Hospital Infection Prevention and Control Manual

Quality Improvement Secretariat
Ministry of Health & Family Welfare

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Developed by

Quality Improvement Secretariat (QIS), Health Economics Unit, Health Services Division, Ministry of Health and Family Welfare, Government of Bangladesh, in collaboration with USAID's MaMoni Health Systems Strengthening Project

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Message

This document lays down the policies and broad guidelines required for the practice of a nationally acceptable standard of IPC in health care settings. We all know that the Healthcare-associated infections (HAI) are infections that are acquired in healthcare facilities or as a result of healthcare interventions and lapses in infection prevention. The Ministry of Health and Family Welfare (MOHFW) is committed to create and sustain an environment that is safe and ensures that no patient is harmed due to an avoidable healthcare associated infection (HAI).

Quality Improvement Secretariat (QIS) has done commendable job on quality of care since its inception in 2015. Quality of care, as a mainstay of Universal Health Care (UHC), got satisfactory momentum. MOHFW will remain supportive to accelerate the momentum even more in years to come.

I am delighted that the Manual for Infection prevention and control, which is a national document, has been developed receiving inputs from all relevant stakeholders in the light of Quality Improvement Strategic Plan under the leadership of Quality Improvement Secretariat with the financial and technical assistance of USAID provided through the MaMoni-HSS Project. I believe this will be an effective and useful document for the planners, health administrators and health managers including health care providers at different levels of health service system.

I appreciate the QIS of Health Economics Unit (HEU) for leading the work of developing the guideline. I also thank HEU and others concerned who were involved in the development process. I hope that by acquiring knowledge from this document, health professionals will play their respective roles in infection prevention and control in Bangladesh.

Joy Bangla, Joy Bangabandhu
Long live Bangladesh.

Mohammed Nasim, MP
Minister
Ministry of Health and Family Welfare
Govt. of the People's Republic of Bangladesh

Message

Patients' care needs an environment that is safe and clean in order to keep risk of acquiring infection as low as possible. This manual is, basically, crafted to meet that crucial need. This will facilitate the delivery of high quality health care for patients and will ensure safe working environment for our health care workers.

MOH&FW is committed to the prevention and control of infections in hospitals and to provide care which is in line with Quality Improvement Strategy Plan to ensure that no patient is harmed due to an avoidable Healthcare-associated infection.

This piece of work is an outcome of sincere efforts of many experts, professionals and organizations which intended to prepare a comprehensive yet user friendly and oriented towards practical management of infection prevention and control program in a facility.

We accept that some aspects of the guidelines may be a challenge to implement initially due to lack of facilities or insufficient personnel, but we strongly believe that these guidelines represent best practices. Where there are difficulties, these should be adapted locally so that measures are taken to ensure implementation.

Effective infection prevention and control practice is an essential feature of patient protection. By incorporating these guidelines into routine daily clinical practice, patient safety can be enhanced and the risk of patients acquiring an infection during episodes of health care in hospitals in Bangladesh can be minimized. We strongly encourage institutionalizing the implementations of these guidelines across health sector.

We extend thanks to QIS, HEU of MOH&FW for their timely initiative to develop this manual involving all relevant stakeholders, experts, professionals and others. We also give special thanks to USAID's MaMoni HSS Project for providing technical and funding support in preparing and publishing the manual.

Md. Serajul Huq Khan
Secretary
Health Services Division
Ministry of Health and Family Welfare

Message

Healthcare associated infections (HAIs) are preventable through implementation of best infection prevention and control practices. Infection prevention and control refers to measures aimed at preventing and controlling infections and transmission of infections in health care settings. Our overall aim is to ensure a safe hospital environment for both patients and care providers by preventing and controlling infections.

This manual presents guidelines that are developed to provide a coordinated approach to the prevention and management of HAIs. The guidelines are based on the best available current evidence and built on existing international guidelines and reviews, as well as systematic reviews of the evidence.

This manual on infection prevention and control (IPC) responds to the heightened concerns about inappropriate IPC practices in health care settings in the country. We firmly believe that practice of these guidelines will eliminate unacceptable IPC practices in hospitals.

I am confident this document is a comprehensive one because it was developed after extensive review of relevant literature and consultation with experts, professional bodies, and other stakeholders, and also because its contents are realistic, practical, and designed to meet local requirements.

The guidelines are for use by all those working in healthcare-this includes healthcare workers, management and support staff: I recommend them to follow and implement it for promoting good and safe practices in all health care facilities according to local need.

I know the resource limitations and other shortcomings prevail in our facilities but we can always customize with local situations.

Particular thanks to Quality Improvement Secretariat (QIS) for their initiative and efforts for the development of this important document and also to MaMoni -HSS project/USAID for their valuable all out support for the process of developing, finalizing and publishing the manual.

