q fever</strong></td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rabies</strong></td>
<td>S</td>
<td></td>
<td>Person to person transmission rare; transmission via corneal, tissue and organ transplants has been reported. If patient has bitten another individual or saliva has contaminated an open wound or mucous membrane, wash exposed area thoroughly and administer postexposure prophylaxis.</td>
</tr>
<tr>
<td><strong>Rat-bite fever (Streptobacillus moniliformis disease, Spirillum minus disease)</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Relapsing fever</strong></td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td><strong>Resistant bacterial infection or colonization (see multidrug-resistant organisms)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory infectious disease, acute (if not covered elsewhere)</strong></td>
<td>Adults</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infants and young children</td>
<td>C</td>
<td>DI</td>
</tr>
</tbody>
</table>
Respiratory syncytial virus infection, in infants, young children and immunocompromised adults | C | DI | Wear mask according to Standard Precautions. In immunocompromised patients, extend the duration of Contact Precautions due to prolonged shedding. Reliability of antigen testing to determine when to remove patients with prolonged hospitalizations from Contact Precautions uncertain.

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reye's syndrome</td>
<td>S</td>
<td></td>
<td>Not an infectious condition</td>
</tr>
<tr>
<td>Rheumatic fever</td>
<td>S</td>
<td></td>
<td>Not an infectious condition</td>
</tr>
<tr>
<td>Rhinovirus</td>
<td>D</td>
<td>DI</td>
<td>Droplet most important route of transmission. Outbreaks have occurred in NICUs and LTCFs. Add Contact Precautions if copious moist secretions and close contact likely to occur (e.g., young infants)</td>
</tr>
<tr>
<td>Rickettsial fevers, tickborne (Rocky Mountain spotted fever, tickborne typhus fever)</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person except through transfusion, rarely</td>
</tr>
<tr>
<td>Rickettsialpox (vesicular rickettsiosis)</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Ringworm (dermatophytosis, dermatomycosis, tinea)</td>
<td>S</td>
<td></td>
<td>Rarely, outbreaks have occurred in healthcare settings, (e.g., NICU rehabilitation hospital. Use Contact Precautions for outbreak</td>
</tr>
<tr>
<td>Ritter's disease (staphylococcal scalded skin syndrome)</td>
<td>C</td>
<td>DI</td>
<td>See staphylococcal disease, scalded skin syndrome below</td>
</tr>
<tr>
<td>Rocky Mountain spotted fever</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person except through transfusion, rarely</td>
</tr>
<tr>
<td>Roseola infantum (exanthem subitum; caused by HHV-6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus infection (see gastroenteritis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubella (German measles) ( also see congenital rubella)</td>
<td>D</td>
<td>U 7 days after onset of rash</td>
<td>Susceptible HCWs should not enter room if immune caregivers are available. No recommendation for wearing face protection (e.g., a surgical mask) if immune. Pregnant women who are not immune should not care for these patients. Administer vaccine within three days of exposure to non-pregnant susceptible individuals. Place exposed susceptible patients on Droplet Precautions; exclude susceptible healthcare personnel from duty from day 5 after first exposure to day 21 after last exposure, regardless of post-exposure vaccine.</td>
</tr>
<tr>
<td>Rubeola (see measles)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonellosis (see gastroenteritis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scabies</td>
<td>C</td>
<td>U 24</td>
<td></td>
</tr>
<tr>
<td>Scalded skin syndrome, staphylococcal</td>
<td>C</td>
<td>DI</td>
<td>See staphylococcal disease, scalded skin syndrome below</td>
</tr>
<tr>
<td>Schistosomiasis (bilharziasis)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe acute respiratory syndrome (SARS)</td>
<td>A,D,C</td>
<td>DI plus 10 days</td>
<td>Airborne Precautions preferred; D if AIIR unavailable. N95 or higher respiratory</td>
</tr>
</tbody>
</table>
after resolution of fever, provided respiratory symptoms are absent or improving protection; surgical mask if N95 unavailable; eye protection (goggles, face shield); aerosol-generating procedures and “supershedders” highest risk for transmission via small droplet nuclei and large droplets. Vigilant environmental disinfection (see www.cdc.gov/ncidod/sars)

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Precaution</th>
<th>Type</th>
<th>Duration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shigellosis (see gastroenteritis)</td>
<td>AC D1</td>
<td></td>
<td></td>
<td>Until all scabs have crusted and separated (3-4 weeks). Non-vaccinated HCWs should not provide care when immune HCWs are or higher respiratory protection for susceptible and successfully vaccinated individuals; post-exposure vaccine within 4 days of exposure protective</td>
</tr>
</tbody>
</table>

**TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS**

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Duration</th>
<th>Precaution</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sporotrichosis S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiroplasma minor disease (rat-bite fever)</td>
<td>S</td>
<td></td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Staphylococcal disease (S. aureus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin, wound, or burn</td>
<td>Major</td>
<td>C</td>
<td>DI</td>
<td>No dressing or dressing does not contain drainage adequately</td>
</tr>
<tr>
<td></td>
<td>Minor or limited</td>
<td>S</td>
<td></td>
<td>Dressing covers and contains drainage adequately</td>
</tr>
<tr>
<td>Enterocolitis</td>
<td>S</td>
<td></td>
<td></td>
<td>Use Contact Precautions for diapered or incontinent children for duration of illness</td>
</tr>
<tr>
<td>Multidrug-resistant (see multidrug-resistant organisms)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td></td>
<td></td>
<td></td>
<td>Consider healthcare personnel as potential source of nursery, NICU outbreak</td>
</tr>
<tr>
<td>Scalded skin syndrome</td>
<td>C</td>
<td>DI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toxic shock syndrome</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptobacillus moniliformis disease (rat-bite fever)</td>
<td>S</td>
<td></td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Streptococcal disease (group A streptococcus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin, wound, or burn</td>
<td>Major</td>
<td>C, D</td>
<td>U 24 hrs</td>
<td>No dressing or dressing does not contain drainage adequately</td>
</tr>
<tr>
<td></td>
<td>Minor or limited</td>
<td>S</td>
<td></td>
<td>Dressing covers and contains drainage adequately</td>
</tr>
<tr>
<td>Endometritis (puerperal sepsis)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharyngitis in infants and young children</td>
<td>D</td>
<td>U 24 hrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>D</td>
<td>U 24 hrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scarlet fever in infants and young children</td>
<td>D</td>
<td>U 24 hrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious invasive disease</td>
<td>D</td>
<td>U 24</td>
<td></td>
<td>Outbreaks of serious invasive disease have</td>
</tr>
</tbody>
</table>
hrs occurred secondary to transmission among patients and healthcare personnel.

Contact Precautions for draining wound as above; follow rec. for antimicrobial prophylaxis in selected conditions.

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Precaution</th>
<th>Type</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streptococcal disease (group B streptococcus, neonatal)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptococcal disease (not group A or B) unless covered elsewhere</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multidrug-resistant (see multidrug-resistant organisms)</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongyloidiasis</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TYPE AND DURATION OF PRECAUTIONS RECOMMENDED FOR SELECTED INFECTIONS AND CONDITIONS

<table>
<thead>
<tr>
<th>Infection/Condition</th>
<th>Type</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syphilis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latent (tertiary) and seropositivity without lesions</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin and mucous membrane, including congenital, primary, Secondary</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tapeworm disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hymenolepis nana</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Taenia solium (pork)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus</td>
<td>S</td>
<td></td>
<td>Not transmitted from person to person</td>
</tr>
<tr>
<td>Tinea (e.g., dermatophytosis, dermatomycosis, ringworm)</td>
<td>S</td>
<td></td>
<td>Rare episodes of person-to-person transmission</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>S</td>
<td></td>
<td>Transmission from person to person is rare; vertical transmission from mother to child, transmission through organs and blood transfusion rare</td>
</tr>
<tr>
<td>Toxic shock syndrome (staphylococcal disease, streptococcal disease)</td>
<td>S</td>
<td></td>
<td>Droplet Precautions for the first 24 hours after implementation of antibiotic therapy if Group A streptococcus is a likely etiology</td>
</tr>
<tr>
<td>Trachoma, acute</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmissible spongiform encephalopathy (see Creutzfeld-Jacob disease, CJD, vCJD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trench mouth (Vincent's angina)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichinosis</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichomoniasis</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichuriasis (whipworm disease)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis (M. tuberculosis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrapulmonary, draining lesion)</td>
<td>A,C</td>
<td></td>
<td>Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are three consecutive negative cultures of continued drainage. Examine for evidence of active pulmonary tuberculosis.</td>
</tr>
<tr>
<td>Extrapulmonary, no draining lesion, meningitis</td>
<td>S</td>
<td></td>
<td>Examine for evidence of pulmonary tuberculosis. For infants and children, use Airborne Precautions until active pulmonary</td>
</tr>
</tbody>
</table>
**Tuberculosis in visiting family members ruled out**

- **Pulmonary or laryngeal disease, confirmed**
  - **Type**: A
  - **Precaution**: Discontinue precautions only when the likelihood of infectious TB disease is deemed negligible, and either 1) there is another diagnosis that explains the clinical syndrome or 2) the results of three sputum smears for AFB are negative. Each of the three sputum specimens should be collected 8-24 hours apart, and at least one should be an early morning specimen.

- **Skin-test positive with no evidence of current active disease**
  - **Type**: S

**Tularemia**

<table>
<thead>
<tr>
<th>Type and Duration of Precautions Recommended for Selected Infections and Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infection/Condition</strong></td>
</tr>
<tr>
<td>Draining lesion</td>
</tr>
<tr>
<td>Pulmonary</td>
</tr>
<tr>
<td>Typhoid (<em>Salmonella typhi</em>) fever (see gastroenteritis)</td>
</tr>
<tr>
<td>Typhus</td>
</tr>
<tr>
<td>Rickettsia prowazekii (Epidemic or Louse-borne typhus)</td>
</tr>
<tr>
<td>Rickettsia typhi</td>
</tr>
<tr>
<td>Urinary tract infection (including pyelonephritis), with or without urinary catheter</td>
</tr>
<tr>
<td>Vaccinia (vaccination site, adverse events following vaccination)</td>
</tr>
<tr>
<td>Vaccination site care (including autoinoculated areas)</td>
</tr>
<tr>
<td>Eczema vaccinatum</td>
</tr>
<tr>
<td>Fetal vaccinia</td>
</tr>
<tr>
<td>Generalized vaccinia</td>
</tr>
<tr>
<td>Progressive vaccinca</td>
</tr>
<tr>
<td>Post vaccinia encephalitis</td>
</tr>
<tr>
<td>Blepharitis or conjunctivitis</td>
</tr>
<tr>
<td>Infection/Condition</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>Iritis or keratitis</td>
</tr>
<tr>
<td>Vaccinia-associated erythema multiforme (Stevens Johnson Syndrome)</td>
</tr>
<tr>
<td>Secondary bacterial infection (e.g., S. aureus, group A beta hemolytic streptococcus)</td>
</tr>
<tr>
<td>Varicella Zoster</td>
</tr>
<tr>
<td>Variola (see smallpox)</td>
</tr>
<tr>
<td><em>Vibrio</em> paraohaemolyticus (see gastroenteritis)</td>
</tr>
<tr>
<td>Vincent's angina (trench mouth)</td>
</tr>
<tr>
<td>Viral hemorrhagic fevers due to Lassa, Ebola, Marburg, Crimean-Congo fever viruses</td>
</tr>
<tr>
<td>Viral respiratory diseases (not covered elsewhere)</td>
</tr>
<tr>
<td>Adults</td>
</tr>
<tr>
<td>Infants and young children (see respiratory infectious disease, acute)</td>
</tr>
<tr>
<td>Whooping cough (see pertussis)</td>
</tr>
<tr>
<td>Whooping cough (see pertussis)</td>
</tr>
<tr>
<td>Wound infections</td>
</tr>
<tr>
<td>Major</td>
</tr>
<tr>
<td>Minor or limited</td>
</tr>
<tr>
<td><em>Yersinia enterocolitica</em> gastroenteritis (see gastroenteritis)</td>
</tr>
<tr>
<td>Zoster (varicella-zoster) (see herpes zoster)</td>
</tr>
<tr>
<td><em>Zygomycosis</em> (phycomycosis, mucormycosis)</td>
</tr>
</tbody>
</table>

**Type of Precautions:** A, Airborne Precautions; C, Contact; D, Droplet; S, Standard; when A, C, and D are specified, also use S.

**Duration of precautions:** CN, until off antimicrobial treatment and culture-negative; DI, duration of illness (with wound lesions, DI means until wounds stop draining); DE, until environment completely decontaminated; U, until time specified in hours (hrs) after initiation of effective therapy; criteria for establishing eradication of pathogen has not been determined,
EMPIRIC USE OF AIRBORNE, DROPLET, OR CONTACT PRECAUTIONS

In many instances, the risk of nosocomial transmission of infection may be highest before a definitive diagnosis can be implemented. Therefore, patients with certain clinical syndromes should be isolated while a definitive diagnosis is pending. Table below delineates appropriate empiric isolation precautions for various clinical syndromes based on the potential mechanism of transmission.

<table>
<thead>
<tr>
<th>Clinical Syndrome or Condition</th>
<th>Potential Pathogens</th>
<th>Empiric Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diarrhea</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute diarrhea with a likely infectious cause in an incontinent or diapered patient.</td>
<td>Enteric pathogens( Escherichia coli O157:H7, Shigella, Hepatitis A, Rotavirus)</td>
<td>Contact</td>
</tr>
<tr>
<td>Diarrhea in an adult with a history of prolonged antibiotic use</td>
<td><em>Clostridium difficile</em></td>
<td>Contact</td>
</tr>
<tr>
<td><strong>Meningitis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever, neck rigidity with rash or exanthems.</td>
<td><em>Neisseria meningitidis</em></td>
<td>Droplet</td>
</tr>
<tr>
<td><strong>Vesicular rashes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Varicella</td>
<td>Airborne and contact</td>
</tr>
<tr>
<td><strong>Maculopapular with coryza and fever</strong></td>
<td>Rubeola (measles)</td>
<td>Airborne</td>
</tr>
<tr>
<td><strong>Respiratory infections</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prolonged cough, fever, upper lobe pulmonary infiltrate Night sweat, loss of weight</td>
<td><em>Mycobacterium tuberculosis</em></td>
<td>Airborne</td>
</tr>
<tr>
<td>Prolonged cough/fever/pulmonary infiltrate in any part of the lung, loss of weight, in HIV-infected patient or a patient at high risk for HIV infection</td>
<td><em>Mycobacterium tuberculosis</em></td>
<td>Airborne</td>
</tr>
<tr>
<td>Paroxysmal or severe persistent cough during periods of Pertussis activity</td>
<td><em>Bordetella Pertussis</em></td>
<td>Droplet</td>
</tr>
<tr>
<td>Respiratory infections, particularly bronchiolitis and croup, in infants and young children</td>
<td>Respiratory syncytial or Para influenza virus</td>
<td>Contact</td>
</tr>
<tr>
<td>Risk of multidrug-resistant microorganisms History of infection or colonization with multidrug-resistant organisms</td>
<td>Resistant bacteria</td>
<td>Contact</td>
</tr>
<tr>
<td>Skin, wound, or urinary tract infection in a patient with a recent hospital or nursing home stay in a facility where multidrug-resistant organisms are prevalent</td>
<td>Resistant bacteria</td>
<td>Contact</td>
</tr>
<tr>
<td>Skin or Wound Infection Abscess or draining wound that cannot be covered</td>
<td><em>Staphylococcus aureus, Group A streptococcus</em></td>
<td>Contact</td>
</tr>
</tbody>
</table>

References:
CHAPTER 6 PREVENTION OF NOSOCOMIAL INFECTION

6.1 Guidelines for Prevention of
Catheter Associated Urinary Tract Infection (CAUTI)

6.1.1 Personnel
a. Only trained personnel who know the correct technique of aseptic insertion and maintenance of the catheter should handle catheters.

b. Hospital personnel and others who take care of catheters should be given periodic in-service training stressing the correct techniques and potential complications of urinary catheterization.

6.1.2 Catheter Use
a. Urinary catheters should be inserted only when necessary and left in place only for as long as necessary. They should not be used solely for the convenience of patient-care personnel.

b. For selected patients, other methods of urinary drainage such as condom catheter drainage, suprapubic catheterization, and intermittent urethral catheterization can be useful alternatives to indwelling urethral catheterization.

6.1.3 Handwashing
Handwashing should be done immediately before and after any manipulation of the catheter site or apparatus.

6.1.4 Catheter Insertion
a. Catheters should be inserted using aseptic technique and sterile equipment.

b. Sterile gloves, drapes, sponges, an appropriate antiseptic solution for periurethral cleaning, and a single-use packet of lubricant jelly should be used for insertion.

c. As small a catheter as possible, consistent with good drainage, should be used to minimize urethral trauma.

d. Indwelling catheters should be properly secured after insertion to prevent movement and urethral traction.

6.1.5 Closed Sterile Drainage
a. A sterile, continuously closed drainage system should be maintained.

b. The catheter and drainage tube should not be disconnected unless there is a need to irrigate the catheter.

6.1.6 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 intermittent method of irrigation may be used.

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

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

6.1.7 Specimen Collection

a. If small volumes of fresh urine are needed for examination, the distal end of the catheter, or preferably the sampling port if present, should be cleansed with a disinfectant, and urine then aspirated with a sterile needle and syringe.

b. Larger volumes of urine for special analyses should be obtained aseptically from the drainage bag.

6.1.8 Urinary Flow

a. Unobstructed flow should be maintained (6,8). Category I (Occasionally, it is necessary to temporarily obstruct the catheter for specimen collection or other medical purposes.)

b. To achieve free flow of urine:

- the catheter and collecting tube should be kept from kinking;

- the collecting bag should be emptied regularly using a separate collecting container for each patient (the draining spigot and nonsterile collecting container should never come in contact);

- poorly functioning or obstructed catheters should be irrigated or if necessary, replaced;

- collecting bags should always be kept below the level of the bladder.

6.1.9 Meatal Care

Twice daily cleansing with povidone-iodine solution and daily cleansing with soap and water.

6.1.10 Catheter Change Interval

Indwelling catheters should not be changed at arbitrary fixed intervals.

6.1.11 Spatial Separation of Catheterized Patients

To minimize the chances of cross-infection, infected and uninfected patients with indwelling catheters should not share the same room or adjacent beds.

6.1.12 Bacteriologic Monitoring

The value of regular bacteriologic monitoring of catheterized patients as an infection control measure has not been established and is not recommended.
6.2. Guidelines for Preventing Health-Care-Associated Bacterial Pneumonia (PNEU)

6.2.1 Staff Education and Involvement in Infection Prevention:

a) Educate health-care workers about the epidemiology of, and infection-control procedures for, preventing health-care-associated bacterial pneumonia.

6.2.2 Infection and Microbiologic Surveillance:

a) Conduct surveillance for bacterial pneumonia in intensive care unit (ICU) patients who are at high risk for health-care-related bacterial pneumonia such as:

- Factors that enhance colonization of the oropharynx and/or stomach by microorganisms, e.g., administration of antimicrobial agents, or presence of underlying chronic lung disease.

- Conditions favoring aspiration into the respiratory tract or reflux from the gastrointestinal tract (e.g., initial or repeat endotracheal intubation; insertion of nasogastric tube; supine position; coma; surgical procedures involving the head, neck, thorax, or upper abdomen; and immobilization due to trauma or illness).

- Conditions requiring prolonged use of mechanical ventilator support with potential exposure to contaminated respiratory devices and/or contact with contaminated or colonized hand, mainly of health-care personnel.

- Host factors such as extremes of age malnutrition, and severe underlying condition, including immunosuppression.

b) The use of the new National Nosocomial Infection Surveillance (NNIS) system's surveillance definition of pneumonia is recommended.

c) Include data on the causative microorganisms and their antimicrobial susceptibility patterns.

d) Express data as rates (e.g., number of infected patients or infections per 100 ICU days or per 1,000 ventilator days) to facilitate intra hospital comparisons and trend determination. Link monitored rates and prevention efforts and return data to appropriate health-care personnel.

In the absence of specific clinical, epidemiologic, or infection-control objectives, do not routinely perform surveillance cultures of patients or of equipment or devices used for respiratory therapy, pulmonary-function testing, or delivery of inhalation anesthesia.

6.2.3 Prevention of Transmission of Microorganisms:

A. Sterilization or Disinfection and Maintenance of Equipment and Devices.

A.1 General measures

a. Thoroughly clean all equipment and devices to be sterilized or disinfected.

b. Whenever possible, use steam sterilization (by autoclaving) or high-level
disinfection by wet heat pasteurization at >158°F (>70°C) for 30 minutes for reprocessing semi critical equipment or devices (i.e., items that come into direct or indirect contact with mucous membranes of the lower respiratory tract) that are not sensitive to heat and moisture.

- Use low-temperature sterilization methods for equipment or devices that is heat- or moisture-sensitive.

c. After disinfection, proceed with appropriate rinsing, drying, and packaging taking care not to contaminate the disinfected items in the process.

d. Preferentially use sterile water for rinsing reusable semi critical respiratory equipments and devices when rinsing is needed after they have been chemically disinfected. If this is not feasible, rinse the device with filtered water (i.e., water that has been through a 0.2µ filter) or tap water, and then rinse with isopropyl alcohol and dry with forced air or in a drying cabinet.

A.2 Mechanical ventilators

a. Do not routinely sterilize or disinfect the internal machinery of mechanical ventilators.

A.3 Breathing circuits, humidifiers, and heat-and-moisture exchangers (HMEs)

A.3.1 Breathing circuits with humidifiers

a. Do not change routinely, on the basis of duration of use, the breathing circuit (i.e., ventilator tubing and exhalation valve and the attached humidifier) that is in use on an individual patient. Change the circuit when it is visibly soiled or mechanically malfunctioning.

A.3.2 Breathing-circuit--tubing condensate--

a. Periodically drain and discard any condensate that collects in the tubing of a mechanical ventilator, taking precautions not to allow condensate to drain toward the patient.

b. Wear gloves to perform the previous procedure and/or when handling the fluid.

c. Decontaminate hands with soap and water (if hands are visibly soiled) or with an alcohol-based hand rub after performing the procedure or handling the fluid.

A.3.3 Humidifier fluid.

a) Use sterile water to fill bubbling humidifiers.

b) Ventilator breathing circuits with HMEs

1. Changing HME

   a) Change an HME that is in use on a patient when it malfunctions mechanically or becomes visibly soiled.

   b) Do not routinely change more frequently less than every 48 hours an HME that is in use on a patient.

2. Do not change routinely (in the absence of gross contamination or malfunction) the breathing circuit attached to an HME while it is in use on a patient.
A.3.4 **Oxygen humidifiers**

a) Follow manufacturers' instructions for use of oxygen humidifiers.

b) Change the humidifier-tubing (including any nasal prongs or mask) that is in use on one patient when it malfunctions or becomes visibly contaminated.

A.3.5 **Small-volume medication nebulizers: in-line and hand-held nebulizers**

a) Between treatments on the same patient clean, disinfect, rinse with sterile water, and dry small-volume in-line or hand-held medication nebulizers.

b) Use only sterile fluid for nebulization, and dispense the fluid into the nebulizers aseptically.

c) Whenever possible, use aerosolized medications in single-dose vials. If multidose medication vials are used, follow manufacturers' instructions for handling, storing, and dispensing the medications.

A.3.6 **Mist tents**

a) Between uses on different patients, replace mist tents and their nebulizers, reservoirs, and tubings with those that have been subjected to sterilization or high-level disinfection.

b) Subject mist-tent nebulizers, reservoirs, and tubings that are used on the same patient to daily low-level disinfection (e.g., with 2% acetic acid) or pasteurization followed by air-drying.

A.3.7 **Other devices used in association with respiratory therapy**

a) Respirometers and ventilator thermometer: between their uses on different patients, sterilize or subject to high-level disinfection portable respirometers and ventilator thermometers.

b) Resuscitation bags: Between their uses on different patients, sterilize or subject to high-level disinfection reusable hand-powered resuscitation bags.

A.3.8 **Anesthesia machines and breathing systems or patient circuits**

a) Do not routinely sterilize or disinfect the internal machinery of anesthesia equipment.

b) Between uses on different patients, clean reusable components of the breathing system or patient circuit (e.g., tracheal tube or face mask) inspiratory and expiratory breathing tubing, y-piece, reservoir bag, humidifier, and tubing), and then sterilize or subject them to high-level liquid chemical disinfection or pasteurization in accordance with the device manufacturers' instructions for their reprocessing.

c) Follow published guidelines or manufacturers' instructions about in-use maintenance, cleaning, and disinfection or sterilization of other components or attachments of the breathing system or patient circuit of anesthesia equipment.

A.3.9 **Pulmonary-function testing equipment**

a) Do not routinely sterilize or disinfect the internal machinery of pulmonary-function testing machines between uses on different patients.
b) Change the mouthpiece of a peak flow meter or the mouthpiece and filter of a spirometer between uses on different patients.

A.3.10 Room-air "humidifiers" and faucet aerators

a) Do not use large-volume room-air humidifiers that create aerosols (e.g., by venturi principle, ultrasound, or spinning disk, and thus actually are nebulizers) unless they can be sterilized or subjected to high-level disinfection at least daily and filled only with sterile water.

B. Prevention of Person-to-Person Transmission of Bacteria

B.1 Standard Precautions

Refer to Standard Precautions policy

B.1.1 Care of patients with tracheostomy

a) Perform tracheostomy under aseptic conditions.

b) When changing a tracheostomy tube, wear a gown, use aseptic technique, and replace the tube with one that has undergone sterilization or high-level disinfection.

B.1.2 Suctioning of respiratory tract secretions.

a) Wearing sterile gloves when performing endotracheal suctioning.

b) If the open-system suction is employed, use a sterile, single-use catheter.

c) 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.

d) Change the entire length of suction-collection tubing between uses on different patients.

e) Change suction-collection canisters between uses on different patients except when used in short-term-care units.

6.2.4 Modifying Host Risk for Infection

A. Precautions for prevention of aspiration:

As soon as the clinical indications for their use are resolved, remove devices such as endotracheal, tracheostomy, and/or enteral (i.e., oro- or nasogastric or jejunal) tubes from patients.

A.1 Prevention of aspiration associated with endotracheal intubation

a. Use of noninvasive ventilation (NIV) to reduce the need for and duration of endotracheal intubation

i. When feasible and not medically contraindicated, use noninvasive positive-pressure ventilation delivered continuously by face or nose mask, instead of
performing endotracheal intubation in patients who are in respiratory failure and are not needing immediate intubation (e.g., those who are in hypercapneic respiratory failure secondary to acute exacerbation of COPD or cardiogenic pulmonary edema).

ii. When feasible and not medically contraindicated, use NIV as part of the weaning process (from mechanically assisted ventilation) to shorten the period of endotracheal intubation.

b. As much as possible, avoid repeat endotracheal intubation in patients who have received mechanically assisted ventilation.

c. Unless contraindicated by the patient's condition, perform orotracheal rather than nasotracheal intubation on patients.

d. If feasible, use an endotracheal tube with a dorsal lumen above the endotracheal cuff to allow drainage (by continuous or frequent intermittent suctioning) of tracheal secretions that accumulate in the patient's subglottic area.

c. Before deflating the cuff of an endotracheal tube in preparation for tube removal, or before moving the tube, ensure that secretions are cleared from above the tube cuff.

A.2 Prevention of aspiration associated with enteral feeding

a. In the absence of medical contraindication(s), elevate at an angle of 30-45 degrees of the head of the bed of a patient at high risk for aspiration (e.g., a person receiving mechanically assisted ventilation and/or who has an enteral tube in place).

b. Routinely verify appropriate placement of the feeding tube.

c. Routinely assess the patient's intestinal motility (e.g., by auscultating for bowel sounds and measuring residual gastric volume or abdominal girth) and adjust the rate and volume enteral feeding to avoid regurgitation.

A.3 Prevention or modulation of oropharyngeal colonization

a. Oropharyngeal cleaning and decontamination with an antiseptic agent: develop and implement a comprehensive oral-hygiene program (that might include the use of an antiseptic agent) for patients in acute-care settings or residents in long-term-care facilities who are at high risk for health-care-associated pneumonia.

b. Chlorhexidine oral rinse:

i. Use an oral Chlorhexidine gluconate (0.12%) rinse during the perioperative period on adult patients who undergo cardiac surgery.

ii. Use an oral Chlorhexidine rinse for the prevention of health-care-associated pneumonia in all postoperative or critically ill patients and/or other patients at high risk for pneumonia.