Prof. Dr. Abul Kalam Azad
Director General
Directorate General of Health Services
Ministry of Health and Family Welfare

Message

Healthcare workers are in the front line of protecting themselves and their clients from Hospital Associated Infections (HAI). They perform clinical procedures and other relevant & necessary activities that can expose themselves and clients to potentially infective organisms. Many of their patients are sick and they are more susceptible to infections or they have infections that can be transmitted to others.

Without the proper precautions, facilities can cause the spread of infections and diseases. When providing healthcare services in hospital, it is essential to prevent transmission of infections at all time. Hospital Associated Infections (HAI) are a continuing problem everywhere in the world. Although we don't think about the gravity of it, healthcare facilities are prime settings for transmission of diseases. It is because of many reasons e.g. invasive procedures, exposure to potentially infectious materials, low immune status of already sick patients and overcrowding situation in the hospitals etc.

I am sure that implementing the programmatic approach proposed and the guidelines underscored in this manual will effectively ensure Infection Prevention and Control (IPC) in our hospital services both in the public and private sector.

The aim of this manual is to ensure that the hospital quality improvement committee (QIC), work improvement team (WIT), units and individual will participate in the prevention and control of Hospital associated infections (HAIs) activities.

Finally, I appreciate and thank the financial and technical assistance of USAID provided through its MaMoni-HSS Project. I strongly believe this document will be useful for the planners, health administrators and health managers and ultimately health care providers at different levels of health service system.

Dr. Mohd. Shahadt Hossain Mahmud
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Acknowledgements

Prevention and control of Hospital Associated Infections is one of the key approaches of ensuring patient safety. Many infections have the potential to spread in the healthcare environment and both service users and caregivers are at risk. This document on Infection Prevention and Control (IPC) is the first of its kind in health sector, which would serve as a national document to guide IPC activities in health facilities in both public and private sector across the country.

The purpose of this manual is to provide IPC guidelines (with customization options, depending on the level and type of hospital) for healthcare providers (hospital administrators, nurses and midwives, doctors and support staff) to use in all categories and all level of hospitals, public and private in Bangladesh. The guidance includes strategic directions, approaches, and actions for all major hospital services and sections. The manual incorporates and adapts mostly from the World Health Organization's Practical Guidelines for Infection Control in Health Care Facilities and some other international publications.

The development of this manual was made possible through generous support from USAID's MaMoni HSS Project. Quality Improvement Secretariat (QIS) would like to thank MaMoni HSS Project for its continued support to many other quality improvement activities including this manual development and publication.

Finally, the QIS would like to extend special thanks to all the health professional bodies, individual health professionals, experts and many others who voluntarily engaged themselves in the process of developing this.

Dr. Md. Aminul Hasan, PhD
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ACKNOWLEDGMENTS

This manual has been developed through an extensive consultative process involving concerned representatives of the Directorate of Health Services, Directorate of Family Planning, development partners, health research organizations, professional bodies, and specialists, such as pediatricians, obstetricians and gynecologists, surgeons, anesthesiologists, and public health experts. The technical advisory group members have been involved in the process.

ABBREVIATIONS

AIIR	Airborne Infection Isolation Room
CSSD	Central Sterile Supply Department
GI	Gastro Intestinal
HAI	Healthcare Associated Infections
HEU	Health Economics Unit
HSCT	Hematopoietic stem cell transplant
HIV	Human Immunodeficiency Virus
HSP	Health service provider
ICU	Intensive Care Unit
INGO	International NGO
IPC	Infection Prevention and Control
IPCSC	Infection Prevention and Control Sub- Committee
IPCN	Infection Prevention and Control Nurse
IPP	Infection Prevention Program
IPD	In-patient Department
MOHFW	Ministry of Health and Family Welfare
NICU	Neonatal Intensive Care Unit
OPD	Out Patient Department
OT	Operation Theatre
PPE	Personal Protective Equipment
QIC	Quality Improvement Committee
QIS	Quality Improvement Secretariat
RTI	Respiratory tract infection
SARS	Severe Acute Respiratory Syndrome
TSSU	Theatre Sterile Supply Department
TB	Tuberculosis
WHO	World Health Organization
WIT	Work Improvement Team
ZN	Ziehl Neelsen

1 INTRODUCTION

Background

Health care-associated infections (HAIs) are preventable with correct infection prevention and control (IPC) practices. This IPC manual will ensure a safe working environment for the health care providers and patients.

HAIs are an important focus of infection prevention in all countries, but in developing countries, they are a major cause of preventable disease and death. The most important HAIs are

- Urinary tract infections, pneumonia, and diarrhea
- Infections following surgery or invasive medical procedures
- Maternal and newborn infections

The organisms causing most HAIs come from the patient's own body (endogenous flora). They also can come from contact with staff (cross-contamination), contaminated instruments and needles, and the environment (exogenous flora). In fact, a large portion of infections that originate in hospitals and all those that originate in ambulatory care facilities become apparent only after patients are discharged. As a consequence, it is often difficult to determine whether the source of the organism causing the infection is endogenous or exogenous. Key contributing factors are

- Inadequate standards and practices for operating blood transfusion services
- Increasing use of invasive medical devices (e.g., mechanical ventilators, urinary catheters, and central intravenous lines) without proper training or laboratory support
- Use of contaminated intravenous fluids, especially in hospitals making their own IV solutions
- Antibiotic resistance due to overuse of broad spectrum antibiotics
- Unsafe and frequently unnecessary injections

Most of these infections can be prevented with readily available, relatively inexpensive strategies by

- Adhering to recommended infection prevention practices, especially hand hygiene and wearing gloves
- Paying attention to well-established processes for decontamination and cleaning of soiled instruments and other items, followed by either sterilization or high-level disinfection
- Improving safety in operating rooms and other high-risk areas where the most serious and frequent injuries and exposures to infectious agents occur

Impact of Infection Prevention

The increased length of stay for infected patients is the greatest contributor to cost. Coello et al. (1993) showed that the overall increase in the duration of hospitalization for patients with surgical wound infections was 8.2 days, ranging from 3 days for gynecology to 9.9 days for general surgery and 19.8 for orthopedic surgery. Prolonged stay increases not only direct costs to patients or payers but also indirect costs due to lost work. The increased use of drugs, the need for isolation, and the use of additional laboratory and other diagnostic studies also contribute to costs (Bangal et al. 2014).

It might not be possible to eradicate all hospital-related infections. However, an effective infection control program provides optimum protection for both service providers and service receivers. The purpose of this manual is to help provider teams achieve the best possible IPC practices.

There are several goverenment documents at present taking about infection prevention in pieces. To standardize the practices, this IPC document was developed.

Hospitals should have a committee for IPC and should implement an infection prevention program following implementation framework suggested in this document. This document will be reviewed and updated at regular intervals by the Quality Improvement Secretariat, Ministry of Health and Family Welfare.

Users of the Manual

This manual is intended for use by all who are involved in hospital services, including health care workers, management, and support staff. The manual is generic in nature and can be used in any health care facility. It will serve as a central reference for IPC so that comprehensive infection prevention and control practices are adhered to in each health care facility and setting, including hospitals, health centers/clinics, and special care facilities (government and private).

Infection prevention and control in the health care facility shall be effectively and efficiently supervised, and should be supported with appropriate and adequate resources.

Standard precautions should be implemented, and additional precautions should be implemented where deemed necessary.

This manual is based on systematic reviews of the best available current evidence and on existing international manuals and reviews.

The Global Situation

A World Health Organization prevalence survey conducted in 55 hospitals in 14 countries representing four World Health Organization regions (Europe, Eastern Mediterranean, Southeast Asia, and Western Pacific) showed an average of 8.7% of hospital patients had nosocomial infections (i.e., infections that originate in hospitals) (Tikhomirov 1987). At any time, more than 1.4 million people worldwide suffer from infectious complications acquired in hospitals. The highest frequencies of nosocomial infections (11.8 and 10.0%,

respectively) were reported from hospitals in the Eastern Mediterranean and Southeast Asia regions (Mayon-White et al. 1988). The most frequent nosocomial infections are infections of surgical wounds, urinary tract infections, and lower respiratory tract infections. The World Health Organization study and others have also shown that the highest prevalence of nosocomial infections occurs in intensive care units and acute surgical and orthopedic wards. Infection rates are higher among patients with increased susceptibility because of old age, underlying disease, or chemotherapy (World Health Organization 2002).

The Situation in Bangladesh

There are a few studies of infection control in hospital settings in Bangladesh. One of the few, a study by Faruquzzaman (2011) of the surgical ward at Dhaka Medical College, revealed that 30% of the study patients had suffered a nosocomial infection. Among them, 38.7% were wound infections, 26.6% were urinary tract infections, 19.2% were acute respiratory tract infections, and 12.5% were acute gastrointestinal infections. Another significant finding of this study was that there was a strong positive association between the frequency of nosocomial infections and the number of visitors per patient per day. Shamsuzzaman (2015) suggested that hand hygiene as a strategic action for infection control in hospitals must be part of the organizational culture of hospitals.

Medical records of 8,769 in patients of a private hospital in Dhaka, Bangladesh, in 2014 indicated a nosocomial infection rate of 2.29%, with respiratory tract infection accounting for the highest proportion of infections (63%) and skin & soft tissue infections the lowest (2% of infections), (Begum et al. 2017).

Hasan (2010) describes in an editorial that, within the health system of Bangladesh, infection control is not a well-recognized discipline. Some private hospitals in Dhaka have initiated basic infection control measures, but the overwhelming majority of both government and private hospitals are not even aware of the existence of such measures.