A.4 Prevention of gastric colonization

A.4.A Use of Anti-acid (Sucralfate, H2-antagonists, and Protein-Pumping Inhibitor (PPI)) in patients receiving mechanically assisted ventilation to prevent stress ulcer according to unit policy (If stress-bleeding prophylaxis is needed for a patient receiving mechanically assisted ventilation, use an agent that does not raise the patient's gastric pH).
A.4.B Prevention of Postoperative Pneumonia

1. Instruct preoperative patients, especially those at high risk for contracting pneumonia, about taking deep breaths and ambulating as soon as medically indicated in the postoperative period. Patients at high risk include the following:

- Those who will have abdominal aortic aneurysm repair, thoracic surgery, or emergency surgery.
- Those who will receive general anesthesia.
- Those who are aged ≥60 years.
- Those with totally dependent functional status.
- Those who have had a weight loss >10%.
- Those using steroids for chronic conditions.
- Those with recent history of alcohol use, history of COPD, or smoking during the preceding year.
- Those with impaired sensorium, a history of cerebrovascular accident with residual neurologic deficit, or low (<8mg/dL) or high (>22 mg/dL) blood urea nitrogen level.
- Those who will have received >4 units of blood before surgery.

2. Control pain that interferes with coughing and deep breathing during the immediate postoperative period by:

- Using systemic analgesia, including patient-controlled analgesia, with as little cough-suppressant effect as possible,
- Providing appropriate support for abdominal wounds, such as tightly placing a pillow across the abdomen.
- Administering regional analgesia (e.g., epidural analgesia).

3. Encourage all postoperative patients to take deep breaths, move about the bed, and ambulate unless medically contraindicated.

4. Use incentive spirometry on postoperative patients at high risk for pneumonia.

5. No recommendation can be made about the routine use of chest physiotherapy on all postoperative patients at high risk for pneumonia.

6.3 Guidelines for Preventive Device Related Blood Stream Infection

6.3.1 Healthcare Workers (HCW) Education and Training

Educate Healthcare workers regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections.

6.3.2 Surveillance

a. Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations.
b. Record the operator, date and time of catheter insertion and removal, and dressing changes on a standardized form.

6.3.3 Hand Hygiene

Observe proper hand hygiene procedures either by washing hands with conventional antiseptic containing soap and water or with waterless alcohol-based gels or foams. Observe hand hygiene before and after palpating catheter insertion sites, as well as before and after inserting, replacing, accessing, repairing or dressing an intravascular catheter. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.

6.3.4 Aseptic technique during catheter insertion and care

i. Wearing clean gloves rather than sterile gloves is acceptable for the insertion of peripheral intravascular catheters if the access site is not touched after the application of skin antiseptics.

ii. Sterile gloves should be worn for the insertion of arterial and central catheters.

iii. Wear clean or sterile gloves when changing the dressing on intravascular catheters.

6.3.5 Catheter insertion

Do not routinely use arterial or venous cutdown procedures as a method to insert catheters.

6.3.6 Catheter site care

A. Cutaneous antisepsis

1. Disinfect clean skin with an appropriate antiseptic before catheter insertion and during dressing changes. Although a 2% chlorhexidine-based preparation is preferred, tincture of iodine, an iodophor, or 70% alcohol can be used.
2. Can be made for the use of chlorhexidine in infants aged <2 months.

6.3.7 Catheter-site dressing regimens

a. Use either sterile gauze or sterile, transparent, semipermeable dressing to cover the catheter site.

b. Tunneled CVC sites that are well healed might not require dressings.

c. If the patient is diaphoretic, or if the site is bleeding or oozing, a gauze dressing is preferable to a transparent, semi-permeable dressing

d. Replace catheter-site dressing if the dressing becomes damp, loosened, or visibly soiled.

e. Change dressings at least weekly for adult and adolescent patients depending on the circumstances of the individual patient.

f. Do not use topical antibiotic ointment or creams on insertion sites (except when using dialysis catheters) because of their potential to promote fungal infections and antimicrobial resistance.

g. Do not submerge the catheter under water. Showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter (e.g., if the
catheter and connecting device are protected with an impermeable cover during the shower).

6.3.8 Selection and replacement of intravascular catheters

a. Select the catheter, insertion technique, and insertion site with the lowest risk for complications (infectious and noninfectious) for the anticipated type and duration of IV therapy.

b. Promptly remove any intravascular catheter that is no longer essential.

c. Do not routinely replace central venous or arterial catheters solely for the purposes of reducing the incidence of infection.

d. Replace peripheral venous catheters at least every 72--96 hours in adults to prevent phlebitis (128). Cave peripheral venous catheters in place in children until IV therapy is completed, unless complications (e.g., phlebitis and infiltration) occur.

e. Use clinical judgment to determine when to replace a catheter that could be a source of infection (e.g., do not routinely replace catheters in patients whose only indication of infection is fever). Do not routinely replace venous catheters in patients who are bacteremic or fungemic if the source of infection is unlikely to be the catheter.

f. Replace any short-term CVC if purulence is observed at the insertion site, which indicates infection.

g. Replace all CVCs if the patient is hemodynamically unstable and CRBSI is suspected.

h. Do not use guidewire techniques to replace catheters in patients suspected of having catheter-related infection.

6.3.9 Replacement of administration sets*, needleless systems, and parenteral fluids

A. Administration sets

1. Replace administration sets, including secondary sets and add-on devices, no more frequently than at 72-hour intervals, unless catheter-related infection is suspected or documented.

2. Replace tubing used to administer blood, blood products, or lipid emulsions (those combined with amino acids and glucose in a 3-in-1 admixture or infused separately) within 24 hours of initiating the infusion. If the solution contains only dextrose and amino acids, the administration set does not need to be replaced more frequently than every 72 hours. 3. Replace tubing used to administer propofol infusions every 6 or 12 hours, depending on its use, per the manufacturer's recommendation.

B. Needleless intravascular devices

1. Change the needleless components at least as frequently as the administration set.

2. Change caps no more frequently than every 72 hours or according to manufacturers' recommendations.

3. Ensure that all components of the system are compatible to minimize leaks and breaks in the system.
4. Minimize contamination risk by wiping the access port with an appropriate antiseptic and accessing the port only with sterile devices.

C. Parenteral fluids

1. Complete the infusion of lipid-containing solutions (e.g., 3-in-1 solutions) within 24 hours of hanging the solution.

2. Complete the infusion of lipid emulsions alone within 12 hours of hanging the emulsion. If volume considerations require more time, the infusion should be completed within 24 hours.

3. Complete infusions of blood or other blood products within 4 hours of hanging the blood.

4. No recommendation can be made for the hang time of other parenteral fluids.

6.3.10 IV-injection ports

1. Clean injection ports with 70% alcohol or an iodophor before accessing the system.

2. Cap all stopcocks when not in use.

6.3.11 Preparation and quality control of IV admixtures

A. Admix all routine parenteral fluids in the pharmacy in a laminar-flow hood using aseptic technique

B. Do not use any container of parenteral fluid that has visible turbidity, leaks, cracks, or particulate matter or if the manufacturer's expiration date has passed.

C. Use single-dose vials for parenteral additives or medications when possible.

D. Do not combine the leftover content of single-use vials for later use.

E. If multidose vials are used:-

1. Refrigerate multidose vials after they are opened if recommended by the manufacturer.

2. Cleanse the access diaphragm of multidose vials with 70% alcohol before inserting a device into the vial

3. Use a sterile device to access a multidose vial and avoid touch contamination of the device before penetrating the access diaphragm.

4. Discard multidose vial if sterility is compromised.

6.3.12 In-line filters

Do not use filters routinely for infection-control purposes.

6.3.13 IV-therapy personnel

Designate trained personnel for the insertion and maintenance of intravascular catheters.
6.3.14 **Prophylactic antimicrobials**

Do not administer intranasal or systemic antimicrobial prophylaxis routinely before insertion or during use of an intravascular catheter to prevent catheter colonization or BSI.

### A. Peripheral Venous Catheters, Including Midline Catheters, in Adult and Pediatric Patients

#### A.1 Selection of peripheral catheter

- Select catheters on the basis of the intended purpose and duration of use, known complications (e.g., phlebitis and infiltration), and experience of individual catheter operators.

- Avoid the use of steel needles that might cause tissue necrosis if extravasation occurs.

- Use a midline catheter or PICC when the duration of IV therapy will likely exceed 6 days.

#### A.2 Selection of peripheral-catheter insertion site

**A.** In adults, use an upper- instead of a lower-extremity site for catheter insertion. Replace a catheter inserted in a lower-extremity site to an upper-extremity site as soon as possible.

**B.** In pediatric patients, the hand, the dorsum of the foot, or the scalp can be used as the catheter insertion site.

**C.** Replacement of catheter

i. Evaluate the catheter insertion site daily, by palpation through the dressing to discern tenderness and by inspection if a transparent dressing is in use. Gauze and opaque dressings should not be removed if the patient has no clinical signs of infection. If the patient has local tenderness or other signs of possible CRBSI, an opaque dressing should be removed and the site inspected visually.

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

iii. In adults, replace short, peripheral venous catheters at least 72--96 hours to reduce the risk for phlebitis. If sites for venous access are limited and no evidence of phlebitis or infection is present, peripheral venous catheters can be left in place for longer periods, although the patient and the insertion sites should be closely monitored.

iv. Do not routinely replace midline catheters to reduce the risk for infection.

v. In pediatric patients, leave peripheral venous catheters in place until IV therapy is completed, unless a complication (e.g., phlebitis and infiltration) occurs.
A.3 **Catheter and catheter-site care**

Do not routinely apply prophylactic topical antimicrobial or antiseptic ointment or cream to the insertion site of peripheral venous catheters.

B. **Central Venous Catheters, Including PICCs, Hemodialysis, and Pulmonary Artery Catheters, in Adult and Pediatric Patients**

B.1 **Surveillance**

Conduct surveillance in ICUs and other patient populations to determine CRBSI rates, monitor trends in those rates, and assist in identifying lapses in infection-control practices.

B.2 **General principles**

A. Use a CVC with the minimum number of ports or lumens essential for the management of the patient.

B. Use an antimicrobial or antiseptic-impregnated CVC in adults whose catheter is expected to remain in place >5 days if, after implementing a comprehensive strategy to reduce rates of CRBSI, the CRBSI rate remains above the goal set by the individual institution based on benchmark rates (Table 2) and local factors. The comprehensive strategy should include the following three components: educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a 2% chlorhexidine preparation for skin antisepsis during CVC insertion.

C. No recommendation can be made for the use of impregnated catheters in children.

D. Designate personnel who have been trained and exhibit competency in the insertion of catheters to supervise trainees who perform catheter insertion.

E. Use totally implantable access devices for patients who require long-term, intermittent vascular access. For patients requiring frequent or continuous access, a PICC or tunneled CVC is preferable.

F. Use a cuffed CVC for dialysis if the period of temporary access is anticipated to be prolonged (e.g., >3 weeks).

G. Use a fistula or graft instead of a CVC for permanent access for dialysis.

H. Do not use hemodialysis catheters for blood drawing or applications other than hemodialysis except during dialysis or under emergency circumstances.

I. Use povidone-iodine antiseptic ointment at the hemodialysis catheter exit site after Catheter insertion and at the end of each dialysis session only if this ointment does not interact with the material of the hemodialysis catheter per manufacturer's recommendation.
B.3 **Selection of catheter insertion site**

A. Weigh the risk and benefits of placing a device at a recommended site to reduce infectious complications against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement.

B. Use a subclavian site (rather than a jugular or a femoral site) in adult patients to minimize infection risk for nontunneled CVC placement.

B. No recommendation can be made for a preferred site of insertion to minimize infection risk for a nontunneled CVC.

D. Place catheters used for hemodialysis and pheresis in a jugular or femoral vein rather than a subclavian vein to avoid venous stenosis if catheter access is needed.

B.4 **Maximal sterile barrier precautions during catheter insertion**

A. Use aseptic technique including the use of a cap, mask, sterile gown, sterile gloves, and a large sterile sheet, for the insertion of CVCs (including PICCS) or guidewire exchange.

B. Use a sterile sleeve to protect pulmonary artery catheters during insertion.

B.5 **Replacement of catheter**

A. Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections.

B. Do not remove CVCs or PICCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected.

C. Guidewire exchange
   1. Do not use guidewire exchanges routinely for nontunneled catheters to prevent infection.
   2. Use a guidewire exchange to replace a malfunctioning nontunneled catheter if no evidence of infection is present.
   3. Use a new set of sterile gloves before handling the new catheter when guidewire exchanges are performed.

B.6 **Catheter and catheter-site care**

A. General measures: Designate one port exclusively for hyperalimentation if a multilumen catheter is used to administer parenteral nutrition.

B. Antibiotic lock solutions
   Do not routinely use antibiotic lock solutions to prevent CRBSI. Use prophylactic antibiotic lock solution only in special circumstances (e.g., in treating a patient with a long-term cuffed or tunneled catheter or port who has a history of multiple CRBSIs despite optimal maximal adherence to aseptic technique).

C. Catheter-site dressing regimens
1. Replace the catheter-site dressing when it becomes damp, loosened, or soiled or when inspection of the site is necessary.

2. Replace dressings used on short-term CVC sites every 2 days for gauze dressings and at least every 7 days for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter outweighs the benefit of changing the dressing.

3. Replace dressings used on tunneled or implanted CVC sites no more than once per week, until the insertion site has healed.

C. Additional Recommendations for Peripheral Arterial Catheters and Pressure Monitoring Devices for Adult and Pediatric Patients

C.1. Selection of pressure monitoring system

Use disposable, rather than reusable, transducer assemblies when possible.

C.2 Replacement of catheter and pressure monitoring system

i. Do not routinely replace peripheral arterial catheters to prevent catheter-related infections.

ii. Replace disposable or reusable transducers at 96-hour intervals. Replace other components of the system (including the tubing, continuous-flush device, and flush solution) at the time the transducer is replaced.

C.3. Care of pressure monitoring systems

C.3.i. General measures

1. Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile.
2. Minimize the number of manipulations of and entries into the pressure monitoring system. Use a closed-flush system (i.e., continuous flush), rather than an open system (i.e., one that requires a syringe and stopcock), to maintain the patency of the pressure monitoring catheters.
3. When the pressure monitoring system is accessed through a diaphragm rather than a stopcock, wipe the diaphragm with an appropriate antiseptic before accessing the system.
4. Do not administer dextrose-containing solutions or parenteral nutrition fluids through the pressure monitoring circuit.

C.3.ii. Sterilization or disinfection of pressure monitoring systems

1. Use disposable transducers.
2. Sterilize reusable transducers according to the manufacturers' instructions if the use of disposable transducers is not feasible.
D. Recommendations for Umbilical Catheters

D.1 Replacement of catheters

1. Remove and do not replace umbilical artery catheters if any signs of CRBSI, vascular insufficiency, or thrombosis are present.

2. Remove and do not replace umbilical venous catheters if any signs of CRBSI or thrombosis are present.

3. No recommendation can be made for treating through an umbilical venous catheter suspected of being infected.

4. Replace umbilical venous catheters only if the catheter malfunctions.

D.2 Catheter-site care

D.2.A Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Avoid tincture of iodine because of the potential effect on the neonatal thyroid. Other iodine-containing products (e.g., povidone-iodine) can be used.

D.2.B Do not use topical antibiotic ointment or creams on umbilical catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance.

i. Add low doses of heparin (0.25–1.0 F/ml) to the fluid infused through umbilical arterial catheters.

ii. Remove umbilical catheters as soon as possible when no longer needed or when any sign of vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place >5 days.

iii. Umbilical venous catheters should be removed as soon as possible when no longer needed but can be used up to 14 days if managed aseptically.

6.4 PREVENTION OF SURGICAL SITE INFECTION (SSI)

6.4.1 Guidelines / Recommendations for Prevention of Surgical Site Infection (SSI)

1. Preoperative

   a. Preparation of the patient

      1. Whenever possible, identify and treat all infections remote to the surgical site before elective operation.

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

      3. If hair removal is necessary it should be done immediately before the operation, preferably with electric clippers.
4. Adequately control serum glucose levels in all diabetic patients and particularly avoid hyperglycemia perioperatively.

5. Encourage tobacco cessation. At minimum, instruct patients to abstain for at least 30 days before elective operation.

6. Require the patient to shower

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

8. Use an appropriate antiseptic agent for skin preparation.

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

10. Keep preoperative hospital stay as short as possible while allowing for adequate preoperative preparation of the patient.

6.4.2 Hand/forearm antisepsis for surgical team members

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

2. Clean underneath each fingernail prior to performing the first surgical scrub of the day.

3. Do not wear hand or arm jewelry.

4. Perform a preoperative surgical scrub for at least 2 to 5 minutes using an appropriate antiseptic. Scrub the hands and forearms up to the elbows.

5. After performing the surgical scrub, keep hands up and away from the body (elbows in flexed position) so that water runs from the tips of the fingers toward the elbows. Dry hands with a sterile towel and don a sterile gown and gloves.

6.4.3 Management of infected or colonized surgical personnel

1. Educate and encourage surgical personnel who have signs and symptoms of a transmissible infectious illness to report conditions promptly to the supervisor, infection control staff and employee health clinic for further management.

2. Obtain appropriate cultures from, and exclude from duty, surgical personnel who have draining skin lesions until infection has been ruled out or personnel have received adequate therapy and infection has resolved.

3. Do not routinely exclude surgical personnel who are colonized with organisms such as S. aureus (nose, hands, or other body site) or group A Streptococcus, unless such personnel have been linked epidemiologically to dissemination of the organism in the healthcare setting.

6.4.5 Antimicrobial prophylaxis

1. Use proper prophylactic antibiotics only when indicated according to the hospital policy.
2. **Intraoperative**

2.a **Ventilation**

1. Maintain positive-pressure ventilation in the operating room with respect to the corridors and adjacent areas.
2. Maintain a minimum of 15 air changes per hour, of which at least 3 should be fresh air.
3. Filter all air, recirculated and fresh, through the appropriate filters.
4. Introduce all air at the ceiling, and exhaust near the floor.
5. Do not use UV radiation in the operating room to prevent SSI.
6. Keep operating room doors closed except as needed for passage of equipment, personnel, and the patient.
7. Consider performing orthopedic implant operations in operating rooms supplied with ultraclean air.
8. Limit the number of personnel entering the operating room to necessary personnel.

2.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 an operation, use an Environmental Protection Agency (EPA) approved hospital disinfectant to clean the affected areas before the next operation.
2. Do not perform special cleaning or closing of operating rooms after contaminated or dirty operations.
3. Do not use tacky mats at the entrance to the operating room suite or individual operating rooms for infection control.
4. Wet vacuum the operating room floor after the last operation of the day or night with an EPA-approved hospital disinfectant.

2.c. **Microbiologic sampling**

1. Do not perform routine environmental sampling of the operating room. Perform microbiologic sampling of operating room environmental surfaces or air only as part of an epidemiologic investigation (e.g. construction and in outbreak).

2.d. **Sterilization of surgical instruments**

1. Decontaminate instruments before sending to Central Supply Sterilization Department (CSSD).
2. Sterilize all surgical instruments according to infection control published guidelines and manufacture recommendation.

3. Do not use flash sterilization for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time. Flash sterilization can be used for items that will be used immediately (e.g., to reprocess an inadvertently dropped instrument).

2.e. Surgical attire and drapes

1. Wear a surgical mask that fully covers the mouth and nose when entering the operating room if an operation is about to begin or already under way, or if sterile instruments are exposed. Wear the mask throughout the operation.

2. Wear a cap or hood to fully cover hair on the head and face when entering the operating room.

3. Do not wear shoe covers for the prevention of SSI.

4. Wear sterile gloves if a scrubbed surgical team member. Put on gloves after donning a sterile gown.

5. Use surgical gowns and drapes that are effective barriers when wet (i.e., materials that resist liquid penetration).

6. Change scrub suits that are visibly soiled, contaminated, and/or penetrated by blood or other potentially infectious materials.

7. OR Staff are not allowed to wear scrub suits outside OR. In urgent situations, they wear a laboratory coat over the scrub suit.

2.f. Asepsis and surgical technique

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

2. Assemble sterile equipments and solutions immediately prior to use.

3. Handle tissue gently, maintain effective homeostasis, minimize devitalized tissue and foreign bodies (i.e., sutures, charred tissues, necrotic debris), and eradicate dead space at the surgical site.

4. Use delayed primary skin closure or leave an incision open to heal by second intention if the surgeon considers the surgical site to be heavily contaminated.

5. If drainage is necessary, use a closed suction drain. Place a drain through a separate incision distant from the operative incision. Remove the drain as soon as possible.
3. **Postoperative incision care**

1. Protect with a sterile dressing for 24 to 48 hours postoperatively an incision that has been closed primarily

2. Wash hands before and after dressing changes and any contact with the surgical site.

3. When an incision dressing must be changed, use sterile technique.

4. Educate the patient and family regarding proper incision care, symptoms of SSI, and the need to report such symptoms.

3.a **Surveillance**

1. The nurse-in-charge should report any signs and symptoms of SSI to infection control team.

2. Use CDC definitions of SSI without modification for identifying SSI among surgical inpatients and outpatients.

3. Documentation of surgical wound classification, ASA classification and duration of operation should be available.

6.5 **Management for Needlestick Injury**

6.5.1 **Treatment of Exposure Site**

a. Encourage bleeding of the site

b. Wash site with plenty of water

c. Disinfect exposure site

d. Put dressing on exposure site

6.5.2 **Make an Exposure Report**

a. Fill up the needle stick/splash injury notification form completely.

b. Inform infection control nurse and unit supervisor.

c. The unit supervisor must review the incidence form and ensure that all data are complete and correct.

6.4.2 **Evaluation of Exposure Source**

a. Send blood sample for hepatitis B markers, anti-HCV, and anti-HIV screening.

b. If the source is negative for hepatitis B, hepatitis C, and HIV, no further management will be done.

6.4.3 **Evaluate the HCW**

a. Send blood sample for hepatitis B markers, anti-HCV, LFT (for hepatitis C) and anti-HIV screening.
b. Check if HCW received the 3 doses of hepatitis B vaccine. If the HCW has not been vaccinated or has not completed the 3 doses, advise him to complete the vaccine series (0,1,6).

* If the source is HBsAg positive
i. If HCW is unvaccinated, HBIG is given. Hepatitis B vaccination series is also started at the same time.
ii. If HCW is vaccinated, determine if he is a good responder or non-responder.
   a. If HCW is a good responder (anti-HBs level is >10IU/ml), no treatment is necessary.
   b. If HCW is a non-responder (anti-HBs level is <10IU/ml), HBIG is given as soon as possible preferably within 24 hours (but not later than 7 days) after exposure and hepatitis B vaccine series started at the same time. If HCW refused to be revaccinated, a second dose of HBIG can be given one month later.
iii. If HCW’s antibody response status is unknown, screen HCW for anti- HBs and manage as non-responder until the release of laboratory screening result.
iv. If the source HBsAg status is unknown, manage the HCW as if the source is positive.

ii. If the source is positive for Hepatitis C
i. HCW early diagnosis of HCV infection is important. Send blood sample for HCV PCR after 2-8 weeks.
ii. Follow-up testing (eg. 4-6 months) for anti-HCV and ALT activity.
iii. If HCV infection is identified, a short course of interferon is started and refer to Infectious Diseases (ID) unit.

iii. If the source is positive for HIV
i. Post-exposure prophylaxis of Zidovudine (ZDV) and Lamivudine (3TC) for 4 weeks should be initiated as soon as possible within 24-36 hours. A third drug can be added in high risk transmission and refer to ID unit.
   ii. Follow-up anti-HIV testing should be performed for at least 6 months.

* If the source’s HIV status is unknown, evaluation of each case is considered according to the likelihood of HIV infection in the source and how dangerous is the exposure of the HCW.
CHAPTER 7 STERILIZATION AND DISINFECTION

7.2 STERILIZATION

Sterilization aims at destruction or removal of all types of micro-organism including bacterial spores from an object.

7.1.1 Methods of Sterilization

The methods commonly used in the hospital are:

1. Physical
   1.1) Heat
       a. Moist heat – as in high vacuum high Temperature Autoclave. The temperatures of sterilization are 121°C for 15 minutes of 135°C for 3 & 1/2 minutes.
       b. Dry heat – as in hot air oven. The sterilizing temperature is 160°C for 1 hour. (not use in CSSD).
   1.2) Filtration – for heat sensitive solutions. E.g., intravenous fluid, serum, and vaccines.
   1.3) Ionizing radiation – e.g., by using radiation for heat sensitive objects such as syringes.

2. Chemical
   a) Ethylene oxide for heat sensitive items. The items are heated to the desired temperature (37°C or 55°C). The exposure time is dependant on temperature, pressure, humidity, and gas concentration.
   b) Hydrogen Peroxide (H₂O₂) also known as sterrad or plasma sterilizer which is also used for heat sensitive items.
   c) Low temperature steam and formaldehyde for sensitive items. (not use in KKUH).

*Exposure time i.e., the period of exposure to selected sterilizing temperature. These times will vary with different types of load. Surgical instruments, linen and heat sensitive items should be sterilized by the methods recommended by the manufacturer. No disposable items should be used more than once. Disposable items designed for multiuse may be reprocessed only in accordance with the manufacturer’s instructions.

7.1.2 Sterilization Procedures:

It is essential for sterilizing agents (heat, steam or gas) to be in contract with every surface of each item or devices to be sterilized for the specific period of time at the specific temperature for the effectiveness of sterilization. This requires good cleaning, proper arrangements of the items and selection of suitable sterilization cycle.

7.1.3 Maintenance of Sterilizers:

All sterilizers e.g., autoclave must be regularly services and maintained by the Bio-Medical Engineering department at least every 3 months. Sterilizing cycles must be monitored and controlled by frequent checks in order to ensure sterility of each load. Appropriate tests must be applied to check temperature, humidity, pressure and gas content and steam penetrate to ensure proper sterilization.
7.1.4 Testing of Sterilizing Equipments:

1. Physical Test

Bowie Dick Test is done after the Dummy run (this is an empty run to get rid of the overnight residual air) and before the first load, to check for the complete air evacuation.

2. Chemical Tests

These are internal and external indicators. Chemical indicators should be sensitive to the three parameters associated with steam sterilization time, temperature and presence of steam (moist).

Chemical indicator should be used with every package. A chemical indicator on the outside of a package assures the operator that the item has been through the sterilization process. A chemical indicator inside the package assures the user that the sterilization agent penetrated the package.

3. Biological Tests

A biological spore test containing Bacillus Stearothermophilus should be tested in each steam sterilizer once a week. *Rapid Read Out* Biological test is used. After incubation for only 3 hours any microbial growth will change the media color.

If a sterilizer fails any of the required tests it should be taken out of service until it has been examined, repaired and pronounced efficient. The unsterile load should be rewashed and resterilized.

7.1.5 Marking of Sterile Packages

Packages should have the following external indications, showing that they have processed:

a. Autoclave tapes that show a package has been through a sterilization cycle should be visible on the outside of each package sterilized. The autoclave tape is designed to turn black when a certain temperature inside the autoclave is reached, This is usually at 121°C - 135°C depending upon the length of the selected time cycle.

b. Each package must be labeled as to its content and expiry date.

c. Every item is to be tagged with a label giving the processing date, autoclave number, code number of technician and load number. This will assist locating processed items in case of recall.

7.1.6 Detailed sterilization procedures should be clearly documented in Central Sterile Supply Department (CSSD)

7.16.a Sterile Packs

Sterile items can be different type of packing material. The packing materials can be:

1. Container system
2. Peel pack e.g., paper pouch
3. Paper wrapper
7.1.6.b Storage of Sterile Packages

a. Sterile Store should be spacious, well ventilated, well lighted, smooth shelves for easy cleaning and it should be cleaned daily by vacuum cleaner or wet cleaning.
b. Sterilized packages should be allowed to cool before storage to avoid condensation inside the packs.
c. Sterile packages must be handled as little as possible to reduce the risk of contamination.
d. Separate trolley to be used for the sterile items.
e. Sterile packages should be stored at least 12 inches off the floor and 18 inches from the ceiling.
f. Sterile packages must be stored and issued in correct date order.
g. Sterile items are good for 30 days, 6 months, or 1 year depending solely on how the packages are wrapped.
h. The store must be subjected to adequate pest control to prevent contamination from rodents, ants and cockroaches.
i. Traffic is restricted to CSSD personnel and trainees only.

7.2 Disinfection

Disinfection – is a process which removes or, reduces the number of vegetative micro-organism to safe or relatively safe level. It will not destroy bacterial spores.

7.2.1 Methods of Disinfection

Disinfection is achieved by the following methods:

A. Cleaning – thorough cleaning with a detergent and clean hot water is an excellent mode of disinfection. It removes almost all pathogens including bacterial spores. Hand washing, showering or bathing with detergent is a physical cleaning process applied to living tissues. Generally, cleaning is designed to remove rather than to kill microorganisms.

The value of efficient cleaning is usually underestimated. If all hospital kitchens and lavatories were kept immaculately clean without the use of chemical disinfectants hospitals would be hygienic and safe environment for patients.