Overcrowding, inadequate and unsanitary facilities, lack of routine cleaning and basic infection control measures (e.g., coughing etiquette and disinfecting medical equipment before/after use), and improper waste management may combine to create opportunities for transmission of infection in the observed hospital wards. This type of environment poses a threat of infection, particularly through contact with contaminated hands, objects, or surfaces, to all individuals in the wards, including patients, family caregivers, visitors, and hospital staff.

Rationale

There is no active infection prevention program institutionalized in most health facilities in Bangladesh, and at present there is no standardized, government-recommended IPC manual in the public or private health sector. Therefore, a manual that can be used in all health care facilities is needed.

Purpose

A key purpose of this manual is to provide IPC guidelines (with customization options, depending on the level and type of hospital) for health care providers (hospital administrators, nurses and midwives, doctors, and support staff) to use in all categories and all level of hospitals public and private in Bangladesh. The guidance includes strategic directions, approaches, and actions for all major hospital services and sections.

The manual incorporates and adapted mostly from the World Health Organization's Practical Guidelines for Infection Control in Health Care Facilities and some other international publications.

Objectives

General

The general objective of this manual is to provide administrators and health care workers with guidelines that enable them to implement an IPC program effectively so that they can protect themselves, patients, and others from the transmission of HAIs.

Specific

The specific objectives are to provide directions and information related to

- Formation of an IPC committee in the health care setting and terms of references for the committee
- Facilities, equipment, and procedures needed to implement standard and additional (transmission-based) precautions for control of infections
- Basic IPC practices
- Cleaning, disinfecting, and reprocessing of reusable equipment
- Protection of health care workers from transmissible infections
- IPC in special situations

2 IMPLEMENTATION STRUCTURE FOR INFECTION PREVENTION AND CONTROL IN HOSPITALS

Introduction

On admission to a hospital, a patient may present with a community-acquired infection that is transmissible from patient to patient as well as to health care workers, and visitors. Patients, visitors, and staff are therefore vulnerable to opportunistic pathogens. In addition, the misuse of antibiotics and a lack of compliance with isolation technique predispose people in hospitals to the spread of nosocomial and other infections. Effective measures must be developed to prevent, identify, and control infections.

An effective infection prevention and control (IPC) committee is necessary for IPC in a hospital. The hospital manager and Hospital Superintendent are responsible for ensuring that an appropriate IPC program is in place.

Infection Prevention and Control Program

The following are important components of an infection control program

- Basic measures for infection control (i.e., standard and additional precautions)
- Education and training of health care workers
- Protection of health care workers (e.g., immunization)
- Identification of hazards and minimizing risks
- Routine practices essential to infection control, such as aseptic techniques, use of single-use devices, reprocessing of instruments and equipment, antibiotic use, management of blood/body fluid exposure, handling and use of blood and blood products, and sound management of medical waste
- Effective work practices and procedures, such as environmental management practices, including management of hospital/clinical waste, support services (e.g., food and linen), and use of therapeutic devices
- Surveillance
- Incident monitoring
- Outbreak investigation
- Infection control in specific situations
- Research

Adapted from Republic of Trinidad and Tobago Ministry of Health (MOH), Pan American Health Organization. Infection Prevention and Control Policies and Guidelines for Health Care Services. 2nd ed. Port of Spain, Trinidad and Tobago: MOH, 2011.

The Hospital Infection Prevention and Control Subcommittee

There shall be an active hospital infection prevention and control subcommittee (HIPCSC) in each hospital. The committee shall represent all disciplines or departments in the hospital.

The HIPCSC will be part of the hospital's quality improvement committee (QIC), which is the apex body for quality improvement activities. The HIPCSC will be responsible for IPC program implementation as well as approval of all chemicals used for disinfection and all methods of sterilization.

This manual will be used as a central reference for IPC so that comprehensive IPC practices will be adhered to in each hospital setting.

Infection prevention and control in the health care facility shall be effectively and efficiently supervised and supported with appropriate and adequate resources.

Standard precautions must be implemented and additional precautions will be implemented where necessary.

Structure of Hospital Infection Prevention and Control Subcommittee (HIPCSC)

The hospital IPC subcommittee provides a forum for multidisciplinary input, cooperation, and information sharing. This subcommittee should include wide representation from relevant departments. An example of membership in the subcommittee of tertiary hospital is shown below. Modifications can be made based on local needs and type of hospital.

- Chairman: Hospital director/superintendent
- Member secretary: Deputy director/Assistant Director/Resident medical officer
- Members: Professor/ Associate Professor/ Senior Consultant/ Consultant of all departments and section i.e., Departments of: Medicine, Surgery, Gynecology and Obstetrics, Casualty, Pathology, Microbiology etc. and Sections: Sterilization, Waste management, Housekeeping, and Maintenance etc
- Focal person (selected by the committee to coordinate all committee activities)

Roles and Responsibilities of the Hospital Infection Prevention and Control Subcommittee

The committee has the following responsibilities for

Tasks	Responsibility
Develop and review control of health care–associated infection policies and manuals	HIPCSC
Ensure compliance with policies and manuals	HIPCSC
Develop and review service specifications	HIPCSC
Allocate resources (availability of staff, cost implications)	HIPCSC
Involve infection control teams	HIPCSC
Training and education	HIPCSC
Coordination	Focal person
Performance management	Focal person

- Developing an IPC work plan
- Establishing infection surveillance, regularly reviewing data, and taking necessary measures
- Coordinating and conducting training activities, including staff training
- Providing/advocating for sufficient resources to support the IPC program
- Monitoring infection prevention practices and applying measures to close gaps between set standards and actual practices (e.g., isolation, sterilization, waste management, etc.)
- Collecting data to measure indicators reflecting extent of infections acquired in the health facility (e.g., postoperative infection rate)
- Developing and disseminating infection control policies

Monitoring and managing critical incidentsnfection Prevention and Control Focal Person

The infection prevention and control focal person is a physician nominated by the HIPCSC. The focal person's main responsibility is to coordinate HIPCSC activities and to take initiatives for implementing IPC activities. He or she also provides instruction and guidance to work improvement teams to translate guidelines into practice.

The Quality Improvement Committee

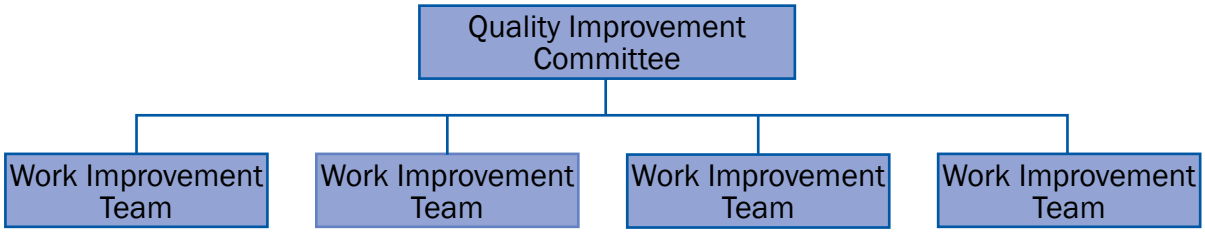
Ministry of Health and Family Welfare developed a strategic plan on health care quality improvement in 2015 and created a dedicated unit called the Quality Improvement Secretariat for developing protocols, guidelines, standards of practice and piloting quality improvement projects for building evidence.

The Quality Improvement Secretariat has circulated nationwide instruction on how to form a quality improvement committee. The QIC acts as a hospital's apex body for implementing

quality improvement activities. It has the following responsibilities

- Monitoring and mentoring work improvement teams
- Periodic review of the progress of quality improvement activities
- Ensure implementation of quality improvement strategy and guidelines to attain quality of care at hospitals
- Ensure adherence to clinical protocols and quality standards through regular internal assessments, audits, and reviews, and initiate corrective action plans for identified gaps
- Regular monthly reporting to the appropriate authority/Quality Improvement Secretariat and sharing of feedback in internal review meeting

Figure 1: Structure of Quality Improvement Program in a Hospital



Roles and Responsibilities of the Work Improvement Teams

The work improvement teams that are supervised by the quality improvement committee have the following responsibilities

- Implementing 5S
- Holding regular meetings
- Preparing action plan
- Taking pictures to demonstrate changes (before and after) in their respective sections
- Identifying problems in their sections and presenting a future plan to the QIC through the QI focal person
- Solving problems with existing resources
- Seeking support from QIC for problems they cannot solve
- Finding innovative ways to work

Table 1: Structure of a Work Improvement Team

Position	Person
Facilitator	Medical officer and above
Team leader	Nursing supervisor/SSN/anyone suitable for the section
Member secretary	SSN/anyone suitable for the section
Member	MLSS
Member	MLSS
Member	Cleaner

Education and Training

The IPC program must include ongoing in-service education on IPC for all categories and levels of staff so that they understand basic concepts of hygiene, microbiology, immunology, epidemiology, the infectious disease process, prevention and control of nosocomial and other infections, and compliance with IPC guidelines. As new employees join the staff, the QIC must orient them to IPC.

A program of education for the patients and their caregivers should also be implemented to create awareness of IPC.