B. Heat – Heat is a simple and reliable disinfectant for almost anything except living tissues and some heat-sensitive objects. Hot water used in the process of physical cleaning greatly enhances the quality of disinfection. Washing machines which maintain cotton fabrics at 90°C for several minutes and dishwashing machines in which very hot water is used for much of the cycle are excellent disinfectors. Ironing raises the heat of linen that it may be sterilized rather than merely disinfected in the process. Mechanical cleaning with water provides an excellent quality of disinfection for a wide variety of purposes.

C. Chemical Agents – chemical disinfectants are not ordinarily necessary in the cleaning of walls, floors and ceiling. Similarly, they need not be used for soaking mops and scrubbing brushes, or for into lavatories or drains. They are recommended for achieving very high levels of disinfection in baths, kitchen work surfaces, rooms of patients on isolation precautions and high-risk areas such as operating theaters, renal dialysis units and intensive care units. They are used to disinfect the skin of a patient
prior to surgery and to disinfect the hands of medical personnel working in high-risk areas.

7.2.2 Chemical Disinfectants:

1) *Glutaraldehyde* – It has a broad spectrum action with recognizable sporocidal activity. It is usually used as a high level disinfectant for equipments such as endoscopes that cannot be sterilized or disinfected by heat. It is an irritant to the eye, skin and respiratory mucosa and must be used with adequate protection when used in a 2% solution can disinfect articles in 10-20 minutes. But if it is used for 10 hours it will sterilize them. The microbial activity effectively killed vegetative bacteria in <2 minutes; M. tuberculosis, fungi, and viruses in <10 minutes; and spores of *Bacillus* and *Clostridium* species in 3 hours.

**Uses of Glutaraldehyde:**

2. It is used most commonly as a high-level disinfectant for medical equipment such as endoscopes, spirometry tubing, dialyzers, transducers, anesthesia and respiratory therapy equipment.

2) *Alcohol* – Ethyl alcohol 70% and 60-70% isopropyl alcohol are effective and rapidly acting disinfectants. It has been widely recommended as rapidly drying disinfectant for skin and surfaces. It can be used in a form of solutions. However, recently gel preparations have been recommended. These gel preparations are quick in action, have long standing effect, and are more users friendly.

Alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they also are tuberculocidal, fungicidal and virucidal but do not destroy bacterial spores. Their cidal activity drops sharply when diluted below 50% concentration, and the optimum bactericidal concentration is 60% - 90% solutions in water (volume/volume).

3) *Chlorhexidine* – This useful skin antiseptic is highly active against vegetative. Gram-positive organisms.

4) *Hypochlorites* – These broad-spectrum, chlorine releasing disinfectant are rapidly effective against viruses, fungi, mycobacteria, bacteria and spores. They are the disinfectants of choice against viruses including Hepatitis B.

It is the most widely used of the chlorine disinfectants, are available as liquid (e.g., sodium hypochlorite) or solid (e.g., calcium hypochlorite). The most prevalent chlorine products are aqueous solutions of 5.25%-6.15% sodium hypochlorite usually called household bleach. They have a broad spectrum of antimicrobial activity, do not leave toxic residues. Higher concentrations of (1,000 ppm) of chlorine are required to kill M. tuberculosis. For large spill (1:10) – for small spill (1:100) dilution of 5.25%-6.15% sodium hypochlorite (i.e., household bleach) has been recommended for decontaminating blood spills.

5) *Iodine and Iodophors* – They are used as skin antiseptics 1% solution of iodine in 70% alcohol is an effective pre-operative skin antiseptic. Iodophors are complexes of iodine and solubilizers which possess the same actively as iodine but are non-irritant and do not stain the skin. It is weak sporocidal.

Iodine solutions or tinctures long have been used by professionals primarily as antiseptics on skin or tissues.
6) **Hydrogen Peroxide** – It is active against a wide range of microorganisms, including bacteria, yeast, fungi, viruses, and spores. A 0.5% accelerated hydrogen peroxide demonstrated bactericidal and virucidal activity in 1 minute and mycobactericidal and fungicidal activity in 5 minutes. A commercially available in 3% hydrogen peroxide is a stable and effective disinfectant when used on inanimate surfaces.

7) **Formaldehyde** – It is used as a disinfectant and sterilant in both its liquid and gaseous states. It should be handled in the workplace as a potential carcinogen and set an employee exposure standard for formaldehyde that limits an 8-hour time-weighted average exposure concentration of 0.75 ppm.

8) **Ortho-phthalaldehyde (OPA)** - has several potential advantages over glutaraldehyde. It has excellent stability over a wide pH range (pH 3-9), is not a known irritant to the eyes and nasal passages does not require exposure monitoring.

9) **Peracetic Acid** – Peracetic acid will inactivate gram-positive bacteria, fungi, yeasts in <5 minutes at <1000 ppm. An automated machine using peracetic acid to chemically sterilize medical, surgical, and dental instruments.

10. **Phenolics** – they showed bactericidal, fungicidal, virucidal and tuberculocidal. It is used as disinfectants for use on environmental surfaces (e.g., bedside tables, bedrails, and laboratory surfaces) and noncritical medical devices.

11. Quaternary Ammonium Compounds – is a hospital disinfectants generally fungicidal, bactericidal, and virucidal against lipophilic (enveloped) viruses; they are not sporicidal and generally not tuberculoidal or virucidal against hydrophilic (nonenveloped) viruses. The quaternaries commonly are used in ordinary environmental sanitation of noncritical surfaces, such as floors, furniture and walls.

**References:**

CHAPTER 8        HOUSEKEEPING SERVICES

Good sanitation is considered a way of life in most countries today, and when sick people are gathered in a hospital, it becomes even more apparent that certain sanitary routines should be observed.

General Rules

a. The effectiveness of the hospital program for cleaning and hygiene practice will be monitored by the Infection Control Team.

b. Each member of staff is responsible for the hygienic condition of his/her equipment and working area.

c. All nursing staff should be familiar with the recommended methods of cleaning.

d. The general rules of housekeeping service will apply in addition to specific regulations as required by the Infection Control Team.

e. Hospital housekeeping is responsibility of the Director of Housekeeping Department

8.1        Housekeeping Personnel

Hospital Employees

The director of Housekeeping Department should have a comprehensive knowledge of cleaning procedures and schedules of all hospital areas. Under the guidance of the director, hospital supervisors should meet the specifications of their functions.

B. Contract Employees

The responsibility of the housekeeping manager is to ensure employment of competent staff. Orientation of any staff, new to the hospital environment, should be completed before they start work.

8.1.1 Conditions of Service

A. Training Program

All staff are required to have pre-employment and in-service training as seems necessary. Any transfer must first receive training in the duties of that area. Help from the Infection Control Team could be sought in this regard.

Personal Health

Under Personnel Health Services all staff are required to have a pre-employment medical certificate of fitness. Subsequent routine medical checkups are carried out at stated intervals depending upon the health history and the location of work. Any infectious illness should be promptly reported to a member of the Infection Control Team. Some apparently minor ailments, such as sore throat, diarrhea and infected skin lesions, carry a special infection risk. The employee must remain off duty until the physician permits his return.
Personal Hygiene and Uniform

Uniforms are provided and should be worn when on duty. A sufficient number of clean uniforms must be available to be worn for each duty shift and for a change if it becomes soiled. Individuals are to keep themselves clean and neat. Uniforms designated to special areas should only be worn in these areas.

8.1.2 Environmental Cleaning

A. Dust Control

B. Routine Cleaning

C. Frequency of Cleaning

D. Care of Cleaning Equipment

Once used, all cleaning equipment must be regarded as infected. They must, therefore, be cleaned, disinfected and dried before being put away ready for use. In high-risk areas, each unit must have its own cleaning equipment. If the cost is not prohibitive, disposable mops should be used. Where the supply of disposable ones are limited, high-risk areas should have priority.

8.2 Environmental Cleaning

Environmental Cleaning – refers to the general cleaning of environmental surfaces and the maintenance of cleanliness in a health care facility.

It is the physical removal of organic materials such as soil and dirt followed by complete drying, thus removing large amount of microorganisms.

8.2.1 General Principles

The following general principles must be followed to maintain adequate infection control in the hospital.

a. Hands must be thoroughly washed and dried before duty, and after contact with toilets and hand basins.

b. All equipment, mops, buckets and so forth, must be clean and dry before commencing duty.

c. Mop heads must be changed at the start of each shift, and must be laundered, after each shift is completed. It should not be left standing in a bucket.

d. Cloths for wet – dusting must be changed at the start of each shift, and must be laundered, after each shift is completed. It should not be left standing in a bucket.

e. Hot water and suitable detergent should be used for all floors cleaning. Water and detergent will be properly discarded and renewed after cleaning an area not exceeding that occupied by six hospital beds, or 40 square meters.
f. Scouring powder and bleach should be used for cleaning all sinks, and wash basins.
g. Less dirty areas should always be cleaned before the dirty ones.
h. Surfaces should be washed from top to bottom (e.g., ceiling lamps, shelves, tables and lastly floors).
i. Buckets containing water must be left unattended. They may only be left empty and dry.

8.2.2 Cleaning Procedures

A. Dry Cleaning Method – relies on mechanical action with electrostatic cloth to loosen and to remove large objects and particulate soil but does not remove stains.

a. Sweeping – should be avoided in patient treatment and food preparation areas; it leads to the dissemination of bacteria carrying particles and increases the airborne bacterial count nearly tenfold.

B. Wet Cleaning Method – accomplished manually by a damp cloth, damping mop, or deck scrubber using water with or without detergent or disinfectant.

2.1.1 Cleaning of floors can be accomplished by using one of the following methods:

a. Mop floors with electrostatic cloth which is discarded after cleaning an area not exceeding 40 square meters or an area occupied by six beds.

b. Clean floors using a vacuum cleaner fitted with an efficient filter. Vacuum cleaners should have an inner paper bag which is discarded daily; their filters should be inspected and changed periodically and whenever they are visibly dirty.

No alternative to electrostatic cleaning or vacuuming will be permitted.

2.1.2 Wet – mop floor area with hot water and detergent. The water temperature must exceed 50°C and the area cleaned should not exceed 40 square meters or the area occupied by six beds before the water is changed.

8.2.3 Cleaning Frequencies

3.1 Daily Routine Duties

a. Clean floors.
b. Empty waste containers and line with new plastic bags.
c. Clean hand basins, taps and mirrors.
d. Replenish all tissues, toilet tissues and soaps.
e. Damp – dust all furniture and fittings.
f. Damp – dust bedside and locker areas.
g. Damp – dust headboards, side rails and undersurfaces including wheel assemblies on patients’ beds.
h. Spot – clean walls and doors, wash and dry door handles (especially toilet door handles), and clean all tiled walls.
3.2 **Weekly Routine Duties**

Some cleaning is not required on a daily basis, but should be performed on a weekly basis.

a. Clean lifts inside and out.
b. Highly clean corridors and office areas including picture frames, door frames, high ledges and curtain rails.
c. Scrub and dry all ceramic tiled areas.
d. Scrub and repolish stairways.
e. Vacuum carpets in office area.
f. Clean all upholstered and vinyl furniture.
g. De-scale toilets and urinals as necessary.
h. Check all curtains (patient area curtains) and change if soiled.

3.3 **Monthly Routine Duties**

a. Change cubicle and shower curtains.
b. Clean walls in patients’ rooms.
c. Clean windows inside and out.

3.4 **Changes to Routine Duties**

The cleaning schedule may be changed from time to time, on the recommendations of Housekeeping Department or Infection Control Team. Certain areas may require more frequent or high level cleaning than that specified above. It is the contractor’s responsibility to increase cleaning frequency where necessary, or when the hospital administration determines that changes to the schedule are required.

8.2.4 **Frequency of Cleaning**

Cleaning frequencies must be observed according to the risk levels of the different clinical areas.

4.1 **Low risk areas** – waiting rooms, administrative areas, corridors, public places.

These areas are not contaminated with blood or bloody fluids or with associated infectious microorganisms. Clean these areas with a cloth or mop dampened with detergent and water.

a. Maximum continuous cleaning period of high - traffic areas is up to 16 hours daily.
b. Maximum continuous cleaning period of low - traffic areas is up to eight hours daily.
c. Toilets, ablations, and shower baths should be inspected and cleaned at regular intervals during the 24 hour period; the frequency to be decided by need.
4.2 Intermediate Risk Areas - Patient wards (General Patient – Care Areas)

These are areas used for the care of patients who are not obviously infectious and not highly susceptible. These areas are usually cleaned by procedures that control dust, such as damp mopping with detergent cleaners. Spills of blood and body fluids are cleaned up with a disinfectant solution.

a. General daily cleaning of wards and clinics is between 6:00 a.m. and 6:00 p.m.; the floors being cleaned at least once daily.
b. Spot – cleaning of toilets and ablutions at regular intervals during the day and between 6:00 a.m. and 11:00 p.m.
c. Cleaning of patient care areas after visiting hours or after removal of organic material (e.g., isolation wards, ICUs, OR and Dialysis Units).

4.3 High-Risk Areas – Isolation wards, Intensive therapy Units, Operating Room and Dialysis Unit

These are special care areas that must be cleaned with care using a cleaning solution and separate cleaning equipment.

a. High–quality cleaning is required in certain areas where the risk of infection to patients is high.
b. Maximum continuous cleaning period is 24 hours for Operating Theaters, Delivery Rooms and Accident and Emergency Departments, and 18 hours for SICU, NICU, PICU, MICU, and Burn Unit.

4.4 Extra-Duties for High Risk Areas

a. Damp-dust all fixtures, fittings and surfaces, using neutral detergent and hot water. Wipe over with suitable disinfectant solution daily.
b. Damp – mop floors using disinfectant solution.

8.2.5 Cleaning Procedures for Isolation Rooms / Cubicles (Communicable Diseases)

The contractor is responsible for providing a complete room disinfection service as required throughout all areas. The service will include cleaning and disinfection of the rooms during the stay of infectious patients and on discharge of these patients.

Housekeeping personnel must adhere to the following procedures in cleaning rooms or cubicles of patients on isolation precautions (i.e. Airborne, Droplet, and Contact Precautions) in order to reduce the risk of cross–infection:

5.1 Daily Routine Cleaning

a. Use clean equipment and freshly prepared detergent – disinfectant solutions at all times.
c. Use new cloths and clean mop heads when cleaning each room.
d. Wear protective clothing (i.e., gown, mask, and gloves) which should be discarded before leaving the room.
e. Wash hands before entering and leaving the room.
f. Enter rooms of infected patients after cleaning rooms of patients on protective isolation (i.e., rooms of severely compromised patients).

g. Frequently clean areas such as taps, door handles, touch plates, and other items the patient often handles.

h. Provide the isolation rooms with their own disposable cloths, cleaning equipment and mops which should be kept clean and dry at all times.

i. Discard cleaning solutions and disposable cloths after use. Take mop heads in a plastic bag to be laundered. Disinfect buckets before being refilled.

j. Double – bag solid wastes in color – coded plastic bags and treat as infectious waste.

5.2 Terminal Cleaning

Terminal cleaning means cleaning after the patient has been taken off from isolation precautions or has ceased to be a source of infection. When isolation precautions have been discontinued, the remaining infection control responsibilities relate to the inanimate environment. Therefore, terminal cleaning should primarily be directed toward those items that have been in direct contact with the patient or in contact with the patient’s infective material (excretions, secretions, blood or body fluids). Terminal cleaning of rooms or cubicles consists of the following:

a. Wear protective clothing as mentioned above before entering the room.

b. Send all visibly soiled curtains and covers to the laundry. Return all nondisposable receptacles in a properly labeled and double bagged (drainage bottles, urinals, bedpans, flow meter jars, etc.) for decontamination and reprocessing.

c. Thoroughly clean all horizontal surfaces of furniture, and mattress covers with an disinfectant – detergent solution.

d. Wet – vacuum or wet – mop all floors with a disinfectant – detergent solution.

e. Clean walls and blinds only if they are visibly soiled. Change curtains if visibly soiled.

f. “Airing – out” periods and disinfectant fogging are no longer considered necessary. The room is ready for use immediately after an extensive and meticulous cleaning.

g. Thoroughly wash and dry all equipments after use. Dispose of all cloths and gloves and take mop heads in a plastic bag to be laundered.

8.2.6. Cleaning Procedures for Protective Isolation Rooms

Severely compromised patients are isolated, not because they are suffering from infectious diseases, but because they are highly susceptible to infection and they require special protection from the hospital environment.

Routine daily cleaning procedures as are used in other rooms must be used in the protective isolation room with emphasis on the following:

a. Use clean equipment and freshly prepared cleaning solutions at all times.

b. Use detergent-disinfectant solution for damp-dusting and damp-mopping.

c. Use new cloths and clean mop heads when cleaning each room.
d. Properly and carefully wash hands before entering the room.
e. Properly wear gown, mask and gloves, as indicated.
f. Clean these rooms first before cleaning other areas in the ward.
g. Provide these rooms with their own disposable cloths, cleaning equipment and mops which should be retained in the rooms and kept clean and dry at all times.
h. Discard cleaning solutions and disposable cloths after cleaning and take mop heads to be laundered after use.

Terminal cleaning in 'Protective Isolation' is to be consistent with routine terminal cleaning in regular non-isolation rooms as long as the patient in protective isolation is not infected.

*Updated 10 Feb 2007/Reviewed for correction 25 November 2009*
CHAPTER 9  HEALTH CARE WASTE MANAGEMENT

Introduction

The primary purpose of management of health care waste in the health care institution is to assist facility administrator in evaluating their operation in order to improve the health care waste management practices. It also aims to promote the use of appropriate technologies and to communicate with health care personnel as well as to the public the risk associated with health care waste.

The waste management committee in King Saud university hospitals recognizes the high priority status of the safe and effective management of healthcare waste and as such the aims of management of healthcare waste are outlined here:

1. Improve regulatory compliance.
2. Protection of human health by reducing the exposure of employees, patients, watchers and entire community to hazardous health care waste in the work environment.
3. Enhance community relations by demonstrating a commitment to environmental protection.
4. Minimize the production and environmental impact of waste by reviewing materials used and practices employed.
5. Safeguard against the uncontrolled release or spillage of waste material.
6. Ensure that of clinical/healthcare and household/domestic waste are properly and efficiently segregated, presented in appropriate packaging, handled, stored, transported and disposed.
7. Ensure procedures for waste management are established, adopted, understood and implemented.
8. Provide information, instruction, training and supervision as necessary to ensure the implementation of waste management systems.

9.9 Impacts of Health Care Waste

A framework for health care waste management should always consider health and occupational safety. There are many potential hazards associated when dealing or handling health care waste such as physical, chemical and biological hazards as well as ergonomic factors. Health care facilities should identify all these specific environmental and occupational hazards during handling, sorting, treating and disposing of health care waste.

Exposure of hazardous health care waste can result to disease or injury. The hazardous nature of health care waste may be due to one or more of the following characteristics:

- Contains infectious agents.
- Genotoxic.
- Contain toxic or hazardous chemicals or pharmaceuticals.
- Radioactive
- Contains sharp.

9.1.1 Personal at Risk

All individual exposed to hazardous health care waste are potentially at risk, including those within health care establishments that generate hazardous waste.
The main groups of people who are at risk of exposure to health hazards associated with health care waste are the following:

- Staff of the health care establishments such as physicians, nurses, health care assistant, hospital maintenance personnel.
- Patients in health care establishments.
- Visitors, comforters, and care givers to health care establishments.
- Personnel and workers providing support services and allied to health care establishments, such as laundries, waste handling and transportation.
- Persons transporting hazardous health care waste.
- General public

9.1.2 Health Care Waste:

9.1.2.a Definition

Healthcare waste, all waste produced as a consequence of health care activities in hospitals and community settings, requires classification by the person generating the waste at the point of production – hazardous or nonhazardous.

9.1.2.b Two categories of Health-Care Waste:

1. Non-Risk Health-Care Waste :

Non-risk health-care waste ((HCW)) includes all the waste that has not been infected like general office waste, packaging or left over food. They are similar to normal household or municipal waste and can be managed by the municipal waste services.

They represent between 75% and 90% of the total amount of HCW generated by medical institutions. Five groups can be established:

1.1 Offensive/hygiene waste (e.g. Incontinence and other human hygiene, sanitary waste, nappies, stoma bags). Waste which may cause offence to those coming into contact with it.
1.2 Domestic waste (uncontaminated paper towels, flowers, materials which are unsuitable for recycling).
1.3 Packaging waste.
1.4 Recyclable materials (cardboard, non-confidential paper, drinks cans, bottles, plastic, toner/ink cartridges, cooking oil).
1.5 Food waste.

2. Risk Health-Care Waste : which includes the following:

2.1 Infectious Waste –

This type of waste is suspected to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. This includes:

- Cultures and stocks of infectious agents from laboratory work. (Sputum cultures of TB laboratories, contaminated blood clots and glassware material generated in the medical analysis laboratories, high concentrated microbiological cultures carried out in medical analysis laboratories).
• Waste from surgery and autopsies on patients with infectious diseases (e.g. tissues, materials or equipment that have been in contact with blood or other body fluids).

• Waste from infected patients in isolation wards (e.g. excreta, dressings from infected or surgical wounds, clothes heavily soiled with human blood or other body fluids); Faeces from patients infected with typhoid fever, enteritis, cholera.

• Waste that has been in contact with infected patients undergoing hemodialysis (e.g. dialysis’ equipment such as tubing and filters, disposable towels, gowns, aprons, gloves, and laboratory coats);

• Infected animals from laboratories.

• Any other instruments or materials that have been in contact with infected persons or animals.

**Note:**

- Urine and faeces are not considered infectious waste unless:-
  - The specimen of urine or faeces is for laboratory testing.
  - The urine or faeces is contaminated with visible blood.
  - The urine or faeces are infected with pathogenic micro-organisms.

• Incontinence pads and nappies are not considered infectious waste unless they are contaminated with visible blood

2.2 Pathological Waste

Pathological waste consists of tissues, organs, body parts, human fetus and animal carcasses, blood and body fluids. Within this category, recognizable human or animal body parts are also called anatomical waste. This category should be considered as a subcategory of infectious waste, even though it may also include healthy body parts.

2.3 Sharps –

Include needles, syringes, scalpels, saws, blades, broken glass, Infusion sets, knives, nails and any other items that can cause a cut or puncture wounds. Whether or not they are infected, such items are usually considered as highly hazardous health care waste.

2.4 Pharmaceutical Waste –

The term "pharmaceuticals" embraces a multitude of active ingredients and types of preparations. The spectrum ranges from teas through heavy metal containing disinfectants to highly specific medicines. Waste management therefore requires the use of a differentiated approach.

2.5 Genotoxic Waste –

Cytotoxic pharmaceutical wastes are wastes that can arise by use (administration to patients), manufacture and preparation of pharmaceuticals with a cytotoxic (antineoplastic) effect.

Genotoxic waste may include certain cytostatic drugs, vomit, and urine, of feces from patients treated with cytostatic drugs, chemicals, and radioactive materials.
This type of waste is highly hazardous and may have mutagenic, teratogenic, or carcinogenic properties.

f) Chemical Waste –

Chemical waste consists of discarded solid, liquid, and gaseous chemicals, for example from diagnostic and experimental work and from cleaning, housekeeping, and disinfecting procedures. Chemical waste from health care may be hazardous or non-hazardous.

Chemical waste is considered hazardous if it has at least one of the following properties:

- Toxic, Flammable.
- Reactive (explosive, water-reactive, shock-sensitive).
- Genotoxic (e.g. cytostatic drugs).
- Corrosive (e.g. acids of pH <2 and bases of pH >12).

Non-hazardous chemical waste consists of chemicals with none of the above properties, such as sugars, amino acids, and certain organic and inorganic salts.

g) Radioactive Waste –

Includes disused sealed radiation sources, liquid and gaseous materials contaminated with radioactivity, excreta of patients who underwent radionuclide diagnostic and therapeutic applications, paper cups, straws, needles and syringes, test tubes, and tap water washings of such paraphernalia.

It is produced as a result of procedures such as in vitro analysis of body tissues and fluids, in vivo organ imaging, tumor localization and treatment, and various clinical studies involving the use of radioisotopes.

Radioactive health care wastes generally contain radionuclides with short half-lives, which lose their activity in a shorter time. However, certain radionuclides e.g. C-14 contaminated wastes have much longer half-life, more than a thousand years, which need to be specially managed in a centralized treatment facility for radioactive wastes. The same is required for the management of disused sealed radiation sources used for cancer treatment.

9.1.3 Waste Handling, Collection, Storage, and treatment:

9.1.3.a Waste Segregation and Storage:

The effective management of health care waste considers the basic elements of waste minimization, segregation and proper identification of the waste. Appropriate handling, treatment and disposal of waste by type reduce costs and do much to protect public health.

Segregation should take place as close as possible to where the waste is generated and should be maintained in storage areas and during transport.

Segregation is the process of separating different types of waste at the point of generation and keeping them isolated from each other. Moreover the amount of hazardous waste that needs to be treated will be minimized or reduced subsequently prolonging the operational life of the disposal facility and may gain benefit in terms of conservation of resources.

Hazardous waste should be placed in clearly marked containers that are appropriately labeled for the type and weight of the waste. Except for sharps and fluids, hazardous wastes are generally put in plastic bags; plastic lined cardboard boxes, or leaked proofed containers that meet specific performance standards.

To improve segregation efficiency and minimize incorrect use of containers, proper placement and labeling of containers must be carefully determined.

General waste containers placed beside infectious waste containers could result in better segregation. Minimizing or eliminating the number of hazardous waste containers in patient
care areas (except for sharp containers, which should be readily accessible) may further reduce waste. Facility management should develop a segregation plan that includes staff training.

9.2 Color Coding Scheme for Health Care Waste

The most appropriate way of identifying the categories of health care waste is by sorting the waste into color-coded plastic bags or containers.

Recommended color-coding scheme for health care waste in shown in table I.

**Table 1. Color-coding Scheme for Containers and Bags.**

<table>
<thead>
<tr>
<th>Color</th>
<th>Type of Waste</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Non-Risk health care dry and Wet waste</td>
<td>Domestic (municipal) waste for landfill at a suitably licensed and permitted site. Recyclable</td>
</tr>
<tr>
<td>Orange</td>
<td>Infectious, Anatomical and Pathological waste</td>
<td>Waste which requires treatment to ‘render safe’ in a suitably licensed and permitted facility (usually alternative treatment plants). May also be disposed of by incineration.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Sharps Waste</td>
<td>Waste which requires disposal by incineration in a suitably licensed and permitted facility</td>
</tr>
</tbody>
</table>

Apart from the color-coding system for health care waste, the following practice should also be observed:

a) Residuals of the general health care waste should join the stream of domestic refuse or municipal solid waste for proper waste management.

b) Sharps should all be collected together, regardless of whether or not they are contaminated. Containers should be puncture proof (usually made of metal or high-density plastic) and fitted with covers. It should be rigid and impermeable to contain not only the sharps but also any residual liquids from syringes.

c) Bags and containers for infectious waste should be marked with the international infectious substance symbol.

d) Highly infectious and other hazardous waste should, whenever possible, be treated immediately by any method recommended in this chapter. It therefore needs to be package in bags that are compatible with the proposed treatment process.

e) Cytotoxic waste, most of which is produce in major hospital or research facilities, should be collected in strong, leak proof containers clearly labeled “Cytotoxic wastes”.

f) Radioactive wastes should be segregated according to its physical form: solid and liquid and according to its half-life or potency: short-live and lived in especially marked containers.

g) Large quantities of chemical waste should be packed in chemical resistant containers and sent to specialized treatment facilities (if available). The identity of the chemicals should be clearly marked on the containers. Hazardous chemical waste of different types should never be mixed.

h) Waste with a high content of heavy metals (e.g. cadmium or mercury) should be collected separately. These wastes can be sent to waste treatment facility available in the area.
i) Aerosol containers may be collected with general health care waste once they are completely empty. Aerosol containers should not be burnt or incinerated.

j) Appropriate containers or bag holder should be placed in all locations where particular categories of waste may be generated.

k) Staff should never attempt to correct errors of segregation by removing items from a bag or container after disposal or by placing one bag inside another bag of a different color. If general and hazardous waste are accidentally mixed, the mixture should be classified as hazardous health care waste.

9.3 Storage

All health care waste should be collected and stored in waste storage area until transported to a designated off-site treatment facility. This area shall be marked with warning sign:

"CAUTION: BIOHAZARDOUS WASTE STORAGE AREA - UNAUTHORIZED PERSONS KEEP OUT".

Storage areas for health care waste should be located with the establishment or research facility. However, these areas should be located away from patient rooms, laboratories, hospital function/operation rooms or any public access areas. The waste in bags or containers should be stored in a separate area, room or building of a size appropriate to the quantities of waste produced and the frequency of collection. In cases where the health care facility lacks the space, daily collection and disposal should be enforced.