Monitoring and Supervision

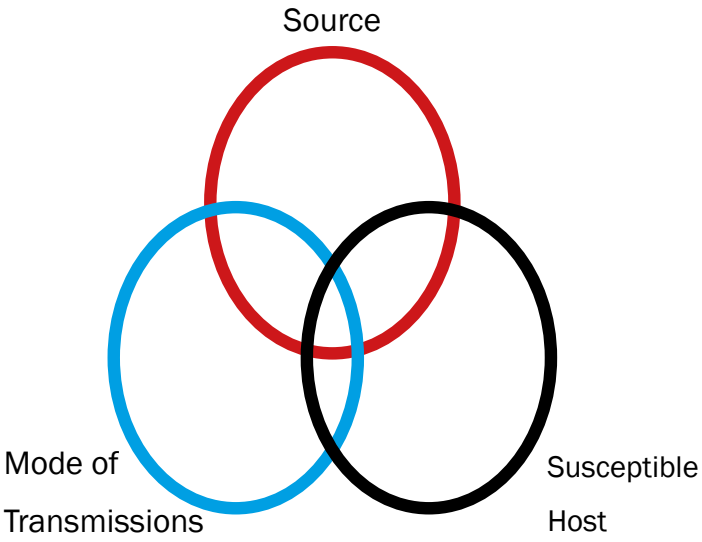
Monitoring and supervision is essential for successful IPC program implementation. The IPC program should use a monitoring checklist for compliance and practices. The IPC focal person will engage the work improvement team focusing standard precautions as per the monitoring and supervision plan. The IPC focal person should share monitoring and supervision progress and challenges in the QIC meeting.

3

TRANSMISSION ELEMENTS

Comprehension of the infectious disease process is necessary in order to understand the spread of infections in hospitals. The spread of infection requires three interrelated elements: a source of infecting organisms, a susceptible host, and a mode of transmission for the microorganism.

Figure 2: Transmission of Infectious Agents in All Settings



Source

The source of the infecting agent may be patients, staff, or visitors. It may be a person with active disease, someone in the incubation period of a disease, or someone who is colonized by the infectious agent but have no apparent disease (carriers).

Other possible sources of infecting microorganisms include a patient‘s own endogenous flora (autogenous infection), which may be difficult to control, and inanimate environmental objects that have become contaminated, including equipment and medications.

Adapted from Republic of Trinidad and Tobago Ministry of Health (MOH), Pan American Health Organization. Infection Prevention and Control Policies and Guidelines for Health Care Services. 2nd ed. Port of Spain, Trinidad and Tobago: MOH, 2011.

Host

The susceptible host is the second element in the spread of infection. Persons lacking effective resistance to a particular microorganism are susceptible to those microorganisms.

Patients' resistance to pathogenic microorganisms varies greatly. Some persons may be immune or able to resist colonization by an infectious agent, while others exposed to the same agent may establish a commensal relationship with the infecting microorganism and become asymptomatic carriers, and still others may develop a clinical disease.

Certain conditions—such as age, underlying diseases such as diabetes, treatments with antimicrobials, corticosteroids, or other immunosuppressive agents, irradiation, and breaks in the first line of defense mechanisms caused by factors such as surgical operations and indwelling catheter intubation and suctioning—may render patients more susceptible to infection.

Types of Transmission

Microorganisms are transmitted in health care facilities by several routes, and the same microorganism may be transmitted by more than one route. There are five (5) main modes of transmission:

- Contact
- Droplet
- Airborne
- Food-borne and waterborne
- Vector-borne

Contact Transmission

This is the most important and most frequent mode of transmission of nosocomial infection and it can be divided into two subgroups: direct-contact transmission and indirect-contact transmission.

- Direct-contact transmission involves direct body surface-to-body surface contact and physical transfer of microorganisms between a susceptible host and an infected or colonized person, such as occurs when a person turns a patient, gives a patient a bath, or performs other patient care activities that require direct personal contact. Direct transmission also can occur between two patients, with one serving as the source of the infectious microorganisms and the other as a susceptible host.
- Indirect-contact transmission involves contact of a susceptible host with a contaminated, usually inanimate, intermediate object, such as an instrument, needle, or dressing, or with contaminated hands, medications/intravenous solutions, blood, or equipment and devices.

Droplet Transmission

Droplets are generated from the source person primarily during coughing, sneezing, and talking. Transmission occurs when microorganism-containing droplets from the infected person are propelled a short distance through the air and deposited on the host's conjunctivae, nasal mucosa, mouth, or environmental surfaces. For transmission to occur, the source and the susceptible host need to be within approximately 1 meter (3 feet) of one another. Large droplets (greater than 5 µm in diameter) carry the infectious agent.

Airborne Transmission

Airborne transmission occurs by dissemination of either airborne droplet nuclei (small particle residue) of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time, or dust particles containing the infectious agent. Infection usually occurs by the respiratory route, with the agent present in aerosols (infectious particles less than 5 µm in diameter).

The performance of certain procedures such as suctioning, aspiration of respiratory tract, intubation, resuscitation, bronchoscopy, and autopsy will generate aerosols.

Microorganisms carried in this manner can be dispersed widely by air currents and may be inhaled by a susceptible host within the same room or over a long distance from the source patient, depending on environmental factors.

Microorganisms transmitted by air include mycobacterium tuberculosis, rubella, and varicella viruses. Optimal control of airborne transmission requires control of air flow through special ventilation systems or well-ventilated rooms.

Food- and Waterborne Transmission

Food- and waterborne transmission apply to microorganisms transmitted by contaminated items such as foods (e.g., salmonellosis) and water (e.g., shigellosis). Because this type of transmission may infect multiple hosts, transmission may result in an explosive outbreak.

Vector-Borne Transmission

Vector-borne transmission refers to transmission by insect and other vectors. It occurs when mosquitoes, flies, rats, and other vermin transmit microorganisms. It is prevented by appropriate facility construction and maintenance, closed or screened windows, and proper housekeeping.

4

STANDARD PRECAUTIONS

Because it is not always possible to identify people who might spread infection to others, precautions to prevent the spread of infection must be followed at all times. The aim of standard infection prevention and control (IPC) precautions is to break the chain of infection using standard precautions at all times.

These precautions should be followed in all patient care situations. All staff should be informed of the need to report exposure to blood or potentially infectious body fluids to the doctor on duty without delay. The following standard precautions should be taken in all health care settings

- Wash hands before and after all patient or specimen contact.
- Wear personal protective equipment (PPE) while handling blood or body fluids.
- Safely handle sharps (includes sharps injury management).
- Handle the blood of all patients as potentially infectious when dealing with spills.
- Follow proper waste disposal practices and handle all linen soiled with blood and/or body secretion as potentially infectious.
- Correctly process instruments and patient care equipment to decontaminate them.

Handwashing

Appropriate hand hygiene can minimize microorganisms acquired on the hands during daily duties and when there is contact with blood, body fluids, secretions, excretions, and known and unknown contaminated equipment or surfaces.

Handwashing can be of two types

- Routine handwashing before general procedures
- Hand scrubbing before a surgical procedure

It is important in the following situations

- After handling any blood, body fluids, secretions, excretions, and contaminated items
- Between contact with different patients
- Between tasks and procedures on the same patient, to prevent cross-contamination between different body sites

Portions of this chapter were adapted from Eastern and South Cheshire Clinical Commissioning Groups, Infection Prevention and Control Manual, National Health Service, 2015; and World Health Organization WHO Guidelines on Hand Hygiene in Health Care. Geneva: WHO, 2009.

- Immediately after removing gloves

Appropriate hand washing involves the use a plain soap, antimicrobial agent, such as an alcoholic hand rub or waterless antiseptic agent.

Figure 3: Hand Hygiene Technique with Soap and Water

Source: *World Health Organization. WHO Guidelines on Hand Hygiene in Health Care: A Summary. Geneva: WHO, 2009. Figure 11.2, page 14.*

The newly developed "Five Moments for Hand Hygiene" approach has emerged from the World Health Organization's WHO Guidelines on Hand Hygiene in Health Care to add value to any hand hygiene improvement strategy. The five moments are as follows

Before touching a patient

- WHEN? Clean your hands before touching a patient.
- WHY? To protect the patient against harmful germs carried on your hands.

Before a clean or aseptic procedure

- WHEN? Clean your hands immediately before performing a clean or aseptic procedure.
- WHY? To protect the patient against harmful germs, including the patient's own.

After body fluid exposure risk

- WHEN? Clean your hands immediately after any possible exposure to body fluids (and after glove removal).
- WHY? To protect yourself and the health care environment from harmful germs.

After touching a patient

- WHEN? Clean your hands after touching a patient and the patient's immediate surroundings.
- WHY? To protect yourself and the health care environment from harmful germs.

After touching patient surroundings

- WHEN? Clean your hands after touching any furniture or other objects in the patient's immediate surroundings—even if the patient has not touched the objects.
- WHY? To protect yourself and the health care environment from harmful germs.

System Change

Ensure that the necessary infrastructure is in place to allow health care workers to practice proper hand hygiene. This infrastructure includes two essential elements:

- Access to a safe, continuous water supply as well as soap and towels
- Readily accessible alcohol-based hand rubs at the point of care.

Training/Education

Providing regular training on the importance of hand hygiene, based on the "Five Moments for Hand Hygiene" approach, and the correct procedures for hand rubbing and handwashing, to all health care workers.