9.3.1 Requirements for Storage Facilities

1. The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy clean and disinfect.

2. There should be water supply for cleaning purposes.

3. The storage area should allow easy access for staff in charge of handling the waste.

4. It should be possible to lock the storage area to prevent access by unauthorized persons.

5. Easy access for waste collection vehicle is essential.

6. There should be protection from sun, rain, strong winds, floods, etc.

7. The storage area should be inaccessible to animals, insects and birds.

8. There should be good lighting and adequate ventilation.

9. The storage area should not be situated in the proximity of fresh food stores or food preparation areas.

10. A supply of cleaning equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage area.

11. Floors, walls, and ceilings of the storage area must be kept clean in accordance to established procedures, which at a minimum should include daily cleaning of floors.

12. Biodegradable general and hazardous waste should not be stored longer than 2 days to minimize microbial growth, putrefaction, and odors. If the waste must be stored longer than 2 days, application of treatment like chemical disinfection or refrigeration at 40C or lower is recommended.
9.4 Collection and Transport of Health Care Waste

The proper collection and transportation is an important component in health care waste management. Its implementation requires the direct involvement of the health care facility’s maintenance services, housekeeping services, motor pool service personnel and cooperation of all the health care personnel.

Health care waste collection practices should be designed to achieve an efficient movement of waste from points of generation to storage or treatment while minimizing the risk to personnel.

Suggested collection frequency on room to room basis is once every shift or as often as necessary. Time of collection regardless of category should be at the start of every shift.

9.4.1 On-site Collection

Waste should not be allowed to accumulate at the point of production. A program for their collection and transportation should be established as part of the health care waste management plan. Nursing and other clinical staff should ensure that waste bags are tightly closed or sealed when they are about three-quarters full. Bags should not be closed by stapling.

The following are recommendations that should be followed by health care personnel directly involved in waste handling and collection:

- Waste should be collected daily (or as frequently as required) and transported to the designated central storage site or waste transfer station.
- No bags should be removed unless they are labeled with their point of production (hospital ward or department) and contents.
- The bags or containers should be replaced immediately with new ones of the same type.
- A supply of fresh collection bags or containers should be readily available at all locations where waste is produced.

9.4.2 On-site Transport

Transportation of waste within the establishment could utilize wheeled trolleys, containers, or carts that are dedicated solely for the purpose. On-site transportation vehicle should meet the following specifications.

- Easy to load and unload.
- No sharp edges that could damage waste bags or containers during loading and unloading.
- Easy to clean.

The on-site collection vehicles should be cleaned and disinfected daily with an appropriate disinfectant like chlorine compounds, formaldehyde, phenolic compounds and acids. All waste bag seals should be in-place and intact at the end of transportation.

Workers transporting the waste should be equipped with appropriate personal protective equipment including heavy-duty gloves, coveralls, and thick-soled boots and leg protectors.

9.4.3 Off-site Transportation of Health Care Waste

The health care waste generator is responsible for the safe packaging and adequate labeling of waste to be transported off – site for treatment and disposal. Packaging and labeling should comply
with the national regulation governing the transport of hazardous wastes and maintaining that it presents no danger to the public during transport. Likewise, the waste generators are ultimately responsible for ensuring that their wastes are properly treated and disposed of in an approved disposal facility.

Tracking of wastes could be done with the implementation of the consignment system. By the time that waste transporter receives the waste; the transporter shall provide the waste generator with a copy of the consignment note for the generator’s waste records. The transporter and the generator shall separately maintain a copy of the consignment note.

**The consignment note shall include, but not limited to the following information:**

- The name, address, telephone number, and accreditation number of the transporter, unless the transporter is the generator.
- The type and quantity of waste transported.
- The name, address, telephone number of the generator.
- The name, address, telephone number, permits number, and the signature of an authorized representative of the approved facility receiving the waste.
- The date that the waste is collected or removed from the generator’s facility, the date that the waste is received by the transfer station, or point of consolidation, if applicable, and the date that the waste is received by the treatment facility.

The transporter or generator transporting the waste should have the consignment note in his or her possession in the vehicle while transporting the waste. The tracking document should be available upon demand by any traffic enforcement agency personnel. The transporter shall provide the facility receiving waste with a copy of the original tracking document.

**9.5 Role of Waste Management in Infection Control**

- Continuing training programme is conducted to improve their knowledge on:

  1. Importance of cleaning and safe hospital environment in the control hospital infection.
  2. The housekeeping policy, cleaning technique of K.K.U.H. is given to each domestic staff as a hand out in their own language which they can refer to whenever they have any queries about procedures.
  3. The infection control nurse meets the cleaning supervisors on a monthly basis to remind and review with them about important issues of hospital cleaning procedures (e.g., disinfection of spillages, disposal of infectious waste, reporting needle stick injuries).

- Continuous and close monitoring of domestic staff is done at all times by the infection control team.
Continuous monitoring of storage areas of non-clinical waste and clinical waste is carried out by the infection control team.

9.6 Recommendations for Improvement of Waste Management in King Saud University Hospitals

1. The ongoing procedures for dealing with waste from university hospital should continue until the following recommendations are met.

2. A fenced site should be built for domestic waste and it should be away from patient’s area.

3. Besides the proposed domestic waste site, a room should also be constructed for the storage of infectious waste, confirming with W.H.O. recommendations with the room temperature of 4°C for the inhibition of microbial growth.

4. The infectious waste should be autoclaved before it is sent to Riyadh landfill area. For this purpose, suitable autoclaves need to be immediately installed for both KKUH and KAUH to deal with infectious waste before disposal to Riyadh landfill area. The Engineering Department should be consulted about the types of autoclaves and their site of installation.

5. Incinerators should be installed in both KKUH and KAUH which should accommodate the weight of 675 kg + 150 kg infectious waste generated from KKUH & KAUH per day respectively with the proper comparative temperature range of 1000 ºC to deal with the Cytotoxic waste.

6. A good quality, water repellant waste bags should be purchased confirming with W.H.O. standards.

7. These bags when doubled should be tied separately.

8. All wastes should be collected in double bags and which should not be allowed to overfill more than 3/4.

9. The housekeeping staff dealing with the waste disposal should wear protective barriers (e.g., rubber gloves up to the forearm, water repellant, full sleeved gowns, rubber boots and masks) at all times.

10. While contracting these domestic staff, one should select those who have basic education, which would help them to have better understanding of recommendations.
11. The domestics staff should have a continuous training programme about hospital housekeeping services (safe disposal of waste, dangers of infectious waste if not handled properly, disinfection and cleaning blood and body fluid spillage) which should be arranged by hospital housekeeping department in coordination with hospital infection control team.

12. Continuous close monitoring of domestic staff by the hospital housekeeping department should be done at all times.

13. A clear policy should be put to deal with accidents and spillage, and this should confirm with international recommendations.

14. The garbage trolleys should have significant indications (e.g., color codes) to specify the category of waste they carry.

15. The infectious waste and domestic waste should have different rooms for storage. If not possible, a hard barrier made of non penetrating material should be placed in between infectious and non-infectious waste.

16. The importance of having an operational plan prepared and submitted to the waste management committee. This plan should be confirm with international standards. Having an approved plan will be critical if the health care facility expects to have their treated waste disposed of as solid waste.

Clinical laboratory operational plans developed to address the on site treatment of regulated medical waste by autoclaves must be submitted for review and approval to the clinical laboratory evaluation programme and must also confirm with international standards.

17. The type of bags used to collect and store the autoclaving regulated infectious medical waste prior to treatment. They should be specially designed bags which can be used in autoclaving regulated medical waste. These bags not only remain intact, but also enhance the sterilization process by allowing easier passage of steam into the waste.

9.7 Waste Disposable

9.7.1 Use of color coded bags for the segregation of waste

1.1 Health Care Non Risk Waste
They are disposed in black plastic bags. They are not always doubled but double bags are used when bags are not sturdy.

1.2 Health Care Risk Waste

They are disposed in orange plastic bags and they are always doubled.

Sharp waste is collected in specified puncture resistant sharp containers; different sizes of containers are used, depending on the sharp items used.

Chemical waste is collected in specified containers from where it is generated and is later handed over to the University Committee, which deals with a company specific for disposal of chemical waste.

Radioactive waste is also disposed off through a University Committee which deals with the radioactive safety measures.

Human remains and parts are handled in orange bags from generation sites to the mortuary, from where they are collected by Riyadh governing body (Amant Al Riyadh) within two weeks time after receiving them in mortuary.

Animal remains from Animal House are autoclaved before disposal with infectious waste.

Tuberculosis cultures and TB contaminated materials are autoclaved before disposal with infectious waste.

9.7.2 Collection of waste from the clinical areas

- The domestic staff posted in each clinical unit collects the waste from patient’s bedside areas in appropriate color-coded bags.
- Once ¾ full, they are tied securely.
- They are left in the dirty utility room of all the wards. Due to deficiency of rooms, both infective and non infective waste is gathered in the same room.
- If they are from other areas like X-Ray, Emergency Wards, they are collected and taken to the waste storage room, which is located in each level of the hospital.

9.7.3 Transportation of Waste from the Collection Areas

- There is two domestic staff (garbage clearing personnel) who is appointed to collect the waste from dirty utility room of the wards and waste storage rooms in each level.
- Of the two staff, one will collect the non-risk waste and the other will collect the risk waste from all levels.
- Individual trolleys with lids are given to both of the garbage clearing staff but these trolleys are not color-coded.
- They are instructed to use the last elevator on the right side of each floor, at the end of the corridor and nearer to the storage area.
- They wear rubber gloves (domestic gloves) mask and apron while collecting the waste.
- The collection of waste take place three times a day, from 06:00 hrs to 13:00 hrs, 14:00 hrs to 15:00 hrs, 17:00 hrs to 19:00 hrs every day.
- During the night times, if there is too much collection of the waste, arrangements are made with security to open the hospital door for domestic staff to clear the garbage.
• The domestic staff is instructed not to collect the waste in ‘O’ level during 11:00 AM to 1:00 PM as this is the lunch time for hospital staff.

9.7.4 Storage of Waste:

• The risk waste, collected in orange bags is stored in a separate room, which is located in hospital campus near to kitchen.

• The non clinical waste collected in the black bags is stored in the open area of the hospital campus, (not in trucks) which gives an unhealthy appearance to the hospital which is located nearer to kitchen.

9.7.5 Clearance of Waste from Hospital Premises

• There are two trucks available to take garbage to Riyadh landfill area.

• One truck takes only the non clinical waste and the other truck takes the clinical waste (infectious waste).

• Once in the morning and once in the evening, the waste (risk and non risk) are cleared from the storage area by different vehicle.

9.7.6 After Care of Garbage Trolley and Storage Area

• The garbage trolleys should be washed in the morning and the evening with water and hospital approved disinfectant (Diesin R680).

• The storage areas should be washed and cleaned with water and disinfectant. They are left to air dry.

9.8 HANDLING, STORAGE, COLLECTION AND TRANSPORTATION, TREATMENT AND DISPOSAL OF SHARPS

9.8.1 Packing and Storage
Sharps should be stored in a puncture-proof (made of metal or high-density plastic) containers and fitted with covers. Containers should be rigid and impermeable to retain or contain residual liquid from syringes. This should also be temper-proof (difficult to open or break)
In the absence of metals or plastic containers, the use of containers made of dense cardboard with plastic lining is recommended.
Needles should not be removed from the syringe because of the risk of injury however, if removal is required, special care must be taken. No healthcare waste other than sharps should be deposited in sharp containers, as these (containers) are more expensive.
Close sharps containers securely when they are three quarters full. When sharps containers become too full, people may push the sharps into the containers, causing injury.
The sealed sharp containers must be properly labeled in accordance with the Revised DOH Healthcare Waste Management Manual. Supply of sharp containers should be readily available at the source of (sharps) waste generation.

9.8.2 Collection and Transportation
Sealed sharp containers should be collected regularly or as frequently as required and transported to the designated on site or off-site disposal area. The waste generator is responsible for safe packaging and adequate labeling of waste to be transported off-site. Packaging and labeling must conform to the manual to prevent spilling during handling and transport.

9.8.3 Treatment and Disposal
Satisfactory treatment process prior to disposal of sharp wastes in healthcare establishments is necessary to maximize the promotion of health, safety and protection of environment. The following are the recommended methods of disposal of used sharps.

a. Chemical disinfection

Chemical disinfection is used to destroy or kill microorganisms on healthcare wastes like sharps. The types of chemical used for disinfection of healthcare waste are mostly aldehydes, chlorine compounds, and phenolic compounds. Used syringes and needles shall be put into containers with 1:10 solution of 5 – 10% sodium hypochlorite or other approved disinfectants for at least 30 minutes.

b. Wet and thermal Treatment (Autoclaving)

Wet thermal – or steam – disinfection is based on exposure of shredded infectious waste to high temperature, high pressure steam, and is similar to the autoclave sterilization process. Sharps must be milled or crushed to increase disinfection efficiency.

c. Land Disposal

Sanitary Landfill is an engineered method of disposing solid waste on land in a manner that protects the environment, e.g. by spreading the waste into layers, compacting it to the smallest particle volume, and covering it with soil by the end of each working day, constructing barriers to infiltration, evacuating the gases produced. Encapsulation is the process of pre-treating sharps and other health care wastes. This process involves filling container with sharps, adding an immobilizing materials and sealing the containers. Examples of the immobilizing materials are plastic foam, bituminous sand, cement, and mortar or clay material. Encapsulation process used either cutic boxes of high density polyethylene (HDPE) or metallic drums. Once sharp waste was encapsulated this can be disposed of in a sanitary landfill. The cell site for this waste should be separated from general wastes. Safe burial on Hospital / Health Center Premises, when there is no available disposal facility within the area, safe burial on health establishment premises is considered as the only viable option. However, certain basic rules should be established such as:

9.8.4 DISPOSAL OF LIQUID MEDICAL WASTE

- When carrying or disposing of liquid medical waste, be careful to avoid splashing the waste on yourself, others nearby, or surfaces.

- Carefully pour liquid waste down a sink, drain, flushable toilet, or latrine. If this is not possible, bury it in a pit. Note: Before pouring the waste down a sink, drain, or toilet, consider where it empties. It is hazardous for liquid for liquid medical waste to run through open gutters or to come out of pipes that empty into the grounds of the facility.

- Rinse the sink, drain, or toilet thoroughly with water to remove residual waste, again avoiding splashing. Clean with a disinfectant cleaning solution at the end of each day, or more frequently, if heavily used or soiled.
• Decontaminate the container that held the liquid waste by filling it with a 0.5% chlorine solution and soaking it for 10 minutes before washing.

• Always wear heavy utility gloves and shoes when handling or transporting liquid medical waste. Wash both the gloves and your hands afterward.

9.8.5 DISPOSAL OF HAZARDOUS CHEMICAL WASTE
• Cleaning the solutions and disinfectants, such as glutaraldehyde, should be handled as described above for liquid medical waste. Rinse containers thoroughly with water; wash glass containers with detergent and water, rinse thoroughly, and reuse. Do not reuse plastic containers.

• Always wear heavy utility gloves and shoes when handling or transporting hazardous chemical waste. Wash both the gloves and your hands afterward.

• Disposing of cytotoxic chemicals and radioactive waste requires special consideration beyond the scope of this training course. If your facility’s waste includes these types of materials, consult experts for guidance on appropriate handling and disposing.

References:


CHAPTER 10  VIRAL HEPATITIS

The term “viral hepatitis” is commonly used for several clinically similar diseases that are etiologically and epidemiologically distinct.

2. Enterically transmitted hepatitis: Hepatitis A and E.

10.5 HEPATITIS A

Hepatitis A virus (HAV) is transmitted from person to person mainly by the fecal-oral route. Infections with HAV are either asymptomatic or mild in young children. In contrast, approximately 70% of adults and older children manifest jaundice and other symptoms. Fulminant infection with HAV is rare and chronic infection does not occur. No HAV carrier state exists.

Patients with symptomatic infection probably are most likely to spread infection during the preceding two weeks and one week following the onset of jaundice. However, HAV can be detected in stool for longer period especially in neonates and young children.

10.1.1 Control Measures:

In addition to standard precautions, contact precautions are recommended for diapered and incontinent patient for 1 week after the onset of symptoms.

10.1.2 Patient Placement

Patients who are not toilet trained or who have diarrhea, fecal incontinence, or poor personal hygiene require private rooms and others do not require a private room.

10.1.3 Post exposure use of Immunoglobulin (IG)

Perinatal transmission is rare. If the mother is jaundiced 2 weeks before and 1 week after delivery, the infant may be given IG (0.02 ml/kg) intramuscularly, although its efficacy in this setting has not been established. Proper hygiene should be emphasized to the mother.

In health care setting, immunoglobulin can be given, preferably within 2 weeks after exposure.

10.1.4 Vaccination

Vaccine is available for long term prevention of hepatitis A infection in person two (2) years of age and older. It is given in two (2) doses within 6-12 months interval.

10.2 HEPATITIS B

Hepatitis B virus (HBV) is transmitted from person to person by the percutaneous introduction of blood, administration of certain blood products, or direct contact with blood or secretions contaminated with blood containing HBV. Infection also can result from inoculation of mucous membranes, such as during birth or sexual contact. Percutaneous contact with contaminated,
inanimate objects may transmit infection due to survival of HBV in the dried state for one week and longer. Experimental data indicate that HBV is not transmitted by the fecal-oral route.

Patients at higher risk for acquiring HBV infection are patients on chronic hemodialysis, patients with hemophilia and others receiving blood products or frequent blood transfusions, intravenous drug users and household contacts of HBV. Perinatal transmission can occur when mothers are hepatitis B surface antigen (HbsAg) positive, particularly when they are also hepatitis B e antigen (HbeAg) positive.

Health care personnel who sustained injuries from needles contaminated with blood containing HBV, the risk of developing clinical hepatitis if the blood is both HbsAg and HBeAg-positive is 22% - 31%, while the risk of developing clinical hepatitis is 1% - 6% if the blood is HbsAg positive and HbeAg negative.

HBV was endemic in Saudi Arabia. But with improved health care and education, and the availability of an effective, safe HBV vaccine the prevalence of this virus within the Kingdom should fall. The Hospital Infection Control Department adopts a positive reducing HBV by instituting a policy which limits the opportunity of transmitting the virus from patients to patients/staff to patients.

**Control Measures:**

I. **Hospitalized Patient**

Physicians and nurses should follow the recommended standard precautions for all hospitalized patients and for patients with HBV infections

II. **Hospital Personnel**

All hospital employees will be screened for HBV before recruitment and travelling to the kingdom and on arrival.

- MOH (circular no. 8896/19 on 07.06.2009) regulation for Health Care Employee is as follows:-
  - Those with negative hepatitis B virus (HbsAg –ve) should receive hepatitis B vaccine series. First dose of vaccine should be receive before iqama application.
  - For the 1st iqama renewal, EHC should issue vaccine certificate to prove that the employee received hepatitis B vaccine series.

III. **Prenatal screening for HbsAg**

Identification of HbsAg-positive pregnant women is essential to prevent perinatal transmission. Routine prenatal screening of all pregnant women for HBsAg is carried out at KKUH.

IV. **Care of Infants whose Mothers are HBsAg Positive**

Infants born to HbsAg-positive mothers who are HBeAg-positive have a 70%-90% chance of acquiring perinatal HBV infection. Infants born to HbsAg-positive mothers who are HbeAg-negative have 5% - 20% risk of acquiring perinatal infection.

The following measures should be undertaken:

1. Neonates born to mothers who are HBsAg positive should be bathed carefully as soon as possible to remove maternal blood and secretions that contaminated their skin during birth.
2. Personnel who handle blood-contaminated neonates should follow standard precaution and wear Personal Protective Equipment (PPE).

3. After bathing, the neonates may be managed without special precautions for the rest of their stay in the nursery. Neonates and mothers may have normal contact or they may room in.

4. Hepatitis B immunoglobulin as soon after birth as possible. The efficacy of HBIG given within 12 hours after birth is presumed but not proved. If a mother is found to be positive after this time, HBIG still should be given to the neonate within 1 week as it may still be of some value.

5. In addition to HBIG, neonates should receive the first dose of HBV vaccine, 0.5 ml (i.e., half the adult dose) intramuscularly within 12 hours. The first dose is given at the same time as HBIG with a separate syringe at a different site. The second and third doses are given one month and six months after the first. The regimen combining one dose of HBIG at birth with the HBV series started soon after birth is 95% effective in preventing development of the HBV carrier state but should be given at different sites.

6. Infants should be tested at 9-18 months of age (not before 9 months) after completion of vaccination series for anti-HBs to determine the outcome of immunoprophylaxis. Children who are HBsAg negative and anti-HBs less than 10 m IU/ml should receive three additional doses of vaccine in a 0, 1, 6 months. Followed by testing for anti-HBs after the 3rd dose. Alternatively, 1-3 additional doses of vaccine can be administered, followed by testing for anti-HBs 1 month after each dose to determine whether subsequent doses are needed. All HBsAg positive infants should have followed-up testing to determine their health status.

7. Breast feeding by HBsAg-positive mothers does not increase the risk of HBV infection in their newborn infants who have been given HBV immunoprophylaxis.

V. Risk for Occupational transmission of HBV to Health Care Workers (HCW)

The risk of HBV infectivity is increased with the presence of HBeAg. The risk of developing serologic evidence of HBV infection when exposed to HBsAg positive, HBeAg positive blood is 37% - 62% and the risk of developing clinical hepatitis is 22% - 31%. While the risk of developing serologic evidence of HBV infection when exposed to HBsAg positive, HBeAg negative blood is 23%-37% and the risk of developing clinical hepatitis is 1%-6%. However the absence of HBeAg associated with precore and core promoter mutation was reported to be infectious, the risk of infectivity is not calculated.

VI. Management of Exposures to HBV.

1. Treatment of exposure site
   e. Encourage bleeding of the site
   f. Wash site with plenty of water
   g. Disinfect exposure site
   h. Put dressing on exposure site

2. Make an exposure report
   d. Fill up the needle stick/splash injury notification form completely
   e. Inform infection control nurse and unit supervisor
   f. The unit supervisor must review the incidence form and ensure that all data are complete and correct.

3. EVALUATION OF EXPOSURE SOURCE
   c. Send blood sample for hepatitis B markers for screening,
4. Evaluate the HCW
   c. Send blood sample for hepatitis B markers.
   d. Check if HCW received the 3 doses of hepatitis B vaccine. If the HCW has not been
      vaccinated or has not completed the 3 doses, advise him to complete the vaccine series
      (0,1,6).

   * If HCW received 3 doses of Hepatitis B vaccine and he/she does not know his
     immune status, advise to check anti-HBs level.

   * If the source is HBsAg positive

   * If the source HBsAg status is unknown

   v. If HCW is unvaccinated, HBIG is given. Hepatitis B vaccination series is also started at
      the same time.

   vi. If HCW is vaccinated, determine if he is a good responder or non-responder.

      a. If HCW is a good responder (anti-HBs level is ≥10IU/ml), no treatment is
         necessary.

      b. If HCW is a non-responder (anti-HBs level is <10IU/ml), HBIG is given as soon as
         possible preferably within 24 hours (but not later than 7 days) after exposure and
         hepatitis B vaccine series started at the same time. If HCW refused to be
         revaccinated, a second dose of HBIG can be given one month later.

      c. If HCW’s antibody response status is unknown, screen HCW for anti- HBs and
         manage as non-responder until the release of laboratory screening result.

A. If the source HBsAg status is unknown

   Manage the HCW as if the source is positive.

B. If the source is negative for HBsAg

   Check the health care worker immune status. If he is immune against HBV, no further
   management will be done. If he is non-immune, ask to receive hepatitis B vaccine
   series.

   * If HCW is not vaccinated, he is advised to receive hepatitis B vaccine series.
### Recommended Post Exposure prophylaxis for percutaneous or permucosal exposure to hepatitis B virus

<table>
<thead>
<tr>
<th>Status of exposed person</th>
<th>Treatment when source is</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg positive</td>
<td>HBsAg negative</td>
</tr>
<tr>
<td>1. Unvaccinated</td>
<td>HBIG (1 dose)</td>
</tr>
<tr>
<td></td>
<td>Initiate HB vaccine series</td>
</tr>
</tbody>
</table>

#### 2. Previously vaccinated:

a. Known responder
   - No treatment
   - No treatment
   - No treatment

b. Known non-responder
   - HBIG (1 dose) and initiate re-vaccination or HBIG 2 doses (2nd dose after 1 month)
   - No treatment
   - Treat as if source were HBsAg positive

c. Antibody response unknown
   - 1. Give HBIG and start vaccination
   - 2. Test expose person for anti-HBs level:
     - a. If adequate, no further treatment
     - b. If inadequate, complete the vaccination series
   - Check anti-HBs level
   - Treat as if source were HBsAg positive.

* Responder is defined as a person with adequate levels of serum antibody to hepatitis B surface antigen (i.e. anti-HBs ≥ 10 mIU/mL); inadequate response to vaccination defined as serum anti-HBs < 10 mIU/mL.

1. Antibody to hepatitis B surface antigen

### VII. HBV Vaccination (Refer to Immunization Chapter)

#### 10.3 HEPATITIS C VIRUS (HCV)

It is a flavivirus. It is a single stranded RNA. It consists of a structural part (Capsid and envelope) and non-structural viral protein. HCV has 6 genotypes and > 90 subtypes. Infection is spread primarily by parenteral exposure to blood and blood product. Transmission among household contact is uncommon. Sexual transmission is uncommon. Vertical transmission is rare.

### Control Measures:

I. Hospitalized Patient

The routinely recommended standard precautions should be scrupulously followed for the patients with HCV infections.

II. Hospital Personnel

All hospital employees will be screened for HCV before recruitment and traveling to the kingdom and on arrival.
There is no need for HCV screening every two years for iqama renewal (according to the MOH regulation).

III. **Risk for occupational transmission of HCV to HCW.**

HCV is not transmitted efficiently through exposure to blood. The risk of infection from percutaneous contact to HCV positive blood is 3-10%.

IV. **Management of Exposures to HCV.**

1. Treatment of exposure site (as in Hepatitis B)
2. Make an exposure report (as in Hepatitis B)
3. Evaluation of HCW status, send for anti-HCV and LFT.
4. Evaluation of exposure source:
   - Send blood sample for anti-HCV.
     - **If the source is negative for hepatitis C**
       No further management will be done.
     - **If the source is positive for Hepatitis C**
       iv. Early diagnosis of HCV infection for HCW is important. Send blood sample for HCV PCR after 2-8 weeks.
       v. Follow-up testing (eg. 4-6 months) for anti-HCV and ALT activity.
       vi. If HCV infection is identified, a short course of interferon is started and refer to Infectious Diseases (ID) unit.

10.4. **HEPATITIS D VIRUS (HDV)**

Hepatitis D virus (HDV) infection produces hepatitis, but only in patients with existing or simultaneously active hepatitis B virus (HBV) infection. HDV cannot produce infection in the absence of HBV. Coinfection with hepatitis B usually resolves, while superinfection of hepatitis B carrier frequently causes chronic infection and chronic active hepatitis. Both types of infection may cause fulminant hepatitis.

Transmission is similar to that of HBV (i.e., by parenteral, percutaneous or mucous membrane inoculation). HDV can be transmitted by blood or blood products and sexual contact, as long as HBsAg is found in the patient’s blood.

**Control Measures**

a. The same control and preventive measures as for HBV infection are indicated. HBV carriers should take extreme care in avoiding exposure to HDV as no currently immunobiologic product exists for prevention of HDV superinfection.

b. Prevention of hepatitis B infection, either pre-exposure or postexposure, will suffice to prevent of HDV infection in a hepatitis B-susceptible person.
References:


Updated policy for prevention of hepatitis virus transmission/25 October 2009.
CHAPTER 11  HUMAN IMMUNODEFIENCY VIRUS (HIV)

Introduction

*Human immunodefiency virus* (HIV) infection causes a broad spectrum of disease manifestations and a varied clinical course. *Acquired immunodeficiency syndrome* (AIDS) represents more severe illness. The revised Caracas / PAHO, June 2003 case definition for surveillance of *acquired immunodeficiency syndrome* (AIDS) approved by the World Health Organization defines AIDS cases based on laboratory evidence of HIV infection and cumulative points assigned to the following conditions exceeding 10 points.

The conditions and their points in parenthesis are:

- Kaposi Sarcoma (10);
- Disseminated/Extrapulmoary/non-cavity Pulmonary TB (10);
- Oral Candidiasis/Hairy leukoplakia (5);
- Pulmonary TB with cavitation or unspecified (5);
- Herpes Zoster in person of 60 years or less (5);
- Central Nervous System dysfunction (5);
- Diarrhoea > 1 month (2);
- Fever at least 38°C for at least a month (2);
- Cachexia or weight loss of more than 10% (2);
- Asthma of at least a month (2);
- Persistent dermatitis (2);
- Anaemia lymphopenia and/or thrombocytopenia (2);
- Persistent cough or any pneumonia and/or thrombocytopenia (2);
- Lymphadenopathy of at least 1 cm. at least two non-inguinal sites (2)

HIV cases however, are those patients with laboratory evidence of HIV infection and a cumulative point assigned to the above mentioned conditions is less than 10 points.

The cause of AIDS is a cytopathic human retrovirus, human immunodeficiency virus (HIV). It is a virus particularly tropic for T-helper lymphocytes and macrophages. HIV persists in infected individuals for life.

Humans are the only known reservoir of HIV. The virus is transmitted through sexual contact and exposure to infected blood or blood components and perinatally from mother to infant. HIV has been isolated from blood, semen, vaginal secretions, saliva, tears, breast milk, cerebrospinal fluid, secretions and excretions. However, only blood, semen, vaginal secretions and possibly breast milk has been implicated epidemiologically in the transmission of HIV infection. Transmission of HIV has not been documented to occur by casual contact with routine care in hospitals or clinics.

The incubation period of the disease is highly variable, ranging from months to years. The diagnosis of HIV infection is based on clinical, immunologic, and serologic findings and by exclusion of primary immunodeficiency disease or secondary immunodeficiency associated with immunosuppressive therapy, lympho-reticular malignancy, or starvation. HIV antibody best tests are useful in differentiating patients who are infected with this virus from those with primary immunodeficiency syndromes. Serum antibodies to HIV are present in virtually all infected people, although some patients with AIDS become seronegative late in disease. Some persons with HIV
infection can have hypo-gammaglobulinemia and are unable to produce antibody. A small percentage of HIV-infected persons are antibody negative by enzyme-linked immunosorbent assays (ELISA), but are positive on Western blot or have positive antigen tests and/or cultures for HIV. The HIV tests currently used are ELISA and are highly sensitive and specific. Repeat ELISA testing of initially reactive specimen is required to reduce the likelihood of laboratory errors and repeatedly reactive tests are highly reliable. Western blot antibody tests are used for confirmation of ELISA tests results.

11.1 Control Measures

11.1.1 Isolation of the Hospitalized Patients

A private room is desirable if available; otherwise, the patient can be nursed in the general ward. The routinely recommended standard precautions for all patients should be scrupulously followed for patients with HIV infection. Implementation of these precautions does not eliminate the need for other transmitted based isolation precautions if the patient developed another contagious disease.

Education and on-going counseling regarding HIV and its transmission should be provided to all HIV infected individuals and the need for these patients to follow the recommended precautions should be emphasized to prevent the spread of this virus within the household and the community.

Family screening is done for HIV patient for early management of the other infected family members.

Although accidental exposure of health care personnel to the virus (e.g., through needle stick injuries) has rarely resulted in HIV infection, every effort should be made to adhere rigorously to infection control precautions for minimizing the risk of exposure to blood and body fluids of suspected or infected patients with HIV.

11.1.2 Precautions for Invasive Procedures

An invasive procedure is defined as surgical entry into tissues, cavities, or organs or repair of major traumatic injuries.

i. In an operation or delivery room and emergency or outpatient setting,
ii. Cardiac catheterization and angiographic procedures.
iii. A vaginal or caesarian delivery or other invasive obstetric procedure.
iv. The manipulation, cutting or removal of any oral or peri-oral tissues, including tooth structure, during which bleeding occurs or the potential for bleeding exists.

The standard precautions previously defined combined with the precautions listed below should be the minimum precautions for all such invasive procedures;

All health care personnel who participate in invasive procedures must routinely use appropriate barrier precautions to prevent skin and mucous membrane contact with blood and body fluids of all patients.

Gloves and surgical masks must be worn for all invasive procedures.

Gowns or aprons, and protective eyewear or face shields should be worn for procedures that commonly result in the generation of droplets, splashing of blood or other body fluids, or the generation of bone chips.
All health care personnel who perform or assist in vaginal or caesarian deliveries should wear gloves and gowns when handling placenta or the infant until blood and amniotic fluid have been removed from the infant’s skin and should wear gloves during post-delivery care of the umbilical cord.

If a glove is torn or needle stick or other injury occurs, the glove would be removed and a new glove used as promptly as patients safety permits; the needle or instrument involved in the incident should also be removed from the sterile field.

### 11.1.3 Precautions for Dialysis

Patients with end-stage renal disease who are undergoing maintenance dialysis and who have HIV infection can be dialyzed in hospital-based or free standing dialysis units conventional infection control precautions. Standard precautions should be used when dialyzing all patients.

Strategies for disinfecting the dialysis fluid pathways of the hemodialysis machine are targeted to control bacterial contamination and generally consists of using 500-750 parts per million (ppm) of sodium hypochlorite (household bleach; Clorox) for 30-40 minutes or 1.5% - 2.0% formaldehyde overnight. In addition, several chemical germicides formulated to disinfect dialysis machines are commercially available. None of these protocols or procedures needs to be changed for dialysis patients infected with HIV.

Patients infected with HIV can be dialyzed by either hemodialysis or peritoneal dialysis and do not need to be isolated from other patients. The type of dialysis treatment (i.e., haemodialysis or peritoneal dialysis) should be based on the need of the patient. The dialyzer may be discarded after each use. Alternatively, centers that reuse dialyzers (i.e., a specific single-use dialyzer is issued to a specific patient, removed, cleaned, disinfected, and reused several times on the same patient only) may include HIV-infected patients in the dialyzer-reuse program. An individual dialyzer must never be used on more than one patient.

### 11.1.4 Precautions for Dentistry

Blood saliva and gingival fluid from all dental patients should be considered infective. Special emphasis should be placed on the following precautions for preventing transmission of blood borne pathogens in dental practice:

- In addition to wearing gloves for contact with oral mucous membranes of all patients, all dental workers should wear surgical masks and protective eyewear or chin-length plastic face shields during dental procedures in which splashing or spattering blood, saliva, or gingival fluids is likely. Rubber dams, high-speed evacuation, and proper patient positioning, when appropriate, should be utilized to minimize generation of droplets and spatter.

- Clean and heat-sterilize handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units between patients. Follow the manufacturer's instructions for cleaning, lubrication and sterilization of handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units. Do not surface-disinfect, use liquid chemical sterilants, or ethylene oxide on handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units. Do not advise patients to close their lips tightly around the tip of the saliva ejector to evacuate oral fluids.
Blood and saliva should be thoroughly and carefully cleaned from material that has been used in the mount (e.g., impression materials, bit registration) especially before polishing and grinding intra-oral devices. Contaminated materials, impressions, and should also be cleaned and disinfected before being handled in the dental laboratory and disinfected before being handled in the dental laboratory and before they are placed in the patient’s mouth. Because of the increasing variety of dental materials used intra-oral, dental workers should consult with manufactures as to the stability of specific materials when using disinfection procedures.

11.1.5 Precautions for Laboratories

Blood and other body fluids from all patients should be considered infective. To supplement the standard precautions previously mentioned, the following precautions are recommended for health care personnel in clinical laboratories.

- All specimens of blood and body fluid should be put in a well-constructed container with a secure lid to prevent leaking during transport. Care should be taken when collecting each specimen to avoid contaminating the outside of the container and of the laboratory form accompanying the specimens.

- All persons processing body and body fluid specimens (e.g., removing tops from vacuum tubes) should wear gloves. Masks and protective eyewear should be worn if mucous membrane contacts either blood and body fluid is anticipated. Gloves should be changed and hand washes after completion of specimen processing.

- Mechanical pipefitting devices should be used for manipulating all liquids in the laboratory. Mouth pipetting must not be done.

- Use of needles and syringes should be limited to situations in which there is no alternative, and the recommendations for preventing injuries with needles outlined under standard precautions should be followed.

- Laboratory work surfaces should be decontaminated with an appropriate chemical germicide after a spill of blood or other body fluids and when work activities are completed.

- Contaminated materials used in a laboratory tests should be decontaminated before reprocessing or be placed in bags and disposed of in accordance with policies for disposal of infective waste.

- Equipment that has been contaminated with blood or other body fluids should be decontaminated and cleaned before being repaired in the laboratory or transported to the workshop.

- All persons should wash their hands after completing laboratory activities and should remove protective clothing before leaving the laboratory.
11.1.6 Precautions for Autopsies or Mortician Service

In addition to the standard precautions mentioned previously, the following precautions should be used by persons performing postmortem procedures.

All persons performing or assisting in postmortem procedures should wear gloves, masks, protective eyewear, gowns and waterproof aprons. Instruments and surfaces contaminated during postmortem procedures should be decontaminated with an appropriate chemical germicide.

11.1.7 Environmental Consideration for HIV transmission

No environmentally mediated mode of HIV transmission has been documented. Nevertheless, the precautions described below should be taken routinely in the care of all patients.

A. Sterilization and Disinfection

Standard sterilization and disinfection procedures for patient-care equipment currently recommended for use in a variety of health-care setting are adequate to sterilize or disinfect instruments, devices, or other items contaminated with blood or other body fluids from persons infected with blood borne pathogens including HIV.

Instruments or devices that enter sterile tissue or the vascular system of any patient or through which blood flows should be sterilized before each use.

Devices or items that contact intact mucous membranes should be sterilized or receive high-level disinfection, a procedures that kills vegetative organisms and viruses but not necessarily large number of bacterial spores.

Medical devices or instruments that require sterilization of disinfection should be thoroughly cleaned before being exposed to the germicide and the manufacturer's instruction for the use of the germicide should be followed. Further, it is important that the manufacturer's specifications for compatibility of the medical device with chemical germicides be closely followed.

Studies have shown that HIV is inactivated rapidly after being exposed to commonly use chemical germicides at concentrations that are much lower than used in practice.

In addition to commercially available chemical germicides, a solution of sodium hypochlorite (household bleach; Clorox) prepared daily is an inexpensive and effective germicide. Concentrations ranging from approximately 500 ppm (1:100 dilution of household bleach) sodium hypochlorite to 5,000 ppm (1:10 dilution of household bleach) are effective depending on the amount of organic material (e.g., blood mucous) present on the surface to be cleaned and disinfected.

Commercially available chemical germicides may be more compatible with certain medical devices that might be corroded by repeated exposure to sodium hypochlorite, especially to the 1:100 dilution.

B. Housekeeping

Environmental surfaces such as walls, floors, and other surfaces are not associated with transmission of infections to patients or health-care personnel.
- Extraordinary attempts to disinfect or sterilize these environmental surfaces are not necessary.
- Cleaning and removal of dust should be done routinely.
- Horizontal surfaces (e.g., bedside tables and hard-surfaced flooring) in patient-care areas are usually cleaned on a regular basis, when soiling or spills occur, and when a patient is discharged.
- Cleaning of walls, blinds, and curtains is recommended only if they are visibly soiled.
- Disinfectant fogging is unsatisfactory method of decontaminating air and surfaces and is not recommended.
- Cleaning germicides that are approved for use as “hospital disinfectants” are used at recommended dilutions to decontaminate spills of blood and other body fluids.
  a. In patient-care areas, visible material should first be removed and then the area should be contaminated.
  b. With a large spills of cultured or concentrated infectious agents in the laboratory, the decontaminated area should be flooded with a liquid germicide before cleaning, then decontaminated with fresh germicidal chemical.

**In both settings, gloves should be worn during the cleaning and decontaminating procedures.**

**C. Laundry**

Although soiled linen has been identified as a source of large numbers of certain pathogenic microorganisms, the risk of actual disease transmission is negligible.

- Soiled linen should be handled as little as possible and with minimum agitation to prevent gross microbial contamination of the air and of persons handling the linen.

- All soiled linen should be bagged at the location where it was used; it should not be sorted or rinsed in patient-care areas.

- Linen soiled with blood or body fluids should be placed and transported in bags that prevent leakage in a water soluble bag.

- If hot water is used, linen should washed with detergent in water at least 71°C for 25 minutes. If low-temperature (≤70°C) laundry cycles are used, chemicals suitable for low-temperature washing at proper use concentration should be used.

**D. Infective Waste**

The most practical approach to the management of infective waste is to identify those wastes with the potential for causing infection during handling and disposal and for which some special precautions appear prudent. Hospital wastes for which special precautions appear prudent include microbiology laboratory waste, pathology waste, and blood specimens or blood products.

- Infective waste, in general, should either be incinerated or should be autoclaved before disposal in a sanitary landfill.

- Bulk blood, suctioned fluids, excretions, and secretions may be carefully poured down a drain connected to a sanitary sewer.
- Sanitary sewers may also be used to dispose of other infectious wastes capable of being ground and flushed into the sewer.

### 11.2 Exposed Health Care Personnel

The existing knowledge from prospective studies of exposed personnel demonstrates that on the average risk of transmission of HIV per episode of percutaneously of HIV infected blood is very low, 0.2% - 0.5% and after a mucous membrane exposure, approximately 0.09%.

#### 11.2.1 Several factors may increase the risk of transmission:

- If HCW is exposed to a large quantity of blood.
- A procedure that involved a needle is placed directly in a vein or artery or a deep injury.
- If the source patient is in the terminal illness.
- If the injury is deep with hollow-bore needles or penetrating sharps related event.

Management of the health-care worker who has had a parenteral (e.g., needle stick or cut) or mucous membrane (e.g., splash to the eye or mouth) exposure to blood or bloody secretions from an HIV positive patient should include the following;

a. Immediately and thoroughly wash hands, mucous membrane and other skin surfaces that are contaminated with blood or bloody fluids or secretions. A skin puncture should be encouraged to bleed and the wound should then be washed thoroughly.

b. Write an incident report and include information of the location and medical file number of the source (patient) and health care worker.

c. Confirm that the source patient is HIV positive.

d. Evaluate the health-care worker clinically and serologically for evidence of HIV infection as soon as possible after the exposure. If the health-care worker is seronegative, he/she should be tested at six weeks, and again at three, six, and 12 months following exposure to determine whether transmission has occurred. Most exposed persons who have been infected will seroconvert during the first 12 weeks after exposure.

e. If decision is made to use post exposure prophylaxis, it should be initiated as soon as possible preferably within 24-36 hours. Two and three drugs during exposure prophylaxis regimes are currently recommended Zidovudine (ZDV) and Lamiduvine (3TC) for 4 weeks is the recommended regime. A third drug notably protease inhibitor, for instance indinavir, can be added to the regimen in highly risk transmission over the four week course of treatment.

f. No further follow-up of a health-care worker to infections as described above is necessary if the source patient is seronegative unless the source patient is at high risk of HIV infection.
11.3 Health-Care Personnel

All hospital employees will be screened for HIV before recruitment and travelling to the kingdom and on arrival.

- MOH (circular no. 8896/19 on 07.06.2009) regulation for Health Care Employee is as follows:
  - HIV screening every two years for iqama renewal is done for employees coming from Ethiopia, Erythria, Kenya, Somalia, Jebuty, Thailand, Nigeria, Sudan, Nepal and Vietnam.

11.3.1 Blood Products

Screening blood and plasma for HIV antibody has dramatically reduced the risk of infection. Nevertheless, health-care personnel should ensure the following.

- Careful scrutiny of the requirements of each patient for blood or blood products is prudent.
- Decompressin should be preferred, if possible, for the treatment of individuals with mild or moderate factor VIII deficiency.
- All factor VIII and factor IX concentrates should be manufactured from plasma screened for HIV antibody.

References:

Updated 08 November 2009
CHAPTER 12  SPECIAL IMPORTANT DISEASES

12.1 Tuberculosis and Other Mycobacterial Diseases

Mycobacterium tuberculosis infection occurs as a result of airborne infection from inhalation of an infected sputa droplet produced by coughing, sneezing or even talking to a patient with active, cavitary pulmonary tuberculosis. The person infected is someone who usually lives in close contact with someone else who has active disease. The primary infection normally occurs in the lung and spreads to the regional lymph nodes and from there, throughout the body as a subclinical disease. With the development of immunity, the infection is controlled and becomes inactive, but a small foci containing live mycobacteria, remain quiescent. Reactivation of these foci can occur, frequently as the result of malnutrition, debilitation, immunosuppression, or other forms of stress. Hence, active tuberculosis is associated with starvation, surgery, diseases such as Hodgkin’s lymphoma, Diabetes Mellitus, AIDS, immunosuppressive therapy, and immunosuppressive side effects of cancer chemotherapy.

Because tuberculosis is spread by person-to-person contact, the disease tends to appear in clusters, often among family members or other persons housed together.

The prevalence of active tuberculosis in a community is directly proportional to the incidence of a positive cutaneous reaction to the purified protein derivative (PPD) of tuberculin in any population. A positive PPD skin test is a marker for latent tuberculosis and, in the absence of immunosuppression, a reliable indicator that the person with a positive test has viable mycobacteria within the body.

Control of the spread of tuberculosis depends on an aggressive approach to the diagnosis of active disease. The most hazardous situation involves the patient with a chronic cough who is treated with a variety of antibiotics by unsuspecting physicians who ignore the symptoms and signs of active tuberculosis.

Control of the spread of tuberculosis in hospitalized patients is achieved by promptly isolating patients with suspected open pulmonary or laryngeal tuberculosis in an appropriate, negative-air pressure room and appropriate masking of health care personnel involved in the care of the patient. The type of mask recommended is currently still unsettled because the degree of protection required, especially if the patient harbors drug-resistant mycobacteria, is unclear. The one settled point is that the flimsy, ill-fitting paper masks widely used in the past are inadequate and must be replaced by a mask that is leak proof, capable of removing particles as small as 0.5 µ in diameter, and capable of maintaining their integrity if wet by perspiration or saliva. The best is the N95.

Another important factor to stress in preventing spread of tuberculosis is the well-documented control of infectiousness of tuberculosis by the prompt initiation of effective chemotherapy of tuberculosis; it has been shown that only a few weeks or even days of appropriate drug therapy lowers the risk of spread to others.

Education of patients will markedly reduce spread of disease almost at once. Teaching patients to cough into a disposable cellulose tissue and giving antitusive drugs markedly reduces the number of airborne infectious particles.

In the transport of patients with suspected tuberculosis, the patient should be masked, and movement throughout the hospital should be limited to travel for absolutely essential procedures.
Screening of patient’s contact should be done.

12.1.1 Diagnosis of Mycobacterial Diseases

The diagnosis of pulmonary tuberculosis and some forms of extra pulmonary tuberculosis depends on three primary factors:

**12.1.1.A A positive tuberculin skin test.**

Despite the many situations in which this test has little or no value, it is nonetheless a very important marker for both latent and active disease, when it is positive. Unfortunately, in patients with AIDS, in patients receiving immunosuppressive drugs, or in severely ill persons with widespread tuberculosis, the test may be negative despite the presence of active tuberculosis. The usual strength of tuberculin used for diagnostic testing is 5 tuberculin units (TU). A positive reaction to PPD was a reaction with 10 mm or more of induration. Another useful approach to this problem of the patient with a negative 5-TU test is to repeat the test by using 250 TU (second-strength PPD). This strength of PPD carries a higher incidence of false-positive results because exposure to atypical mycobacteria may produce a positive reaction to second-strength PPD.

**12.1.1.B A suspicious chest x-ray.**

Pulmonary tuberculosis manifests on a chest x-ray as a fibro nodular infiltrate, usually, usually in the apical posterior portion of the upper or lower lobe of the lung, cavitations, often multiple. There is frequently upward retraction of the hilar toward the lesion. An old pleural reaction or a calcified primary complex may be present.

**12.1.1.C Identification of mycobacteria.**

Mycobacteria have traditionally been identified by Ziehl Neelsen staining of concentrates of sputa or other body fluids. Cultures of concentrated sputa is a much more sensitive way of identifying mycobacteria than smears, but results of this test should not be expected for 6 to 12 weeks, and an additional 4 to 6 weeks are needed for drug sensitivity studies to be completed. The methods used for the identification of mycobacteria are at present in transition technologically, with considerable improvement in the length of time required to make a diagnosis.

The Polymerase chain reaction (PCR), when applied to mycobacteria, provides a rapid (48-hour) method of identifying small numbers of mycobacteria in sputa, urine, cerebrospinal or pleural fluid, and appropriately processed tissue specimens. There has also been a marked improvement in the methods used to determine drug sensitivity in mycobacteria. Rapid automated radiometric detection of mycobacterial growth, as found in the BACTEC system, offers reliable drug sensitivity testing in approximately 1 week in a manner as reliable as the older, slower methods widely used at present.

12.1.2 INH: Prophylaxis with INH 300 mg OD for One Year

1. Patient with positive PPD who are immunosuppressed or are going to have immunosuppressed management such as treatment with corticosteroids.
2. Those persons who converted a negative PPD to positive one.
12.2 Management of Varicella-Zoster Exposure

Varicella (chickenpox) is an acute, generalized viral disease with sudden onset of fever and vesicular skin eruptions. Lesions tend to be more abundant on covered than on exposed parts of the body. The virus establishes latency in the dorsal root ganglia during primary infection (varicella). Reactivation results in herpes Zoster (shingles).

Although varicella is usually a benign childhood disease and rarely rated as an important public health problem, it is one of the most readily communicable diseases, especially in the early stages of eruptions. Zoster has a lower rate of transmission unless it is disseminated which usually occur in Immunocompromised patients. Varicella seronegative contacts of herpes zoster patients can develop chickenpox. Infection tends to be more severe in adult and adolescents than in young children.

Infection with varicella zoster virus may be complicated by pneumonia (especially adults), central nervous system involvement (encephalitis, acute cerebellar ataxia) sometimes with persistent sequelae or death. Secondary bacterial infections of the vesicles may result in necrotizing fasciitis or septicemia or leave disfiguring scars. Other rare complications include glomerulonephritis, arthritis and hepatitis. Reye syndrome can follow cases of chickenpox although its incidence has decreased with decreased use of salicylate during varicella or influenza-like illnesses.

Varicella – zoster virus (VZV) is a member of the herpes virus family. Humans are the only source of infection for this highly contagious virus.

12.2.1 Transmission

12.2.1.A By the airborne route. infection can be acquired when the virus comes in contact with the mucosa of the upper respiratory tract or the conjunctiva.

12.2.1.B By the contact route. direct skin to skin contact with vesicular fluid from patients with varicella or zoster lesions.

Nosocomial transmission is well documented. Several outbreaks in hospitals and other institutional settings have been reported. Sources for nosocomial exposures have included patients, healthcare personnel, and visitors with either varicella or herpes zoster. Exposure and transmission typically associated with hospital areas that have no negative pressure isolation rooms, such as emergency rooms, radiology units, outpatient waiting areas, preoperative and post operative holding rooms. Transmission may occur before lesions develop when patient not in appropriate negative pressure isolation room.

Asymptomatic primary infection is unusual, but because some cases are mild, they may not be recognized. Occasionally, especially in adult, the fever and constitutional manifestations may be severe.

Immunocompromised people with primary (varicella) or recurrent (zoster) infection are at increased risk of severe disease. The groups of patients who may experience complicated disease include premature babies, infants, adolescents, pregnant women, cancer patients, immunodeficiency including HIV infection, patients with chronic cutaneous or pulmonary disorders, and patients receiving systemic corticosteroids or long-term salicylate therapy.

In utero infection can occur as a result of transplacental passage of virus during maternal varicella infection. If a pregnant woman acquires varicella infection during the first half of
pregnancy the fetus will be at risk for developing congenital varicella syndrome. Varicella can develop in the first 3 weeks of life in infants born to mothers with active varicella around the time of delivery (5 days before or 2 days after delivery). If the neonate become infected it may result in a serious varicella with fatality rate as high as 30%. When Varicella develops in a mother more than 5 days before delivery and gestational age is 28 weeks or more, the severity of the disease in the newborn infant is modified by transplacental transfer of VZV-specific maternal immunoglobulin (Ig) G antibody.

Infection confers long life immunity; second attacks are rare in immunocompetent persons but have been documented.

12.2.2 Incubation period

Usually is 14-16 days and occasionally is as short as 10 or as long as 21 days after contact. It may be prolonged for as long as 28 days after receipt of varicella- Zoster Immune Globulin (VarZIG) or Immune Globuline Intravenous (IVIG) and shortened in immunocompromised patients.

12.2.3 Period of communicability

Patients are most contagious from 1-2 days before to shortly after the onset of rash. Contagiousness persists until crusting of all lesions (usually about 5 days) and is more prolonged in patients with altered immunity. Susceptible individuals should be considered infectious for 10-21 days following exposure.

12.2.4 Hospital exposure: Defined as:-

A Varicella: 1) Patients in the same 2- to 4- bed room or adjacent beds in a large ward.
          2) Face to face contact with an infectious staff member or patient (for 5 or more minutes).
          3) Visit by a person deemed contagious.

B Zoster: Intimate contact (e.g. touching or hugging) with a person deemed contagious (with exposed zoster lesion)

C Newborn infant: Onset of varicella in the mother 5 days or less before delivery or within 48 h after delivery.

12.2.5 Control measures if an inadvertent exposure in the hospital to an infected patient occurs:

1. **Immediately** notify infection control department.
2. Identify personnel and patients who have been exposed and are susceptible to varicella.
3. All exposed susceptible patients who are fit for discharge should go home as soon as possible.
4. All exposed susceptible patients who can't be discharged should be placed in contact and airborne isolation room from day 10 to day 21 after exposure. For people who have received varicella zoster immunoglobulin (VZIG), isolation should be continued until day 28.
5. Staff who are non immune or whose status is unknown must be evaluated by employee health clinic immediately. If staff is immune no further action will be taken. If found to be non-immune, he/ she can be offered varicella vaccine if still within 3
days of exposure, if ineligible for immunization he/she must remain off work from days 10-21 post exposure.

6. Susceptible people at high risk of developing severe varicella should be given Varicella zoster immunoglobulin (VZIG) within 4 days of exposure, if not available, intravenous immunoglobulin (IVIG) is recommended.

12.2.6 Indication for varicella zoster immunoglobulins:

1) Immunocompromised patients without history of varicella or varicella immunization.
2) Susceptible pregnant women. (there is no assurance that VZIG will prevent congenital malformations in the fetus, but it may modify varicella severity in the pregnant women).
3) Newborn infant whose mother had onset of chickenpox within 5 days before or 2 days after delivery.
4) Hospitalized premature infants ≥ 28 wks of gestation whose mother lacks a reliable history of chickenpox or serologic evidence of protection against varicella.
5) Hospitalized premature infants <28 wk of gestation or ≤1000g birth weight, regardless of maternal history of varicella or serology result.

Whether the uninfected newborn of a mother with peripartum varicella should be separated from the mother remains controversial. The AAP (American Academy of Pediatrics) recommends that the neonate who has been given VZIG may remain with the mother. Some physician may choose to separate infant from mother until all of maternal lesion have crusted. Rationale for separation is that the infant may not have been infected in utero and can acquire varicella from the mother during postnatal period.

12.2.7 Post exposure varicella vaccine

Administration of varicella vaccine to susceptible contacts within 3 days of exposure may prevent or significantly modify disease. There is no evidence that administration of varicella vaccine during the pre-symptomatic or prodromal stage of illness increases the risk of vaccine associated adverse events or more severe natural disease.

Routine varicella immunization is now recommended by ACIP (Advisory committee on immunization practices) for all non-immune health care workers. Serologic testing for immunity in vaccine recipient is not necessary because 99% of adults are seropositive after the second vaccine dose.

Chemoprophylaxis with oral acyclovir generally is not recommended for immunocompetent individuals. It can be considered for a susceptible immunocompromised patient who has been exposed to varicella and VZIG is not available or more than 96 hrs have passed since exposure.
References:

12.3 Multidrug Resistant Organisms

During the last three decades, due to extensive indiscriminate use of antimicrobials many hospitals in the world are experiencing having microorganisms which are resistant to many antibiotics.

Multidrug organisms refer to organisms which are resistant to two or more groups of antimicrobial to which these organisms are usually susceptible.

These organisms have tendency to spread in between patients by hospital staff hands and other means.

12.3.1 The spectrum of these organisms includes the following:-

1. Gram- negative bacilli e.g. E. coli, Klebsiella, etc.
2. Methicillin-resistant Staphylococcus aureus (MRSA)
3. Enterococci

12.3.1.1 Multiply antibiotic-resistant Gram-negative bacilli

One of the major side effects of broad-spectrum antibiotic usage and advanced invasive medical techniques is the emergence and spread of multiply antibiotic-resistant Gram-negative bacilli (MRGN). These organisms may be intrinsically resistant to the more commonly used β-lactam antibiotics or, more usually, carry antibiotic resistance plasmid, which can spread not only between the same species, but also to other species. MRGN are now endemic in most hospital environments and cause great concern to Infection Control teams the world over.

A. Reservoirs of MRGN

- Hands of staff and attendants;
- Stool of patients on broad-spectrum antibiotics;
- drains and sinks;
- Non-clinical and poorly disinfected clinical equipment;
- Open containers of disinfectants;
- Bars of soap lying in pools of water.

B. Routes of Spread

- Hands and non-compliance with hand disinfection procedures;
a. Bedpans and urinals;
b. Bed clothes that become contaminated with urine or faeces;
c. Staff sitting on the beds of colonized patients;
d. Use of antibiotics that further select for plasmid conferring antibiotic resistance;
e. Open containers of contaminated disinfectants and other fluids on the ward.

C. General Principles for Control of MRGN bacilli

C.1. Continuous education of all health care workers about the following principle:

- Always communicate with Infection Control Team, if you are in doubt about any of the following issues

- **Bacterial spread is mainly via hands and contaminated bed pans and urinals**
  - Implement meticulous hand disinfection;
  - Heat-treat bedpans and urinals. Bedpan disinfectors must be operational at all times, at 80°C. Breakdowns should be treated as emergencies.
  - Provide a dedicated bedpan (if possible) for MRGN stool carriers;
  - Ensure that there is an adequate supply of gloves and plastic aprons.

- **Bed clothing can become contaminated:**
  - Do not sit on the patient’s bed;
  - Disinfect hands with hand rub immediately after contact with an infected wound.

- **Urinary catheters can become colonized:**
  - Ensure that an aseptic procedure is used for insertion of catheters;
  - Do not catheterize patients repeatedly;
  - Empty the urinary drainage bag by the tap and wear disposable gloves while doing so. Do not break the circuit and re-connect.
  - Disinfect hands immediately afterwards;
  - Use a separate jug or container for each patient when emptying urinary drainage bags.
• **Indiscriminate antibiotic usage increases risk of spread:**
  - Restrict antibiotics to necessary use only;
  - Use antibiotics to which the bacterium is known to be sensitive.
  - Consider using antibiotics where drug resistance is non-plasmid-mediated.
  - As much as possible avoid using antibiotics in whole resistance is plasmid mediated.

• **Disinfectants as a source of MRGN (everything on the ward must be stored DRY):**
  - Contaminated because of multiple use or left open;
  - Soaking of instruments;
  - Out of date.

• **Heat disinfection of non-clinical equipment is necessary:**
  - Ensure that the engineers maintain the bedpan disinfectors;
  - Ensure that disinfectants are not substituted for heat disinfection;
  - Ensure that bedpans, urinals, and bowls are stored clean, inverted and dry.
  - In the absence of bedpan disinfectors, ensure that bedpans are washed in hot water and dried. Wipe with 1 per cent phenolic disinfectant if necessary. Wipe with damp cloth to remove disinfectant. Dry.

• **Clinical equipment must be sterilized or heat disinfected:**
  - Ensure that the SSD and Theater Sterile Services Unit (TSSU) are providing a reliable service and that all heat-labile equipment is properly disinfected.

• **Patients transferred between units can spread MRGN:**
  - Do not transfer patients between wards or hospitals unless it is absolutely essential. If transfer is essential, the IC team should be informed. They will contact the unit receiving the patient to give details of the patient’s infection and the necessary precautions. Different certain tags should be used for patients with different types of (MDRO).

• **Patients with three consecutive clear stools prevalent swabs may be returned to the open ward:**
  - Apply Contact Isolation Precaution.
  - Send stool specimens or other relevant swabs for clearance – three specimens or swabs in a week. Check other sites, such as urinary catheters and skin lesions, for clearance.
12.4 Methicillin – Resistant *Staphylococcus aureus (MRSA)*

Methicillin Resistant *Staphylococcus aureus* (MRSA) can easily be identified in the laboratory. The laboratories should have clear identification methods for MRSA. It is similar in virulence to Methicillin susceptible to *Staphylococcus aureus* and causes similar infection. E.g., wound infection, bacteremia, osteomyelitis, and colonization.

12.4.1 Patients harbour these organisms in:

a. the nose  
b. perineum  
c. axilla  
d. infected sites, intravascular catheter sites.  
e. other skin areas.  
f. sputum  
g. throat  
h. faeces, urine

12.4.2 Health Care Workers (HCW) harbour theses organisms in:

a. nose  
b. fingers  
c. axilla  
d. infected sites  
e. perineum

12.4.3 Sources

a. Patients  
b. Colonized (HCW)  
c. Contaminated environmental sites

12.4.4 Transmission by:

a. Contaminated HCW hands (main route).  
b. Contaminated equipments

12.4.5 Control of Spread by:

a. Detection of patients and colonized HCWs.  
b. Isolation of patients.

12.4.5.1 Detection of patients by:

Microbiological results, if two or more cases are detected in the same location, do screening of:

1. The identified patients.  
2. Other patients  
3. Attending HCWs screening should be done only after discussion with the infection control team.
Patient Sites:

- a. nose
- b. perineum
- c. axilla
- d. infected and intravascular catheter site
- e. sputum
- f. throat
- g. urine
- h. faeces

12.4.5.2 Health Care Workers (HCW):

- a. nose
- b. finger prints on culture media
- c. axilla, perineum (infection control team may decide to screen by nasal swabbing only).

12.4.5.3 Isolation of Patients by: A. Standard Isolation
B. Contact Isolation

1. Standard isolation procedures in a single room or at a ward side.
2. Most important is handwashing and hand disinfection.
3. Use of disposable gowns.
4. Wearing of gloves (not a substitute to handwashing)
5. Keep the room door close.
6. HCW from other units' e.g. Physiotherapy, Radiology etc., attending to these patients should contact the attending nurse first.

12.4.6 Antimicrobial Susceptibility of MRSA:

MRSA are resistant to:

- a. Flucloxacillin / cloxacillin
- b. All Cephalosporins
- c. Almost all Macrolides e.g. erythromycin
- d. Most of the tetracyclines (except minocycline)

- MRSA are almost always susceptible to GLYCOPEPTIDES
  e.g. Vancomycin and Teicoplanin

12.4.7 Treatment of MRSA Infection:

The best for treatment of systematic infections is Vancomycin or Teicoplanin (other newer drugs are in the pipeline).

Other antibiotic may be used in case of contraindication for use of glycopeptides after antimicrobial susceptibility testing.

- e.g. a. Rifampicin
- b. Fucidic acid
c. Chloramphenicol
d. Cotrimoxazole
e. Fluroquinolone e.g., Ciprofloxacin
f. Minocycline – semi-synthetic derivatives of tetracycline
g. Aminoglycoside e.g., Gentamicin
h. Clindamycin

12.4.8 Management of colonized sites and eradication from carrier sites in patient and HCW:

- Nose carrier – best is Mupirocin, nasal preparation (Bactroban) (2%) X 3 for 5 days.
- Skin carrier – local antiseptics e.g. 4% Chlorhexidine, 2% Triclosan, or 7.5% provide iodine.
- Further management procedures can be advised by the Infection Control Team.

12.5 Novel Influenza H1N1 (Swine Flu)

Introduction

There are three types of influenza viruses: A, B and C. Influenza A and B viruses cause seasonal epidemics. Influenza type C infections cause a mild respiratory illness and are not thought to cause epidemics.

Influenza A viruses are divided into subtypes based on two proteins on the surface of the virus: the hemagglutinin (H) and the neuraminidase (N). There are 16 different hemagglutinin subtypes and 9 different neuraminidase subtypes. Influenza A viruses can be further broken down into different strains. The current subtypes of Influenza A viruses found in humans are A (H1N1) and A (H3N2).

Swine influenza is a respiratory disease of pigs caused by Type A influenza Virus that regularly cause outbreaks of influenza in pigs. It was first isolated in 1930.

Like all influenza viruses, swine flu virus change constantly. Influenza viruses from different species infect pigs, the viruses can reassert (i.e., swap genes) and the new viruses that are a mix of swine, human and/or avian influenza viruses can emerge.

This novel H1N1 virus can be transmitted from one human to another.

12.5.1 Novel H1N1 Case Definition

1. Suspected Case

- Any patient who present with Influenza like illness (ILI) symptoms:
  - Fever of ≥ 38°C, cough, sore throat, rhinorrhea, headache, muscle pain, malaise. Patients may present with some or all these symptoms.

- Gastrointestinal illness may also be present, such as diarrhoea and/or vomiting, especially in children.

2. Probable Case

Any patient who meet suspected case definition who was in close contact with a
confirmed case or has positive laboratory test for influenza A not H1N1.

3. **Confirmed Case**

Any patient with ILI with positive test for Influenza A (H1N1) virus by PCR or viral culture.

12.5.2 **Group At Risk for Developing Complication**

a. **Patient with Chronic diseases:**
   - Pulmonary diseases including bronchial asthma
   - Cardiac diseases
   - Chronic renal / liver diseases
   - Other Immunocompromised patients and HIV patient
   - Diabetic patient with complication

b. **Pregnant woman**
   - Smokers
   - Overweight patients (Body Mass Index \( \geq 34 \))
   - Children \( \leq 5 \) years old and elderly people \( \geq 65 \)

12.5.3 **Mode of Transmission**

- By droplet infection during sneezing and coughing from infected person.
- Touching surfaces contaminated with influenza virus and then touching the eyes, nose or mouth. The virus can stay alive from 2 to 8 hours on surfaces.
- Adults may be able to spread influenza to others from 1 day before getting symptoms to approximately 5 days after symptoms start.

12.5.4 **Laboratory Diagnosis:**

- Swabs are kept in Viral Transport Media (VTM) and the sample to be tested by Rapid test and PCR.

12.5.5 **For antiviral medication, refer to table 12-1.**
Table 12-1  Antiviral Medication dosing recommendations for treatment or chemoprophylaxis of novel influenza A (H1N1) infection.

<table>
<thead>
<tr>
<th>Agent, Group</th>
<th>Treatment</th>
<th>Chemoprophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oseltamivir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>75 – mg capsule twice per day for 5 days</td>
<td>75 – mg capsule once per day</td>
</tr>
<tr>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 kg or less</td>
<td>60 mg per day divided into 2 doses</td>
<td>30 mg once per day</td>
</tr>
<tr>
<td>15-23 kg</td>
<td>90 mg per day divided into 2 doses</td>
<td>45 mg once per day</td>
</tr>
<tr>
<td>24-40 kg</td>
<td>120 mg per day divided into 2 doses</td>
<td>60 mg once per day</td>
</tr>
<tr>
<td>&gt;40 kg</td>
<td>150 mg per day divided into 2 doses</td>
<td>75 mg once per day</td>
</tr>
<tr>
<td>Zanamivir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>Two 5-mg inhalations (10 mg total) twice per day</td>
<td>Two 5-mg inhalations (10 mg total) once per day</td>
</tr>
<tr>
<td>Children</td>
<td>Two 5-mg inhalations (10 mg total) twice per day (age 7 years or older)</td>
<td>Two 5-mg inhalations (10 mg total) once per day (age 5 years or older)</td>
</tr>
</tbody>
</table>

12.5.6  Infection Control Measures

A.  For Suspected or Confirmed Patients

- Patient should be hospitalized in a single room under Droplet Precaution for 7 days after illness onset or until symptoms have resolved.
- If single room is not available, cohorting can be implemented.
- Patient is educated about the respiratory hygiene. Wear a surgical mask outside the room or patient’s waiting area. Use a disposable tissue for coughing and sneezing and dispose the contaminated tissue properly, wash hands frequently.
- Environmental Cleaning should be done properly using hospital approved disinfectant.

B.  For Health Care Workers

- Only those with close contact and taking specimen will wear N95/N99 mask.
- Personnel providing care to or collecting specimen should wear disposable non-sterile gloves, gowns, and eye protection (e.g. goggles)
- HCW with fever and upper respiratory infection should take a sick leave for two (2) days until laboratory result are available. If H1N1 infection is confirmed, continue sick leave up to 7 days from the first day of fever.
- HCW with contact to a confirmed case of H1N1 should continue working and be followed-up for developing signs and symptoms then can be managed as a suspected case.
- HCW with contact to a confirmed case of H1N1 and dealing with patient at high risk (mentioned above), they should be away from patient care for seven (7) days (from the day of exposure). If they
develop signs and symptoms, they will be managed as a suspected case. Prophylactic anti-viral medication can be considered in certain cases.

- HCW should receive H1N1 vaccine.

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3. CDC Mortality and Morbidity Weekly Report
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CHAPTER 13  ANTIMICROBIAL DRUGS AND NOSOCOMIAL INFECTIONS

Introduction

The aim of antibiotics and chemotherapeutic agents is principally to aid the natural defenses of the body to eliminate the microbes from tissues by preventing their multiplication. Antibiotic-resistant strains of certain organisms are common in hospitals.

Staphylococcus aureus and certain gram-negative bacilli causing hospital infection have become increasingly resistant to the commonly used antibiotics during the past four decades. These resistant organisms may have appeared either as the result of extensive and often indiscriminate use of antibiotics, or by mutation of previously sensitive bacteria. Some organisms, especially gram-negative bacilli, can transfer antibiotic resistance to other bacteria.

In a view of the large number of available, there is need for their guidance on their safe and effective administration in treatment and, where indicated in prophylaxis. Methods of delaying the emergence of resistance, especially by avoidance of unnecessary or inefficient use, are stressed. A Hospital Antimicrobial Advisory Committee is a well established committee with representatives from all hospital departments. This committee serves in an advisory capacity to regulate antimicrobial usage, particularly for new drugs, and to revise past antimicrobial restrictions on the basis of trends in patterns of antimicrobial resistance among the bacteria cultured from hospitals patients. The members of the committee meet at regular intervals and all changes in the antibiotic and chemotherapeutic policy are circulated.

13.1 Formulation of Antibiotic and Chemotherapeutic Policy.

There are several reasons for having in this hospital an agreed policy for prescribing antimicrobials and therapeutic agents:

The restrained use of antimicrobials means that the appearance of resistant organisms is delayed and their incidence in the hospital is kept low.

Up-to-date information can be provided for the prescribe, and adverse reactions can be reduced by restricting the use of certain potentially toxic agents.

Prescribing costs are reduced by controlling the use of expensive chemotherapeutic agents.

The antimicrobial and chemotherapeutic policy is adapted to the needs of the staff, the type of patients treated and the prevalent organisms in the various hospital departments or divisions.

13.2 Antimicrobial Agents and Drug Resistance of Hospital Bacteria.

McGowan has summarized seven types of evidence linking antimicrobial use in the hospital and antimicrobial resistance in hospital bacteria:

Antimicrobial resistance is more prevalent among bacteria causing infection in the nosocomial setting than among bacteria causing community-acquired infection.

In outbreak situations in the nosocomial setting, patients infected with resistance outbreak strains are more likely to have received previous antibiotic therapy that are patients colonized or infected with susceptible strains of the same species.
Changes in antimicrobial use may lead to parallel changes in the prevalence of resistance to that antibiotic.

Areas of most intense antibiotic use within the hospital generally also have had the highest prevalence of antimicrobial-resistant bacteria. These are the areas of the hospital in which most highly susceptible patients are encountered, and include intensive care units, burn units, oncology units, and other special care units.

Increased duration of exposure to antibiotics in the hospital generally increases the likelihood of colonization of infection with resistant organisms.

The higher the dose of antimicrobial given, the greater the likelihood of super infection or colonization of infection with resistant organisms.

The notion of a cause-effect relation seems to fit the existing data, in biologic terms (i.e., antibiotic therapy produces marked effects on the host's endogenous flora and exerts selective pressure in favor or resistant organisms).

13.3 Misuse of Antimicrobial Agents

It has now been established beyond reasonable doubt that antimicrobial drugs are both widely misused and widely overused.

From 20% to 35% of patients in hospitals receive antibiotics during the course of their hospitalization and this account for approximately one-third of hospital drug cost.

No evidence of infection has been found in as many 70% of patients who received antimicrobial therapy.

It has been estimated that as many as 50% of hospitalized adults who received antimicrobial therapy either;

- do not require antimicrobial therapy for their medical condition,
- do not receive the most effective and least expensive drug, or
- do not receive the lowest dose and duration of therapy that is considered effective.

Approximately 70% of antimicrobials used in hospitals are in highly expensive drug categories (e.g., cephalosporin’s).

The widespread use of antimicrobial agents in the hospital setting frequently leads to selection of organisms resistant to those antimicrobial agents and thus creates and maintains a population of drug resistant nosocomial pathogens in the hospital environment. These are several different categories of misuse or abuse of antimicrobials.

Antimicrobials are widely misused in surgical prophylaxis. It is important to emphasize the surgical procedures for which prophylaxis is currently recommended, and the appropriate preoperative timing of surgical prophylaxis should be terminated within 24 hours after surgery is completed.
Antimicrobials are often used as a diagnostic procedure; frequently, antimicrobials are given as an empirical test for patients with fever or other presumed evidence of infection if the patient “responds” to antibiotic therapy, then infection is presumed to have been the cause.

Antimicrobials are often used to treat a disease that does not respond to antibiotics. Contributing to abuse in this area are simple ignorance of infection-oriented physicians and the common use of antimicrobials to treat viral respiratory tract infection or childhood bronchial asthma on the grounds that it is not likely to harm the patient and might prevent subsequent bacterial infection.

There are mistakes in the use of antimicrobials, such as incorrect dosage, incorrect route of administration, inappropriate duration of therapy, or inappropriate choice of drug and failure to look for or recognize adverse reactions or toxic effects.

The preferential use of newer and more expensive antibiotics, particularly recently introduced antimicrobials, in clinical situations in which older and less expensive drugs have proved effective represents another category of misuse.

13.5 Control of Antimicrobial Agents in Hospital

Educational programs on the appropriate use of antimicrobial agents should be the principal approach to minimize antibiotic abuse.

Control of the nature and frequency of contact between pharmaceutical representatives and medical staff physicians is important. Potential conflicts of interests of speakers sponsored by the pharmaceutical industry should be clearly identified, and it behooves such speakers to discuss their sponsor’s product in the perspective of other comparable and possibly less expensive products.

The Hospital Pharmacy and Therapeutics Committee should play a major role in keeping to a minimum the number of antibiotics needed for optimum therapy and in publicizing guidelines for medical staff to select the least expensive, effective agent.

The potential role of the diagnostic microbiology laboratory in influencing antibiotic use should not be overlooked. Use of generic terminology, appropriate selection of antibiotic sensitivity tests for organisms and site of infection, and restriction on the reporting of sensitivity tests with new and costly drugs unless specifically requested or indicated are critically important considerations.

Automatic “stop” orders for specific costly antibiotics, especially if used for surgical prophylaxis, should be the pattern or practice in hospitals.

Written justifications for high-cost agents should be required in cases in which alternative, equally effective, less expensive, or less toxic agents may be used.

13.5 Guidelines on Antimicrobial Prophylaxis in Surgery

Introduction

Postoperative wound infection is the major source of infectious morbidity in surgical patients. Antimicrobial prophylaxis can reduce the incidence of postoperative infection when appropriate guidelines of prophylaxis are applied. Antibiotic prophylaxis should be an essential component of the standard of care in surgical procedure. The use of antibiotics must be weighed against the risk of adverse drug reactions, emergence of resistance, and super infection.
13.5.1 The following general guidelines should be applied for all surgical procedures:

An effective prophylaxis agent should be directed against the most likely organism, but need not to eradicate every potential pathogen.

The prophylaxis agent must be administered in a dose, which provides an effective tissue concentration prior to intra-operative bacterial contamination. With many antimicrobial agents, a single dose given 30 minutes before the skin incision provides adequate concentration throughout the operation.

If surgical procedures last for 3 hours or less, a single prophylactic dose is usually sufficient. Procedures lasting three hours or more require an additional effective dose. Procedure in which is there is rapid blood loss and/or fluid administration will dictate more frequent prophylactic dosing.

Antibiotic should be given at induction of anesthesia. Antibiotic should not be given as “on-call” to the operating room as it is usually given more than two hours before the incision. This may result in less than effective serum and tissue antibiotic levels at the time of incision.

Postoperative doses are generally unnecessary except in the situation following a prosthetic insertion in which case 2 or 3 additional prophylactic doses may be deemed sufficient.

Vancomycin should not be given routinely for surgical prophylaxis. It may be used of patients with penicillin or cephalosporin’s allergy or if methicillin resistant *Staphylococcus aureus* (MRSA) infection is expected.

Third generation cephalosporin’s such as ceftriaxone or ceftazidime should not be used for surgical prophylaxis because they are expensive, their activity against *Staphylococci* is less than that of cefazolin, their spectrum of activity includes organisms rarely encountered in elective surgery and their widespread use for prophylaxis promotes emergence of resistance to these valuable drugs.

When infection is presumed to be present at the time of surgery, as in contaminated or dirty procedures, antibiotics are given with therapeutic intent.

13.5.2 Prevention of Wound Infection and Sepsis in Surgical Patients.

13.5.2.1 Cardio-Thoracic Surgery

Recently published clinical studies showed a statistically significant reduction in the incidence of infection associated with cardiac surgery when Antimicrobial prophylaxis is given.

A cephalosporin’s, as single agent, is at least as effective as combination Regimens of anti-
*Staphylococcal* penicillin and amino glycosides and are much easier to administer.

**Procedures:**
- Prosthetic valve
- Coronary artery bypass
- Other open heart surgery
- Pacemaker or defibrillator implant

**Likely pathogens:**
- *Staphylococcus aureus*
- *Staphylococcus epidermidis*
- *Coronybacterium*
- Enteric gram negative bacilli

**Agent used:**

**Adult dose**
- it is recommended that cefazolin 1gm IV at the induction of anesthesia and every 8 hours or cefuroxime 1.5 gm every 12 hours be given for 48-72 hours until chest and mediastinal drainage tubes are removed.
- Cefazolin 20-30mg/kg at the induction of anesthesia and every 8 hours for up to 72 hours or alternatively cefuroxime 50mg/kg every 8 hours for up to 72 hours.

**Pediatric dose**
- Cefazolin 20-30mg/kg at the induction of anesthesia and every 8 hours for up to 72 hours or alternatively cefuroxime 50mg/kg every 8 hours for up to 72 hours.

### 13.5.2.2 Gastro-Intestinal Surgery

Prophylactic antimicrobials should be used when the stomach or duodenum is entered surgically since such procedures place the patient at risk for postoperative infection.

Antimicrobials are not needed when the lumen of the intestinal tract is not entered (e.g., selective vagotomy).

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>Likely pathogens</th>
<th>Dosage</th>
</tr>
</thead>
</table>
Pedicatric: Cefazolin 2-30mg/kg at the induction of anesthesia. |
| Biliary tract surgery               | Enteric gram negative bacilli *Enterococci Clostridia* | Adult: Cefazolin 1 gm IV at the induction of anesthesia  
Pedicatric: Cefazolin 20-30 mg/kg IV at the induction of anesthesia. |
| Appendectomy (non perforated)      | Enteric gram negative bacilli *Enterococci Anaerobes* | Adult: Cefuroxime 750-1500 mg IV + metronidazole 500 mg IV single dose at the induction of anesthesia.  
Pedicatric: Cefuroxime 50mg/kg IV + metronidazole 10mg/kg IV at the induction of anesthesia. |
| Colorectal surgery                 | Enteric gram negative bacilli *Enterococci Anaerobes* | Adult: Oral neomycin 1gm + erythromycin base 1gm should be given after the bowel preparation is complete 19,18, and 9 hours before surgery.  
Pedicatric: Oral neomycin 20 mg/kg + |
13.5.2.3 **Urologic surgery**

**Likely pathogens:**
- Enteric gram negative bacilli
- Enterococci

**Agents used:**

*Adult dosage:*
- High risk only: Ciprofloxacin 500mg PO OR 400mg IV single dose.

*Pediatric dosage:*
- Ceftazidime 30 mg/kg IV single dose at the induction of anesthesia.
- Fluoroquinolones are not recommended in pediatric patients.

13.5.2.4 **Gynecology and Obstetric Surgery**

- Infection is common in women who have undergone vaginal or abdominal.
- Hysterectomy without antimicrobial prophylaxis.
- Antimicrobial prophylaxis is indicated for ALL types of hysterectomy.
- Cefazolin single dose is the drug of choice for surgical prophylaxis in vaginal hysterectomy.
- Extending antimicrobial prophylaxis beyond 24 hours for uncomplicated hysterectomy is unnecessary.

**Gynecology and Obstetric Procedure:**

- Cesarean section.
- Vaginal hysterectomy.
- Abdominal hysterectomy.
- Abortion.

**Likely pathogens:**
- Enteric gram negative
- Enterococci
- Anaerobes
- Group B streptococci

**Agents used:**

*Cesarean delivery:*
- Cefazolin 2 gm IV single dose immediately after clamping of the umbilical cord is used for ALL women (high and low risk) undergoing cesarean delivery and for patients undergoing abortion in the second trimester.

*Hysterectomy:*
- Cefazolin 1 gm IV single dose is recommended for women undergoing vaginal hysterectomy, abdominal hysterectomy or radical hysterectomy at the induction of anesthesia.
- An alternative is cefuroxime 1.5 gm IV + metronidazole 500 mg IV single dose at the induction of anesthesia.

13.5.2.5 Head and Neck Surgery

Clean Procedures:

a. The incidence of infection in clean head and neck surgical procedures is generally less than 2%. Antimicrobial prophylaxis is not justified in patient undergoing clean surgical procedures.

b. If there is prosthetic replacement, cefazolin 1 gm IV at the induction of anesthesia is appropriate.

c. Pediatric patients can be given cefazolin 20-30 mg/kg IV at the induction of anesthesia if there is prosthetic replacement.

Clean Contaminated:

The use of antimicrobial prophylaxis in clean contaminated head and neck surgical procedures is mandatory. All agents should be given in regimens of one to four doses and in no case should prophylaxis exceed 24 hours.

Procedures:
- Incision through oral or pharyngeal mucosa.

Likely pathogens:
- Anaerobes.
- Enteric gram-negative bacilli
- *Staphylococcus Aureus*

Agents used:
*Adult dosage:*
- Cefazolin 2 gm IV at induction of anesthesia and q 8 hours for 24 hours or clindamycin 600-900 mg IV + gentamicin 1.5 mg/kg at induction of anesthesia and q 8 hours for 24 hours.

13.5.2.6 Neurosurgery

A single dose of an antimicrobial directed toward *Staphylococcus Aureus* is recommended and is considered the best choice for clean neurosurgery procedures.

Procedures:
- Craniotomy and laminectomy
- Cerebrospinal fluid shunting

Likely pathogens:
- *Staphylococcus Aureus*
- *Staphylococcus Epidermidis*
Agents used:

**Adult dosage:**
- Cefazolin 1 gm IV single dose at the induction of anesthesia
- Vancomycin 1 gm IV is used if there is > 10% prevalence of MRSA infections.

**Pediatric dosage:**
- Cefazolin 20-30 mg/kg IV x 1 at the induction of anesthesia or Vancomycin 15 mg/kg.

13.5.2.7 Orthopedic surgery

Procedures:
- Total hip joint-replacement therapy
- Repair of hip fractures

Likely pathogens:
- *Staphylococcus Aureus*
- *Staphylococcus Epidermidis*

Agents used:

**Adult dosage:**
- Cefazolin 1 gm IV at the induction of anesthesia and continued every 8 hours for 24 hours.
- Vancomycin 1 gm IV in case of MRSA infection or penicillin allergy.

**Pediatric dosage:**
- Cefazolin 20-30 mg/kg IV at the induction of anesthesia and continued every 8 hours for 24 hours or Vancomycin 15 mg/kg IV in case of MRSA infection or penicillin allergy

13.5.2.8 Ophthalmic surgery

Likely pathogens:
- *Staphylococcus Aureus*
- *Staphylococcus Epidermidis*
- *Streptococci spp.*
- Enteric gram negative bacilli
- *Pseudomonas aeruginosa*

Agents used:

**Adult dosage:**
- Gentamicin, ciprofloxacin ofloxacin or neomycin-gramcidin-polymixne B to be given as multiple drops instilled topically before procedure. OR
- Cefazolin 100 mg subconjuctivally.

**Pediatric dosage:**
- Gentamicin, ciprofloxacin ofloxacin or neomycin-gramcidin-polymixne B to be given as multiple drops instilled topically before procedure.

13.5.2.9 Contaminated surgery

Contaminated or dirty surgery such as that for a perforated abdominal viscus, a compound fracture or laceration due to an animal or human bite is often followed by infection. Therapy for these
infections is considered therapy rather than prophylaxis and should usually be continued for about five days.

13.5.2.10 **Ruptured viscus**

Rupture viscus in postoperative setting requires antibacterial that include coverage for nosocomial pathogens.

**Likely pathogens:**
- Enteric gram negative bacilli
- Anaerobes
- Enterococci

**Agents used:**
- Cefuroxime and metronidazole +/- gentamicin

13.5.2.11 **Traumatic wound**

**Likely pathogens:**
- *Staphylococcus Aureus*
- Gp A streptococci
- Clostridia

**Agents used:**
- Cefazolin 1 – 2 gm q 8 hours.

13.5.3 **Prevention of bacterial endocarditis**

Antimicrobial prophylaxis before procedures that may cause transient bacteremia can prevent endocarditis in patients with:
- Valvular heart diseases
- Prosthetic heart valve
- Other cardiac abnormalities

13.5.4 **Dental and upper respiratory procedures**

The risk of Endocarditis is considered high in patients with previous endocarditis, prosthetic heart valves, and complex cyanotic congenital heart disease such as tetralogy of Fallot or surgically constructed systemic pulmonary shunts or conduits. The risk is also worth treating in patients with congenital heart disease, acquired valvular disease, hyper atrophic cardiomyopathy and mitral valve prolapsed with regurgitation or thickened leaflets.

**Likely pathogens:**

Viridians streptococci are the most common cause of Endocarditis after dental or upper respiratory procedures.
### Oral:

<table>
<thead>
<tr>
<th>Drug name</th>
<th>Adult dose</th>
<th>Dosage for children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>2 gm 1 hour before procedure</td>
<td>50 mg/kg 1 hour before procedure</td>
</tr>
<tr>
<td>Penicillin Allergy Clindamycin or</td>
<td>600 mg 1 hour before procedure</td>
<td>20 mg/kg 1 hour before procedure</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>2 gm 1 hour before procedure</td>
<td>50 mg/kg 1 hour before procedure</td>
</tr>
</tbody>
</table>

### Parental:

<table>
<thead>
<tr>
<th>Drug name</th>
<th>Adult dose</th>
<th>Dosage for children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>2 gm IM or IV 30 min before procedure</td>
<td>50 mg/kg IM or IV 30 min before procedure</td>
</tr>
<tr>
<td>Penicillin Allergy</td>
<td>600 mg IV 30 min before procedure</td>
<td>20 mg/kg 30 min before procedure</td>
</tr>
</tbody>
</table>

### 13.5.5 Gastrointestinal and genitourinary procedures

#### Oral:

<table>
<thead>
<tr>
<th>Drug name</th>
<th>Adult dose</th>
<th>Dosage for children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>2 gm 1 hour before procedure</td>
<td>50 mg/kg 1 hour before procedure</td>
</tr>
<tr>
<td>Ampicillin ± Gentamicin</td>
<td>2 gm IM or IV 30 min before procedure</td>
<td>50 mg/kg IM or IV 30 min before procedure</td>
</tr>
</tbody>
</table>

### Parental:

**Penicillin allergy:**

<table>
<thead>
<tr>
<th>Drug name</th>
<th>Adult dose</th>
<th>Dosage for children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin ±</td>
<td>1 gm IV infused over 1 hour beginning one hour before procedure</td>
<td>20 mg/kg IV infused over 1 hour beginning one hour before procedure</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>1.5 mg/kg (120mg max) IM or IV 30 min before procedure</td>
<td>2 mg/kg IM or IV 30 min before procedure</td>
</tr>
</tbody>
</table>
References


Persons who have direct contact with patients, including nurses, medical house staff, clinical faculty, attending physicians, paramedical personnel, and medical students, are more likely than other hospital personnel to be involved in disease transmission. These persons may become infected through exposure to infected patients or exposure outside the hospital. In either case they may transmit the infection of patients, other hospital personnel, members of their household, or other community contacts.

In this chapter the infection control outlines hospital personnel health service and present a general viewpoint regarding what a hospital personnel health service might do to prevent transmission of infection to and from patient-care personnel.

### 14.2 INFECTION CONTROL OBJECTIVES

a. Stressing maintenance of sound habits in personal hygiene and individual responsibility in infection control.

b. Monitoring and investigating infectious diseases, potentially harmful infectious exposure, and outbreaks of infections among personnel.

c. Providing care to personnel for work-related illnesses or exposures.

d. Identifying infection risks related to employment and instituting appropriate preventive measures.

e. Containing costs by eliminating unnecessary procedures and presenting infectious diseases that result in absenteeism and disability.

### 14.2 Employee Health Services

For the above objectives to be met, the support of the medical staff and other hospital personnel The Infection Control Team and other hospital departments. This coordination will help ensure adequate surveillance and follow-up of personnel. Moreover during case investigations, outbreaks, and other epidemiologic studies involving hospital personnel, this coordination will promote efficient investigation and prompt implementation of control measures. The following infection control activities of a personnel health service must be observed before and during the hospital placement of all employees:

#### 14.2.1 Pre-employment Evaluation

All potential staff members must have a medical examination and certain screening procedures in their country of recruitment and on arrival. This pre-employment medical check-up will ensure that persons are not placed in jobs that would pose undue risk of infection to them, other personnel, patients, or visitors. For infection control purposes, the following screening laboratory tests must be performed:


b. Tuberculin (TB) skin test and chest X-ray.

c. Urinalysis including pregnancy test.

d. Stool screening for parasites and enteropathogenic bacteria.
e. **Varicella antibody screening**

According to the Ministry of Health Regulation, applicants who have established infection, such as tuberculosis, syphilis, or they are hepatitis B or *HIV* will be considered as non fit to work. Details of the policy for prevention of hepatitis or *HIV* transmission are presented in this manual.

Before signing the employment contract, all potential employees irrespective of their recruitment origin must have an initial evaluation by the Employee Health Department and this includes the following.

a. **Complete history of any communicable disease the person may have had and any chronic infection or skin disease.**

b. **General physical examination.**

c. **Screening laboratory test:** complete blood count; biochemistry laboratory test, serologic tests for syphilis, hepatitis B, C, and *HIV*, tuberculin skin test; chest X-ray if longer than 3 months since the last one; urinalysis; pregnancy test; and stool screen for parasites and enteric pathogens.

d. **Varicella screening:** History of varicella infections should be inquired. Those with doubtful or no history of infection should be screened. If they have negative anti-varicella IgG, they should receive varicella vaccine. Personnel with negative anti HBs should receive hepatitis B vaccine series.

### 14.2.2 Personnel Health and Safety Education

Personnel are more likely to comply with an infection control program if they understand its rationale. Thus education is the central focus of such a program and it includes initial job orientation and ongoing in-service education about the infection control aspects of personnel health and the proper use of the personnel health services.

### 14.2.3 Immunization

Since hospital personnel are at risk of exposure to and possible transmission of vaccine-preventable diseases, maintaining immunity is an essential part of a hospital’s personnel health and infection control program. Optimal use of immunizing agents will safeguard the health of personnel, obviate unnecessary work restrictions, and protect patients from becoming infected by personnel.

Indications for use of recommended routine vaccines are generally the same for hospital personnel as for the general population; however, immunity to some diseases, such as rubella or hepatitis B, may be more important for persons who work in hospitals.

### 14.2.4 Work Restriction and Management of Job-related Illnesses and Exposures

Optimal safeguarding of patients and personnel calls for prompt evaluation and administrative action on the basis of symptoms and signs of transmissible infectious diseases or significant exposures of personnel to a transmissible agent. Therefore, a major function of the personnel health service is to arrange for prompt diagnosis and management of job-related illnesses and provide prophylaxis for certain preventable diseases to which personnel may be exposed.
If an employee reports to work with an obvious infection, he/she should be evaluated by the Employee Health Department. Table 14.1 summarizes important recommendations and suggested work restrictions for personnel with selected infectious diseases.
<table>
<thead>
<tr>
<th>Disease/problem</th>
<th>Work Restriction</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis (infectious)</td>
<td>Restrict from patient contact and contact with the patient’s environment</td>
<td>Until discharge ceases</td>
</tr>
<tr>
<td>Cytomegalovirus infections</td>
<td>No restriction</td>
<td></td>
</tr>
<tr>
<td>Diarrheal diseases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute stage (diarrhea with other symptoms)</td>
<td>Restrict from patient contact, contact with the patient’s environment or food handling</td>
<td>Until symptoms resolve and infection with salmonella is ruled out.</td>
</tr>
<tr>
<td>Convalescent stage/or carrier Salmonella spp</td>
<td>Restrict from care of high-risk patients</td>
<td>Until stool is free of the infecting organism on two consecutive cultures not less than 24 hours apart.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Until three negative stools cultures are obtained 48 hours of antibiotics treatment with 24 hours in between each sample cultured.</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>Exclude from duty</td>
<td>Until antimicrobial therapy completed and 2 cultures obtained ≥ 24 hours apart are negative</td>
</tr>
<tr>
<td>Enteroviral infections</td>
<td>Restrict from care of infants, neonates and immuno-compromised patients and their environments</td>
<td>Until symptoms resolve</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Restrict from patient contact, contact with patient’s environment, and food handling</td>
<td>Until 7 days after onset of jaundice.</td>
</tr>
<tr>
<td>Hepatitis B (According to MOH Regulation dated 18.02.1427)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viral load ≤ 100,000 copy/ml</td>
<td>No restriction</td>
<td></td>
</tr>
<tr>
<td>Viral load ≥ 100,000 copy/ml</td>
<td>Restriction from performing exposure-prone invasive procedures.</td>
<td></td>
</tr>
<tr>
<td>Hepatitis C diagnosed by PCR (According to the MOH Regulation dated 18.02.1427)</td>
<td>Restrict from performing exposure-prone invasive procedures.</td>
<td></td>
</tr>
<tr>
<td>Herpes simplex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genital</td>
<td>No restriction</td>
<td></td>
</tr>
<tr>
<td>Hands (herpetic whitlow)</td>
<td>Restrict from patient contact and</td>
<td>Until lesions heal.</td>
</tr>
<tr>
<td>Disease/problem</td>
<td>Work Restriction</td>
<td>Duration</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Orofacial contact with the patient’s environment</td>
<td>Evaluate the need to restrict from care of high-risk patients</td>
<td>---</td>
</tr>
<tr>
<td><strong>Human immune deficiency virus (HIV)</strong> (According to the MOH Regulation)</td>
<td>Do not perform exposure-prone invasive procedures.</td>
<td>---</td>
</tr>
<tr>
<td><strong>Measles</strong></td>
<td>Exclude from duty</td>
<td>Until 4-7 days after the rash appears</td>
</tr>
<tr>
<td>Active</td>
<td>Exclude from duty</td>
<td>From the 5th day after exposure through 21st days after exposure and/or 4-7 days after rash appears.</td>
</tr>
<tr>
<td>Post exposure (susceptible personnel)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mumps</strong></td>
<td>Exclude from duty</td>
<td>Until 9 days after onset of parotitis</td>
</tr>
<tr>
<td>Active</td>
<td>Exclude from duty</td>
<td>From 12th day after exposure through 26th day after exposure until 9 days after onset of parotitis.</td>
</tr>
<tr>
<td>Post exposure (susceptible personnel)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pediculosis</strong></td>
<td>Restrict from patient contact</td>
<td>Until treated and observed to be free of adult and immature lice</td>
</tr>
<tr>
<td><strong>Pertussis</strong></td>
<td>Exclude from duty</td>
<td>From the beginning of the catarrhal stage through 3rd week after onset of paroxysms or until 5-7 days after start of effective antimicrobial therapy.</td>
</tr>
<tr>
<td>Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post exposure (asymptomatic personnel)</td>
<td>No restriction, prophylaxis recommended</td>
<td>Until 5-7 days after start of effective antimicrobial therapy.</td>
</tr>
<tr>
<td>Post exposure (symptomatic personnel)</td>
<td>Exclude from duty</td>
<td></td>
</tr>
<tr>
<td><strong>Rubella</strong></td>
<td>Exclude from duty</td>
<td>Until 5-7 days after rash appears</td>
</tr>
<tr>
<td>Active</td>
<td>Exclude from duty</td>
<td>From 7th day after through 21st day after exposure or 5-7 days after rash appears.</td>
</tr>
<tr>
<td>Post-exposure (susceptible personnel)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Scabies</strong></td>
<td>Restrict from patient contact</td>
<td>Until cleared by medical evaluation</td>
</tr>
<tr>
<td>Disease/problem</td>
<td>Partial work restriction</td>
<td>Duration</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------</td>
<td>----------</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em> infection</td>
<td>Restrict from contact with patients and patient’s environment or food handling</td>
<td>Until lesions have resolved.</td>
</tr>
<tr>
<td>Carrier state</td>
<td>No restriction, unless personnel are epidemiologically linked to transmission of the organism</td>
<td></td>
</tr>
<tr>
<td>Streptococcal infection, group A</td>
<td>Restrict from patient care, contact with patient’s environment or food handling</td>
<td>Until 24 hours after adequate treatment started.</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Exclude from duty</td>
<td>Until proved noninfectious</td>
</tr>
<tr>
<td>Active disease</td>
<td>No restriction</td>
<td></td>
</tr>
<tr>
<td>PPD converter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disease/problem</th>
<th>Partial work restriction</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicella (chickenpox)</td>
<td>Exclude from duty</td>
<td>Until all lesions dry and crust</td>
</tr>
<tr>
<td>Active</td>
<td>Exclude from duty</td>
<td></td>
</tr>
<tr>
<td>Post-exposure (susceptible personnel)</td>
<td>Exclude from duty</td>
<td>From the 10ᵗʰ day after exposure through 21ˢᵗ day (28ᵗʰ day if VZIG given) after exposure</td>
</tr>
</tbody>
</table>

| Zoster | | |
| Localized, in healthy person | Cover lesions; restrict from care of high-risk patients | Until lesions dry and crust |
| Generalized or localized in immunosuppressed person | Restrict from patient contact | Until all lesions dry and crust. |
| Post-exposure (susceptible personnel) | Restrict from patient contact | From 10ᵗʰ day after exposure through 21ˢᵗ day (28ᵗʰ day if VZIG given) after exposure or if varicella occurs, until all lesions dry and crust. |

| Viral respiratory infections, acute febrile | Consider excluding from the care of high risk patients or contact with their environment during community outbreak of RSV and influenza | Until acute symptoms resolve |

**NOTE:**

- All employees are encouraged to report significant exposures to transmissible agents to their supervisors and Infection control Team.

- Restricted from patient contact and contact with environmental means, exclusion from duty only for HCW working in patients area.
All employees are encouraged to report significant exposures to a transmissible agent. Table 14-2 lists recommendations for prophylaxis of hospital personnel after important exposures.

**Table 14-2. Recommendations for prophylaxis after exposure**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTS</td>
<td>When prophylactic treatment with drugs, vaccines, or immune globulins is necessary and is offered, personnel should be informed of risk of infection, alternative means of prophylaxis, degree of protection provided by the therapy, and potential side-effects.</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Personnel who have had direct fecal-oral exposure to excretions from a patient incubating hepatitis A should be given IG (0.02 ml/kg). Prophylaxis with IG for all personnel who take care of patients with hepatitis A, other than as suggested above, should not be given.</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>For prophylaxis after percutaneous (needlestick) or mucous membrane exposure to blood that might be infective, the recommendations in the policy for prevention of Hepatitis virus transmission (chapter 10) should be followed.</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>For needlestick exposures involving patients known to have hepatitis C (see Chapter 10).</td>
</tr>
<tr>
<td>Human immunodeficiency virus (HIV)</td>
<td>For percutaneous (needlestick) or mucous membrane exposure to blood that might be infective, the recommendations in the policy for prevention of HIV transmission (chapter 11) should be followed.</td>
</tr>
<tr>
<td>Meningococcal disease</td>
<td>Antimicrobial prophylaxis (Rifampicin 600 mg twice a day for 2 days, Ciprofloxacin 500 mg orally as a single dose or Ceftriaxone 250 mg IM single dose) should offer immediately to personnel who have had intensive direct contact with an infected patient without using proper precautions.</td>
</tr>
<tr>
<td>Pertussis</td>
<td>Antimicrobial prophylaxis ((Macrolides, Clarithromycin, or Azithromycin) should be offered immediately to personnel who have had intensive contact with an infected patient without using proper precautions.</td>
</tr>
<tr>
<td>Rabies</td>
<td>Hospital personnel who either have been bitten by a human with rabies or have scratches, abrasions, open wounds, or mucous membranes contaminated with saliva or other potentially infective material from a human with rabies should receive a full course of antirabies treatment. (Consult Infectious Diseases)</td>
</tr>
</tbody>
</table>

IG = Immune Globulin
14.2.4 Food-Service Personnel Screening

a. All persons handling or preparing food must submit stool specimens to be examined for parasites and enteric pathogens every 6 months and as soon as they return from any hospital leave.

b. Any Food-Service employee with symptoms of gastroenteritis will be removed from food handling and he is required to have stools examined for parasites and enteric pathogens.

c. Work restriction is required if one of the oro-fecal transmitted organisms is isolated

E.g. (i) Parasites: Enterobius vermicularis (ova)
Strongyloides stercoralis (larvae)
Hymenolepis nana (cysts)
Enteramoeba histolytica (cysts)
Giardia Lamblia (cysts)

(ii) Enteric pathogens: Salmonella
Shigella
Campylobacter

14.3 Control of Selected Infections

The hazards of nosocomial spread of infection from hospital personnel to patients have long been recognized. The occupational risks caused by infection transmitted to personnel have received more attention.

14.3.1 Upper Respiratory Tract Infections

It is neither necessary nor feasible to restrict all personnel with acute upper respiratory infection from taking care of patients who are not in high-risk groups.

a. Personnel with respiratory infections should not be assigned direct patient care of high-risk groups such as neonates, infants, elderly, patients with chronic underlying illness, or immunocompromised patients.

b. Personnel with documented group A Streptococcal pharyngitis need not undergo a repeat throat culture during or after antibiotic treatment and may return to work 24 hours after initiation of appropriate chemotherapy, depending on their clinical status.

d. Careful handwashing is essential to prevent transmission. Masks should be worn to prevent large droplets spreading from personnel to patients on close contact.

e. For influenza control, please refer to chapter 12.

14.3.2 Staphylococcus aureus Disease and Carriage

Staphylococcal infection or carriage occurs frequently in humans. There are two sources of nosocomial transmission; persons with lesions and asymptomatic carriers. The anterior nares are
one of the most commonly colonized sites, but carriage of S. aureus may occur at other sites (e.g.,
draining or crusted lesion, nasopharynx and oropharynx, and the skin of the axilla, fingers, and
perineum). Outbreaks of methicillin-resistant-staphylococci tend to occur more frequently in
intensive care and burn units.

a. Personnel with skin lesions due to Staphylococcus aureus should not be allowed to
take care of patients until skin infection has resolved.

b. Personnel, linked epidemiologically to an increased number of unusual clusters or
outbreak of MRSA infection, should be cultured and, if positive, removed from patient
contact and undergo decolonization therapy until documented to be negative from MRSA before
returning to work.

14.3.3 Acute Diarrhea

Various agents may cause diarrhea in patients and hospital personnel. Salmonella, Shigella, and
Campylobacter species are among the common bacterial enteric pathogens. Rotavirus, Norwalk
and Norwalk-like agents are among the main causes of sporadic and epidemic viral gastroenteritis.
Giardia lamblia and other protozoa are also frequent causes of diarrhea. Any of these agents may
be transmitted in hospitals via the hands of infected personnel.

a. Personnel with acute diarrheal illness accompanied by fever, abdominal cramps, mucoid or
bloody stools are likely to be excreting potentially infective organisms in their feces. These
persons are not allowed to take care of patients pending evaluation. They should report to
Employee Health Clinic for appropriate stool culture and examination for intestinal
protozoa and specific treatment for documented infection or infestation as clinically
indicated.

b. Personnel with Salmonella enteric infections should be excluded from direct contact with
high-risk patients until stool cultures are Salmonella-free on two consecutive specimens
collected not less than 24 hours apart.

c. Personnel infected by enteric pathogens other than Salmonella may return to work after
symptoms resolve.

d. Hand washing, by personnel before and after all patient contacts, will minimize the risk of
acquiring or transmitting enteric pathogens.

14.3.4 Hepatitis

Viral hepatitis has long been recognized as a nosocomial hazard. The agents that most
commonly cause viral hepatitis are hepatitis A virus (HAV), hepatitis B virus (HBV), and hepatitis C
(HCV).

A policy for prevention of hepatitis virus transmission and management of exposed health-
care personnel is discussed in details in this manual.

14.3.5 Human Immunodeficiency Virus

Although the potential for hepatitis B virus (HBV) transmission in the hospital setting is greater than
that for human immunodeficiency virus (HIV), the modes of transmission for both viruses are
similar. Both viruses have been transmitted by percutaneous inoculation or contact with an open
wound, nonintact (i.e., chopped, abraded, weeping or dermatitic) skin, or mucous membranes no
blood, blood-contaminated body fluids, or concentrated virus.

The risk of infection with HIV following an episode of percutaneous exposure to HIV- infected
blood is 0.2%-0.5%. Protection against HIV and HBV for health-care personnel should focus
primarily on preventing these types of exposures to blood as well as on delivery of HBV vaccination.
A policy for prevention of HIV transmission and management of health-care personnel is discussed
in this manual.

14.3.6 Herpes Simplex Viruses

Herpes simplex viruses (HSV) can be transmitted among personnel and patients through direct
contact either with primary or recurrent lesions or with secretions, such as saliva, vaginal secretions
or infected amniotic fluid, that contain the virus when no lesions are obvious.
a. Personnel (e.g., nurses, anesthesiologist, and dentists) may develop an infection of the
fingers (herpetic whitlow or paronychia) from exposure to contaminated oral secretions. 
Avoidance of direct contact with lesions, wearing gloves for all contact with oral or vaginal
secretions, and thorough handwashing after patient contact will protect personnel from
such infections.

b. Personnel with orofacial herpes can reduce the risk of infecting patients by wearing an
appropriate barrier (e.g., a mask or gauze dressing) and washing hands well before all
patient care. They should not take care of patients at high risk of severe infection, such as
neonates and patients with severe malnutrition, severe burns, or immunodeficient states,
until their lesions have healed.

c. Personnel with hepatic whitlow should not have direct contact with patients until their
lesions have healed.

14.3.7 Varicella-Zoster Virus

Varicella –zoster virus (VZV), the causative agent of varicella (chickenpox) and zoster
(shingles), is highly communicable, leading to high attack rates among healthy susceptible
individuals. Nosocomial transmission of varicella-zoster infection among personnel and patients is
well recognized.

a. Appropriate isolation precautions for hospitalized patients with known or suspected
varicella or zoster can reduce the risk of transmission to personnel.

b. After exposure to varicella or zoster, personnel not known to be immune to varicella (by
history or serologic study) should be excluded from work beginning on the tenth day after
exposure and remain away for the maximum incubation period of varicella (21 days).

c. Personnel with zoster should be excluded from taking care of high-risk patients until all
lesions are crusted. These personnel may not pose a special risk to other patients if the
lesions can be covered.

A policy for prevention of Varicella Zoster transmission and management of health-care
personnel is discussed in details in chapter 12 of this manual.
14.3.8 Tuberculosis

Although the risk of nosocomial infection with Mycobacterium tuberculosis is low, tuberculosis (TB) continues to pose a problem for health-care personnel. In the hospital, infection is most likely to occur when a patient has unsuspected pulmonary or laryngeal T.B., has bacillus-laden sputum or respiratory secretions, and is coughing or sneezing into air that remains in circulation.

A tuberculosis screening and prevention program for personnel is important in protecting personnel and patients.

A. Screening Program

1. All newly arrived hospital personnel will have a tuberculin skin test and a chest x-ray prior to employment. Those already known to have significant reactions need not be retested.

2. A significant skin-test reaction, using Mantoux technique, is equally defined as 10 mm or more if induration (not erythema) to 5 tuberculin units (TU, 0.1 ml) of purified protein derivative-standard (PPD-S) which is injected intradermally on the volar aspect of the forearm. Mantoux test is read at 48 to 72 hours.

3. A two-step procedure can be used to minimize the likelihood of misinterpreting a boosted reaction as a true conversation due to a recent infection. In the two-step procedure, an initial tuberculin skin-test (Mantoux, 5 TU PPD-S) is given. If this test result is 0-9 mm of induration, a second test is given at least one week and no more than three weeks after the first. The result of the second test is used as the base line test in determining treatment and follow-up of these personnel.

4. For personnel with documented negative tuberculin skin tests and considered to be at significant risk, repeat skin tests will be necessary on a yearly basis.

5. Skin-test reaction after BCG vaccination may be quite variable, and it cannot be distinguished from that due to virulent tuberculous infection. **Caution is necessary in attributing a significant skin-test reaction to previous BCG vaccination**, especially if the person vaccinated has recently been exposed to infective tuberculosis. Skin test reactivity tends to diminish with time, and by 10 years after BCG vaccination, most recipients do not have a significant reaction (i.e., 10 mm or more of induration). At any time, a reaction greater than 15 mm is not likely to be due to BCG. **It is prudent to manage a significant reaction in BCG-vaccinated persons as a possible tuberculous infection.**

6. Skin testing after BCG vaccination or natural tuberculous infection may be associated with severe or prolonged ulceration at the test site. Initial use of 1 TU PPD or a partial dose of 5 TU PPD maybe useful in avoiding untoward reactions in suspected persons. A full 5 TU dose may be used safely if the initial skin test is negative.

7. It is important to obtain a chest x-ray on persons with significant skin-test reaction, those whose skin test convert, or those who have pulmonary symptoms that may be due to TB.

B. Management of Personnel after Exposure

1. If personnel are exposed to an infective patient with TB and proper precautions are not used, it is important to skin-test these personnel ten weeks after the exposure. Ten weeks is
the upper limit of time required for an infected person to develop hypersensitivity to tuberculin.

2. Unless a recent skin test was given during the three months before the exposure, a baseline test may be needed as soon as possible after the exposure to help decide whether a significant reaction at ten weeks represents a recent conversion related to the exposure.

3. Those that have significant reactions on testing need chest X-rays to exclude the possibility of tuberculous pulmonary disease. If chest films are normal, these persons can be advised to receive preventive therapy (i.e., chemoprophylaxis with oral isoniazid (INH) 300 mg and pyridoxine 25 mg daily for 9-12 months). If the chest film has abnormalities compatible with pulmonary TB, these personnel need evaluation to rule out the possibility of active disease.

4. Household contacts of an employee who develops active pulmonary tuberculosis will be screened and, if indicated, treated.

C. Work Restrictions

1. Work restrictions are necessary for personnel with active pulmonary or laryngeal TB because they pose a risk to patients and other personnel while they are infective.

2. Objective measures of lack of infectivity are negative sputum cultures.

3. Personnel with significant tuberculin testing, but no evidence of active pulmonary tuberculosis, are not infective and work restrictions may not be necessary.

References:

CHAPTER 15 NOTIFICATION CASES

15.1 Notification of Infectious diseases

Notification of infectious diseases is one of the basic element of the surveillance system which is the corner stone in the control and prevention of infectious diseases.

15.2 Notification Definition

Notification is the process of informing the Health Authorities (Ministry of Health) about the occurrence of a disease that should be notified. All patients diagnosed with one of the diseases listed below must be recorded by the Infection Control Nurse who will forward that information to the Chairman of Infection Control Committee and then to the Chief of Staff.

15.3 Objectives of Notification

1. To identify the public health problems.
2. To take preventive and control measures against infectious diseases.
3. To allocate the necessary resources to solve major health problems.
4. To identify the epidemiological change for the disease.
5. To help eradication of some diseases.

15.4 List of Notification Forms in Current use

1) Brucellosis notification form.
2) Chemical Poisoning notification form.
3) Food Poisoning notification form.
4) Guillain Barre Notification form.
5) General Notification form.
6) HIV notification form.
7) Leprosy notification form.
8) Malaria notification form.
9) Measles notification form.
10) Meningitis notification form.
11) Scabies notification form.
12) Tuberculosis notification form.
13) Scorpion sting notification form.
15.5 Types of Notification

15.5.1 Immediate Reporting

This is for diseases that need immediate action, notification done by fax or telephone.

a. Meningitis
b. Guillian Barre Syndrome
c. Food poisoning
d. Chemical poisoning

15.5.2 Weekly Reporting

Infectious Diseases should be notified weekly to the Region Health Authority and then monthly reported to Ministry of Health.

e. Tetanus, other types
f. Whooping cough
g. Measles
h. Mumps
i. Congenital Rubella
j. Hepatitis A,B,C
k. Unspecified Hepatitis
h. Brucellosis
i. Rabies
j. Salmonellosis
k. Shigellosis
l. Amoebic Dysentery
m. Typhoid and paratyphoid fevers
n. Chicken pox
o. Echinococcus Hydatid disease
p. Puerperal fever
q. Hemolytic uraemic syndrome
r. Scorpion bites
s. Syphilis
t. Gonorrhea
u. Scabies

Use the new form, attached, and start collecting blood for all Mumps cases (5 ml, plain tube) then send blood to Virology Laboratory.

15.5.3.1 Monthly Reporting

This includes all infectious diseases notified to the Regional Health Affairs which in turn notifies the Deputy Minister for Preventive Medicine. It also includes reports of vaccination, malaria, tuberculosis and other reports as specified by the Ministry of Health.
### Section I: Infectious Diseases That Should be Notified Immediately

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<tbody>
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<td></td>
<td>8. Rubella</td>
<td></td>
<td>17. Hemorrhagic viral fevers</td>
</tr>
</tbody>
</table>

- Hemorrhagic fevers like: Crimean-congo hemorrhagic fever, Rift valley fever, Dengue fever, Ebola, Lasa fever, West Nile fever

- **Note:** It is mandatory to notify immediately any disease that appears in epidemic even if it is not included in section I and II.

- Diseases notified immediately should be included also in the weekly report.

### Section II: Infectious Diseases that should be notified Weekly to the Region and then Monthly to the MOH.

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<thead>
<tr>
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<tbody>
<tr>
<td>5. Other Meningitis</td>
<td></td>
<td>17. Amoebic Dysentery</td>
<td>22. Hemolytic uraemic syndrome</td>
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<tr>
<td></td>
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<td></td>
<td>24. Syphilis, Others</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>25. Gonorrhea</td>
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<tr>
<td></td>
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<td>26. Scabies</td>
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CHAPTER 16  OUTBREAK INVESTIGATION POLICY

16.1 Purpose
This policy outlines the arrangements for the investigation and management of outbreak of infection within university hospitals. It should be noted however, although there are certain basic arrangements that necessary and will be applicable to all outbreaks of infection for each incident is different.

The aim of this policy is to ensure that all staff within our institution has the ability to recognize an outbreak and implement basic control measures as soon as possible, to prevent further spread. Two types of infections occur in the hospital. 1) **community-acquired infections** developing 48 hours after admission and 2) **hospital-acquired infections** and can be distinguish by latency period according to CDC definition.

Hospital infections are either:
1. Device-related (blood stream infections (BSI), Urinary Tract infection (UTI), or ventilator-associated pneumonia (VAP).
2. Procedure-related (Surgical Site Infection (SSI).
3. Environmental contamination (water, disinfectant, etc...).

16.2 Outbreak Definition
1. **Occurrence of two or more patients and / or staff** with an infectious condition e.g. vomiting and/or diarrhea or respiratory tract infection more than expected in a given area over a particular period of time among a specific group of people.
2. **Nosocomial outbreak** – any group of illnesses of common etiology occurring in patients of a medical care facility acquired by exposure of those patients to the disease agent while confined in such a facility.
3. An outbreak situation may also be declared in the event of one case of a rare or very transmissible and communicable disease e.g. diphtheria, measles or group A streptococci in surgical patients.
4. **Food or water borne outbreak** (WHO definition)
   a. Two or more persons with similar illness, after ingestion of the same type of food or water, and from the same source or epidemiological evidence - the food or the water – the source of the illness.
   b. Vehicle non-living intermediary (insect, arthropod): mechanical or biological transmission (part of life cycle).
   c. Reservoir – habitat where the agent grows and multiplies (humans, animals, environment).
   d. Modes of transmission.
      - Direct contact (mucous membrane skin, fecal-oral)
      - Droplet spread
      - Indirect - Airborne
      - Vehicle borne-food, water or fomite
      - Vector borne-arthropod
   e. Portals of entry - ingestion, inhalation, percutaneous

16.3 Objectives
1. Verify and recognize the magnitude of the outbreak.
2. Diagnose the agent
3. **Stop the outbreak**
   a. Find and neutralize the source (cause) and mode of transmission
   b. Prevent additional cases
4. Prevent future outbreaks.
5. Improve surveillance and outbreak detection.
6. Improve our knowledge
7. Training and research opportunity.
Figure 1: An outbreak comes from a change in the way the host, the environment and the agent interact. This interaction needs to be understood to propose recommendations.

16.4 Recognition of an outbreak
16.4.1 Microbiology Laboratory Results

Sporadic cases of infection may only be recognized if a pathogenic microorganism is cultured in the microbiological laboratory. All laboratory isolates are routinely monitored by the Infection Prevention and Control Team (IPCT) to enable early detection of a potential outbreak. All staff must be aware that two or more patients and/or staff with symptoms of a potentially infectious condition will constitute an outbreak situation.

16.4.2 Notification of an Outbreak

If a potential outbreak manifests clinically, medical, nursing or other clinical staff must inform the Consultant Microbiologist or Infection Control Nurse immediately who in addition will tell the following personnel;

• Head of department/ ward or lead clinician
• Occupational Health Department (If staffs are involved)

If a potential outbreak occurs out of hours, the on-call Consultant Microbiologist should be contacted via KKUH hospital switchboard.

16.4.3 The rapid response team
A. Composition

■ Epidemiologist, Clinician ID and microbiologist
■ Entomologist, if available, when vector-borne disease
■ Gathered on ad hoc basis when needed

B. Role

■ Confirm and investigate outbreaks

C. Responsibility

■ Assist in the investigation and response
■ Primary responsibility rests with local health staff

16.4.4 Role of the Epidemiologist
1. Systematic Description
2. Identification of risk factors (by descriptive or analytical means)
3. Identification of interventions
4. Work with others to implement control measures
5. Evaluate the impact of control measures
16.4.5 **Step of outbreak investigations**

**a. Preliminary Investigation and Descriptive Study:**

1. Review existing information
2. Determine the nature, location, and severity of the disease problem
3. Verify the diagnoses
4. Create a case definition
5. Find and ascertain case patients
6. Request that the laboratory save isolates from affected patients and any suspected sources or vehicles
7. Graph an epidemic curve
8. Summarize case-patient data in a line listing
9. Establish the existence of an outbreak
10. Institute or assess adequacy of emergency control measures

**b. Comparative Study and Definitive Investigations**

1. Review records of existing case patients
2. Develop a hypothesis.
3. Conduct comparative studies (case-control or cohort) to test hypotheses.
4. Conduct microbiologic or other laboratory studies and surveys.
5. Conduct observational studies, including interviews and questionnaire surveys.
6. Conduct experiments to confirm the mode of transmission

**c. Acting on results**

i. Communicate results of investigation to administration and involved departments (as well as any necessary regulatory bodies), along with a plan for definitive control measures
ii. Implement definitive control measures
iii. Maintain surveillance for a sufficient time period to ensure that control measures are effective.

16.4.6 **Preparation for the outbreak**

1. Scientific knowledge by review literature, Consultation of experts an sample questionnaires.
2. Supplies and should by available though consultation with laboratory in addition to equipments (Laptop, camera etc.)
3. Assure personnel resources, funding and make sure you know your role and its parameters.

16.4.7 **Establish existence of an outbreak**

1. Routine surveillance Clinical / Laboratory General public Media
2. Confirm outbreak and diagnosis

16.4.8 **Is this an outbreak?**

- More cases than expected? Determine the expected number of cases before deciding whether the observed number exceeds the expected number
- Surveillance data: hospital discharge data, registries, mortality statistics data from other facilities, regions, surveys of health care providers
- Surveys: community, hospitals, labs, physicians

- **Laboratory confirmation**
  - serology
  - isolates, typing of isolates
  - toxic agents
- Contact (visit) the laboratories
- Meet attending physicians
- Examine some cases

16.4.9 **Caution!**

- Seasonal variations
- Notification artefacts
- Diagnostic bias (new technique)
- Diagnostic errors (pseudo-outbreaks)
- Not always necessary to confirm all the cases but confirm a proportion throughout the outbreak
- Unrelated cases of similar unrelated disease

16.5 **Verify the Diagnosis**

1. Ensure proper diagnosis and rule out lab error as the bias for increased diagnosis by review clinical findings, lab results
2. Summarize clinical findings with frequency distributions, characterize spectrum of disease, verify diagnosis and develop case definition
3. See and talk with patients if at all possible for better understand clinical features and mental image of disease and the patients affected
4. Gather critical information about, source of exposure, what they think caused illness, knowledge of others with similar illness, common denominators and helpful in generating ideas for hypothesis about etiology and spread

16.6 **Establish a case definition**

1. Standard set of criteria for deciding if a person should be classified as suffering from the disease under investigation and should be Simple, practical, objective sensitive, specific and multiple case definitions.
2. Criteria is clinical and/or biological criteria, time, place and person must be applied consistently and without bias to all persons under investigation and must not contain an exposure of risk factor you want to test.

3. Early in investigation may use a “loose” case definition, it is better to collect more than necessary so you don’t need to make repeat visits to identify extent of problem and population affected and generating hypotheses but later when hypotheses are sharpened investigator may “tighten” case definition.

4. **Classification**
   - Definite (confirmed): Laboratory confirmed
   - Probable: Typical clinical features without lab confirmation
   - Possible (suspected): Fewer of the typical clinical features

16.7 **Identify and count cases**

16.7.1 Information to be collected about every case include: identifying information, re-contact if additional questions come up, notification of lab results and outcomes of investigation, check for duplicate records, map geographic extent. Demographics and provide “person” characteristics for defining population at risk.

16.7.2 Clinical findings: verify case definition met, chart time course and supplemental date e.g. deaths.

16.7.3 Risk factor information: tailored to specific disease in question.

16.7.4 Reporter information: Id of person making report.

16.7.5 Collection forms includes: standard case report form, questionnaire and data abstraction form.

16.7.6 Line listing: abstraction of selected critical items from above forms and contains key information.
# CHAPTER 17

## HEALTH CARE PERSONNEL VACCINATION RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td><strong>Hepatitis B</strong></td>
<td>Give 3-dose series (dose #1 now, #2 in 1 month, #3 approximately 5 months after #2). Give IM. Obtain anti-HBs serologic testing 1–2 months after dose #3.</td>
</tr>
<tr>
<td><strong>Influenza</strong></td>
<td>Give 1 dose of TIV or LAIV annually. Give TIV intramuscularly or LAIV intranasally.</td>
</tr>
<tr>
<td><strong>MMR</strong></td>
<td>For healthcare personnel (HCP) born in 1957 or later without serologic evidence of immunity or prior vaccination, give 2 doses of MMR, 4 weeks apart. For HCP born prior to 1957, see below. Give SC.</td>
</tr>
<tr>
<td><strong>Varicella</strong></td>
<td>For HCP who have no serologic proof of immunity, prior vaccination, or history of varicella disease, give 2 doses of varicella vaccine, 4 weeks apart. Give SC.</td>
</tr>
<tr>
<td><strong>Tetanus, diphtheria, pertussis</strong></td>
<td>Give all HCP a Td booster dose every 10 years, following the completion of the primary 3-dose series. Give a 1-time dose of Tdap to all HCP younger than age 65 years with direct patient contact. Give IM.</td>
</tr>
<tr>
<td><strong>Meningococcal</strong></td>
<td>Give 1 dose to microbiologists who are routinely exposed to isolates of N. meningitidis.</td>
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</tbody>
</table>

**Hepatitis A, typhoid, and polio vaccines are not routinely recommended for HCP who may have on-the-job exposure to fecal material.**

17.1 **Hepatitis B**

Healthcare personnel (HCP) who perform tasks that may involve exposure to blood or body fluids should receive a 3-dose series of hepatitis B vaccine at 0-, 1-, and 6-month intervals. Test for hepatitis B surface antibody (anti-HBs) to document immunity 1–2 months after dose #3.

- If anti-HBs is at least 10 mIU/mL (positive), the patient is immune. No further serologic testing or vaccination is recommended.

- If anti-HBs is less than 10 mIU/mL (negative), the patient is unprotected from hepatitis B virus (HBV) infection; revaccinate with a 3-dose series. Retest anti-HBs 1–2 months after dose #3.
  - If anti-HBs is positive, the patient is immune. No further testing or vaccination is recommended.
  - If anti-HBs is negative following 6 doses of vaccine, the patient is a non-responder.

17.1.1 **For non-responders:**

HCP who are non-responders should be considered susceptible to HBV and should be counseled regarding precautions to prevent HBV infection and the need to obtain HBIG prophylaxis for any known or probable parenteral exposure to hepatitis B surface antigen (HBsAg)-positive blood. It is also possible that non-responders are persons who are HBsAg positive. Testing should be considered. HCP found to be HBsAg positive should be counseled and medically evaluated.

**Note:** Anti-HBs testing is not recommended routinely for previously vaccinated HCP who were not tested 1–2 months after their original vaccine series. These HCP should be tested for anti-
HBs when they have an exposure to blood or body fluids. If found to be anti-HBs negative, the HCP should be treated as if susceptible.

17.2  **Influenza**

17.2.1  **Trivalent (Inactivated) Influenza Vaccine (TIV):** May give to any HCP. **Live, Attenuated Influenza Vaccine (LAIV):** May give to any non-pregnant healthy HCP age 49 years and younger.

17.2.2  All HCP should receive annual influenza vaccine. Groups that should be targeted include all personnel (including volunteers) in hospitals, outpatient, and home-health settings who have any patient contact.

17.2.3  TIV is preferred over LAIV for HCP who are in close contact with severely immunosuppressed persons (e.g., stem cell transplant patients) when patients require a protective environment.

17.3  **Measles, Mumps, Rubella (MMR)**

HCP who work in medical facilities should be immune to measles, mumps, and rubella.

- HCP born in 1957 or later can be considered immune to measles, mumps, or rubella only if they have documentation of (a) physician-diagnosed measles or mumps disease; or (b) laboratory evidence of measles, mumps, or rubella immunity (HCP who have an “indeterminate” or “equivocal” level of immunity upon testing should be considered non immune); or (c) appropriate vaccination against measles, mumps, and rubella (i.e., administration on or after the first birthday of two doses of live measles and mumps vaccines separated by 28 days or more, and at least one dose of live rubella vaccine).

- Although birth before 1957 generally is considered acceptable evidence of measles, mumps, and rubella immunity, healthcare facilities should consider recommending a dose of MMR vaccine (two doses during a mumps outbreak) to unvaccinated HCP born before 1957 who are in either of the following categories: (a) do not have a history of physician-diagnosed measles and mumps disease or laboratory evidence of measles and mumps immunity and (b) do not have laboratory evidence of rubella immunity.

17.4  **Varicella**

It is recommended that all HCP be immune to varicella. Evidence of immunity in HCP includes documentation of 2 doses of varicella vaccine given at least 28 days apart, history of varicella or herpes zoster based on physician diagnosis, laboratory evidence of immunity, or laboratory confirmation of disease.

17.5  **Tetanus/Diphtheria/Pertussis (Td/Tdap)**

All adults who have completed a primary series of a tetanus/diphtheria containing product (DTP, DTaP, DT, Td) should receive Td boosters every 10 years. As soon as feasible, HCP younger than age 65 years with direct patient contact should be given a 1-time dose of Tdap, with priority given to those having contact with infants younger than age 12 months.

17.6  **Meningococcal**

Vaccination is recommended for microbiologists who are routinely exposed to isolates of *N. meningitidis*. Use of MCV4 is preferred for persons younger than age 56 years; give IM. If MCV4 is unavailable, MPSV is an acceptable alternative for HCP younger than age 56 years. Use of MPSV is recommended for HCP older than age 55; give SC.
References:


2. For additional specific ACIP recommendations, refer to the official ACIP statements published in *MMWR*. To obtain copies, visit CDC’s website at [www.cdc.gov/vaccines/pubs/ACIP-list.htm](http://www.cdc.gov/vaccines/pubs/ACIP-list.htm); or visit the Immunization Action Coalition (IAC) website at [www.immunize.org/acip](http://www.immunize.org/acip).
CHAPTER 18 INFECTION CONTROL PRACTICES IN INTENSIVE CARE UNIT

The purpose of Infection Control practices in the Intensive Care Unit is to reduce Hospital Acquired Infection (HAI) morbidity and mortality of patients and post-exposure management of personnel by preventing and/or reducing exposure to infectious agents, through strict compliance of Infection Control Protocols.

18.1 Infection Control Surveillance and Reporting

- The Hospital Infection Control Specialist, as a representative of the Infection Control Committee conducts rounds and surveillance of the Intensive Care Unit.

- Any significant findings and trends are reported to the Infection Control Supervisor, ICU Nurse Manager and Medical Director of the ICU by the Infection Control Practitioner. (Details regarding infection control activities can be found in the Infection Control Manual available in the ICU).

18.2 Measures for Prevention and Control of Infections

18.2.1 Health Standards for Personnel:

a. Personnel who have significant contact with patients who are at risk due to immunosuppression should be free of transmittable infectious diseases.

b. HCW with respiratory, Cutaneous, mucocutaneous, herpetic, gastrointestinal or other communicable infections should not have direct contact with these patients.

c. Employees who work in an intensive care environment are considered at higher risk of developing TB, and exposure to blood borne diseases.

d. Nursing staff who are unable to utilize the Standard Precautions outlined in the Infection Control Manual because of current health conditions outlined in (i.e., rash on hands and can not use gloves) will be evaluated by the EHC staff. They will not be allowed to handle ICU patients until the problem is resolved.

e. The ICU Head Nurse will be responsible for advising personnel of exposure to pathogens as well as the infection control recommendations from Infection Control Representatives.

f. Each employee is responsible for notifying supervisory personnel when exposure occurs.

g. Exposure incidents will be reported to Infection Control Department thru the Infection Control Nurse assigned in the area and include the following information:
   - Name and medical file number of involved employee.
   - Area of work
   - Diagnosis of patient involved
   - Steps taken as post exposure management by EHC/DEM.
18.2.2 **Body Substance Precautions**

1. Wash hands before initiating contact with patients; and when body substances have soiled the hands. Hands are to be washed with soap or hospital approved antiseptic agent, running water and friction for 15 minutes paying particular attention to around and under fingernails and between the fingers. Hands should be washed thoroughly and immediately when contaminated.

2. Gloves on both hands are to be worn as protection for anticipated contact with mucous membranes, nonintact skin and body substances from all patients. Gloves protect the hands from being soiled by body substances, keep body substances from beneath fingernails and protect the caregiver from localized infections. Hand wash after gloves are removed.

3. Gloves are to be changed between each patient and/or each task involving blood and/or body substances. Gloves are changed after touching contaminated areas, before going back to care on clean areas.

4. Protective gown is worn whenever contamination of clothing or arms with blood or body substance is anticipated.

5. Masks, Face Shields and/or eye protection are to be worn during tasks where splashing, splattering or spraying with body substance is anticipated, i.e., line placement, suctioning, etc. Masks are worn above the nose and below the chin and immediately discarded when not in use. They are not allowed to be left hanging on or under the chin.

18.3 **Standard Precautions**

Standard Precautions combine the features of universal precautions and body substance isolation. Standard precautions apply to all patients regardless of their diagnosis or suspected infection status.

*Standard precautions apply to the following:*-

- Blood
- All body fluids, secretions and excretions except sweat whether or not they contain visible blood.
- Nonintact skin, and
- Mucous membranes.

18.3.1 **Standard Precautions include the following:**

1. **Hand Hygiene** - hands are to be washed after touching blood, body fluids, secretions, excretions or other contaminated items, whether or not gloves have been worn. Hands must be washed immediately after removal of gloves, between any patient contact and when otherwise indicated. This will help prevent transmission of microorganisms. To prevent cross contamination of different body sites on the same patient, it may be necessary to wash hands between tasks an procedures.
2. **Gloves** - gloves are to be worn when touching blood, body fluids, secretions and other contaminated items. Clean, nonsterile gloves will be adequate. Gloves shall be changed between tasks and procedures on the same patient after contact with material that may contain a high concentration of microorganisms.

3. **Mask, Eye Protection, Face Shields** - when performing procedures that may be likely to generate splashes or sprays of blood, body fluids, secretions or excretions, wear a mask and eye protection or a face shield. This will protect the mucous membranes of the eyes, nose and mouth. Masks must be worn properly covering the nose and the mouth and immediately discarded when not in use.

4. **Gowns** - when performing procedures that may likely to generate splashes or sprays of blood, body fluids, secretions or excretions, wear a gown to protect the skin and to prevent soiling of clothing. Always remove the soiled gown as soon as possible and wash the hands.

5. **Uncontaminated PPE** are discarded in **black bags**; **contaminated PPE** in **orange bag**.

6. **Patient Care Equipment** - all patient care equipment that is soiled with blood, body fluids, secretions or excretions shall be handled in a manner that will prevent skin and mucous membrane exposures. Single use, disposable items must be disposed properly. Make sure that the reusable equipment has been cleaned and reprocessed appropriately prior to use on another patient.

7. **Environmental Controls** - make sure that the facility has adequate implemented procedures for the routine cleaning of all surfaces including beds, bedrails, bedside equipment and other frequently touched surfaces.

8. **Linen** - used linen soiled with blood, body fluids, secretions and excretions will be handled, transported and processed in a way that prevents skin and mucous membrane exposure, contamination of clothing and the transfer of microorganisms to other patients and the environment. Non-infected linens are placed on blue laundry bags and infected linens on the water soluble laundry bags.

9. **Occupational Health and Bloodborne Pathogens** - avoid injuries if at all possible when using needles, scalpels and other sharp instruments. Never recap needles, place all contaminated needles, syringes, scalpel blades and other sharp items in designated puncture resistant containers. These containers should be located as close as possible to the area where the items are used. They should be replaced when ¾ full.

10. Instead of doing **mouth-to-mouth resuscitation**, use mouthpieces, resuscitation bags or other ventilation devices when the need for resuscitation is anticipated.

11. **Patient Placement** - ensure that patients who may be a source of contamination to other patients or the environment be placed in a private room. If single rooming is not possible, Cohorting of patients and staff assigned is observed and consult with your infection control professional.

12. **Respiratory Hygiene / Cough Etiquette**
• Applied to all persons who enter the health care setting including health care personnel, patients and visitors with signs and symptoms of respiratory tract infections to cover their mouths / noses when coughing or sneezing using disposable tissue and dispose the contaminated tissue properly.

• Perform hand hygiene after hands have been in contact with respiratory secretions.

18.4 Transmission Based Precautions

Beside Standard Precaution, Transmission Based Precaution is implemented to patient with certain infectious disease that need extended precaution. They are:

18.4.1 Airborne Precaution
18.4.2 Droplet Precaution
18.4.3 Contact Precaution

For more details, see the Infection Control Manual. See the table of isolation precaution for each specific disease.

18.5 Management of Patients with Resistant Organisms

In the Intensive Care Units, when multiple drug resistant bacteria are cultured from any site, contact precaution should be implemented. The need for isolation/transfer will be evaluated in consultation with the Infection Control Team. The following organisms are examples:

• Gram negative bacilli with ESBL.
• Staphylococcus aureus resistant to methicillin (oxacillin)
• Vancomycin resistant enterococcus
• Pan-resistant organisms.

18.5.1 Precautions:

• Body Substance Precautions (including the use of gloves) for all patient contact.
• Patient equipment will not be shared (e.g., blood pressure cuffs).
• Every effort shall be made to place patients in private areas.
• Isolation signs will be placed in a conspicuous place at the entrance of the room.

18.5.2 Contact Precautions will be maintained until:

• Three negative cultures are obtained from the original site at least 72 hours apart and following completion of effective therapy (negative culture is defined as a report of ‘no growth’, ‘normal flora’ an organism which does not conform to any of the preceding definitions).
• If unable to obtain cultures: consult with IC Team.
Nursing personnel shall document on the patients plan of care, standard and transmission based precautions in use for patients with resistant organisms (contact). Documentation will list the patient’s response to these interventions.

When a resistant organism is isolated from any site, in two or more patients on the same unit, the Infection Control Services will be advised and an epidemiological investigation will be initiated, if indicated.

For additional information regarding the management of patients with multiple resistant organisms, please refer to Infection Control Manual.

18.6 Management of Outbreaks

18.6.1 Cluster epidemiology will become the immediate top priority at any time an unexpected occurrence or frequency of infection becomes evident.

a. The nurse has to report infection clusters or unusual patterns (especially viral or parasitic infection).

b. Indicators for such increased incidence may include reports of a particular organisms, service, site or unit.

c. All infections which fit the previously mentioned criteria will be reported to the Infection Control Team.

18.6.2 The outbreak investigation is to be directed by Infection Control Team with the cooperation of nursing staff. Please refer to Infection Control Manual.

18.6.3 When a resistant organism is isolated from any site in two or more patients housed on the same unit, Infection Control will be advised and an epidemiological investigation will be initiated, if indicated.

- The type of control measure and their duration (e.g., closure of unit or closure to new admissions) will be determined by the Supervisor of the Infection Control Department and Head of the Unit.

- If diversion of new admits is required, they will be located in an intensive care environment which can best meet their treatment needs.

18.7 Assignment of Nursing Personnel

Nursing personnel will be given patient care assignments which minimize the risk of transmission of infectious organisms, if at all possible. In the event such assignments are not possible, patients will be grouped based on an infectious agents/ colonizing organism to minimize the spread of accidental contamination.

18.8 Transport of Patients with Infectious Disease

1. When a patient with an infectious process requires transport from an intensive care setting, the goal is to protect the patient and those who come in contact with them.

2. During transport all non essential personnel should not have contact with the patient.
3. When preparing the patient for transport the staff should create a closed system as much as possible.
4. Personnel will wear protective barriers if required by the patient’s condition, gowns, masks, etc.
5. Receiving department must be notified of the patient coming to prepare for precautionary actions needed.
6. Consideration should be given for discontinuation of any equipment not necessary for the patient’s short term care needs.
7. Invasive lines should be secured to minimize the potential for body substance contamination.
8. Intubated patients requiring oxygen should be transported in a way which minimizes the potential for respiratory contamination.
9. Non-intubated patients requiring respiratory hygiene will wear a mask at all times when off their unit or during transport.

**18.9 Infection Control Guidelines for Patient’s Visitors**
1. In establishing visiting guidelines, our goal is to ensure both patients and their visitors are protected from exposure to infectious contaminates.
2. Nursing personnel are responsible for ensuring adequate precautions are taken based on each patient's diagnosis / condition.
3. Staff will instruct visitors in standard precautions, handwashing, gowning, gloving, etc., as indicated.
4. Nursing personnel observe for visitors in the patient care areas with a noticeable illness (cold, flu, etc.).
5. Staff should evaluate appropriateness of the visit to prevent patients from exposure to communicable diseases.
6. Staff will inform the visitor when exposure would potentially effect the patient’s condition adversely and request they leave the area.
7. **Traffic Control:**
   a. Not more than 2 visitors are allowed at the same time for each patient.
   b. All visitors should enter/exit a unit from the main entrance following the hospital/unit visitor protocol. They also are advised to observe hand hygiene and PPE use according to the need.
   c. In the unit, their contact will be limited to whomever they have come to see.
   d. No visitors will be allowed access to any other patient area or where medications, intravenous or wound care supplies are prepared or stored.
   e. Visitors are only allowed during visiting hours.

**18.10 Environmental Hygiene**
1. Nursing is responsible for assuring and maintaining a clean environment which prevents the spread of infection.
2. Equipments requiring sterilization is the responsibility of Central Sterile Supply Department (CSSD) unless cited.

3. **Nursing responsibilities are as follows:**
   a. **Medication storage and preparation area** - any place where medication and/or sterile equipment is stored.
   b. **Crash Cart** – the inside of the crash cart shall be cleaned periodically and supplies replaced when outdated.
      - The above items will be cleaned with a hospital approved solution.
   c. Any instrument which has been in contact with oral mucosa (laryngoscope blades and stylets) shall be confined and contained at the point of use in clear plastic bags labeled with bio-hazardous insignia. This is exchanged for clean equipment.
   d. **Contaminated instruments and trays** shall be confined and contained at the point of use.
      - Sharps such as scalpels and needles will be disposed of in the approved sharps container.
      - Open all scissors, hemostats and similar instruments, place in clear plastic bags with a biohazardous label, secure bag and place tray in the ‘dirty’ area for transport.
   e. **Refrigerators** – ICU staff will schedule a time for refrigerators to be cleaned.
      - Staff will remove all items from the medication refrigerator and wipe up any spills.
      - Dietary Services will be responsible for cleaning patient nutrition refrigerators.
   f. ICU staff are responsible for cleaning/rinsing items such as urine measuring cups and bedpans between use.
   g. **Food or drink** other than patient food items will be kept outside the ICU.
   h. **General equipment** – items including tables, chairs, gurneys, scales, slider boards and monitor cables shall be cleaned and soon as possible with approved solution and by appropriate staff.
   i. **Patient Discharge:**
      - ICU staff will remove all items such as linen, curtains, patient care supplies, etc., which may have been contaminated by body substances.
      - Monitor cables and lead wires will be cleaned by ICU staff, with an approved solution.
      - Infusion pumps or equipment used at the bedside will be removed, obvious spills wiped clean and the appropriate service area contacted for disinfection.
      - IV poles will be removed from the bedside and placed in the dirty utility room to clean.
- ICU staff shall be responsible for supervising in cleaning the area and preparing for the next admission.

4. Education

1. The nurse manager of the unit is responsible for assessing the infection control education needs of personnel.

2. Infection Control education will be coordinated with Infection Control Department.
3. Baseline Screening for newly admission from:–
   a) nostrils, groin and axillae
   b) swab from device site (e.g. tracheostomy)
   c) swab from wound or bed sore

4. Patient transferred from other hospitals should be on ‘contact precaution’ until cleared by Infection Control Practitioner after laboratory results.

5. Screening of ICU patients is done only in case of an ‘outbreak’ in coordination with Infection Control (IC) team.

6. Infected patients under transmission based isolation precaution are screened after 48 hours from antibiotic cessation until cleared by Infection Control Practitioner after 2 or 3 negative (-ve) laboratory results.

7. ICU patient diagnosed as MRSA, colonized/infection should be screened for other site colonization in coordination with infection control team. Other patients maybe screened to detect hidden cases.

6. Routine screening for ICU patient is not recommended.

7. Routine culture for central line catheter tip is not recommended. Send sample only if infection is suspected.

8. Routine blood culture not to be done. Send sample only if bacteremia is suspected.

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