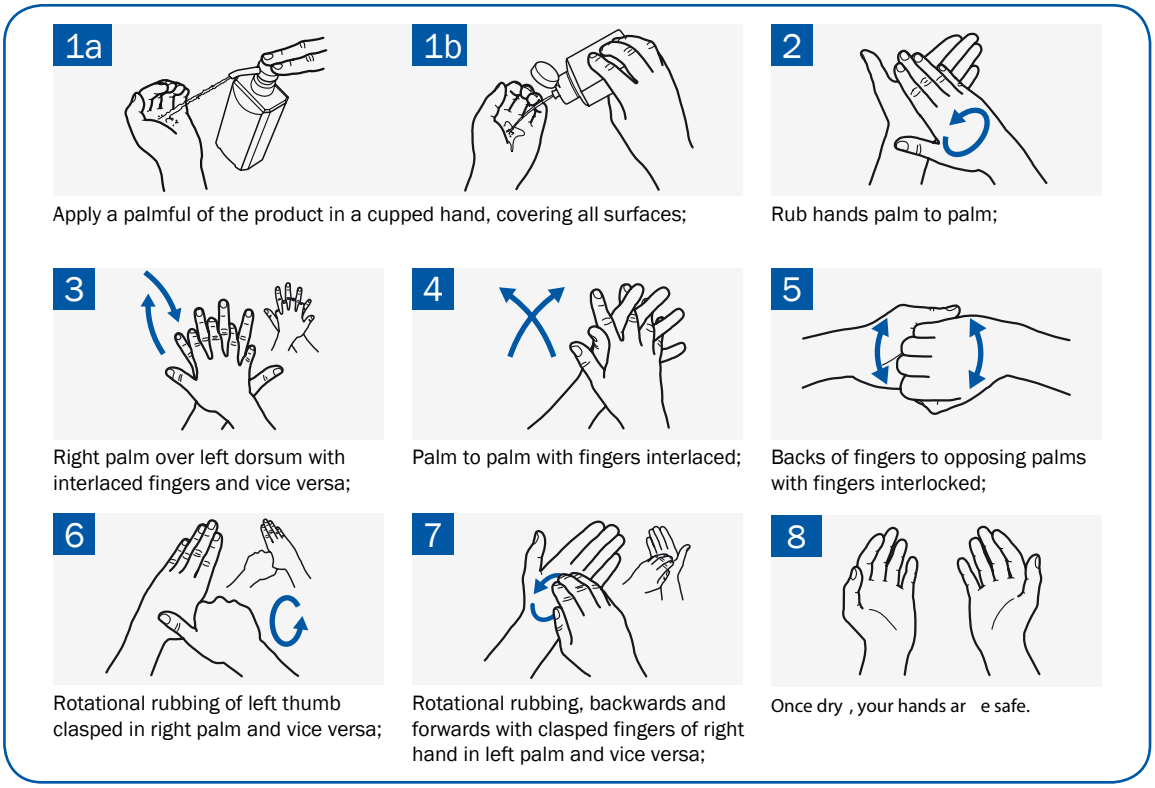
Evaluation and Feedback

Monitoring hand hygiene practices and infrastructure.

Reminders in the Work Place

Posters prompting and reminding health care workers about the importance of hand hygiene and the appropriate indications and procedures for performing it. Use them to help create to raise awareness about patient safety issues and to make hand hygiene improvement a high priority at all levels.

Figure 4: Hand Hygiene Technique with Alcohol-Based Formulation:



Source: *World Health Organization, WHO Guidelines on Hand Hygiene in Health Care: a Summary. Geneva: WHO, 2009. Figure 11.1, page 13.*

Remember

- Remove all jewelry from the hands when working in the hospital.
- Do not wear artificial fingernails or extenders when in direct contact with patients.
- Keep natural nails short.

Surgical Hand Scrubbing

The aim of surgical hand scrubbing with an antiseptic agent is to minimize the number of microorganisms on the hands under the gloves. This in turn reduces the risk of infection to patients if gloves develop a small hole, tears, or nicks during a procedure. To properly scrub the hands

- Remove all jewelry on hands and wrists.
- Hold the hands above waist level and wet them in water.
- Apply sufficient antiseptic solution; use firm, circular motions to wash hands and arms up to the wrists, covering all areas, including palms, backs of the hands, fingers, between fingers, and the lateral side of thumbs, knuckles, and wrists for at least 3–5 minutes.
- Repeat the procedure twice.
- Rinse hands one-by-one and keep the hands above waist level at all times.

- Dry the hands with a sterile towel, continuing to keep the hands above waist level.
- Do not touch anything except the gloves after washing hands before a surgical procedure.

Personal Protective Equipment

Personal protective equipment should be used by

- Health care providers who provide direct care to patients and who work in situations where they might have contact with blood, body fluids, excretions, and secretions;
- Support staff, including medical aides, cleaners, and laundry staff in situations where they might have contact with blood, body fluids, secretions, and excretions;
- Laboratory staff who handle patient specimens; and
- Family members who provide care to patients and are in a situation where they might have contact with blood, body fluids, secretions, and excretions.

Personal protective equipment includes the following

- Gloves
- Protective eye wear (goggles)
- Mask
- Apron
- Gown
- Boots or shoe covers
- Cap or hair cover

Gowns

- Wear a gown that will protect skin and prevent soiling or contamination of clothing during procedures and patient care activities when contact with blood, body fluids, secretions, or excretions is anticipated.
- Wear a gown for direct patient contact if the patient has uncontained secretions or excretions.
- Remove the gown and perform hand hygiene before leaving the patient's environment.
- Do not reuse gowns, even for repeated contacts with the same patient.
- Routinely putting on a gown when entering a high-risk unit (e.g., an intensive care unit, neonatal intensive care unit, or hematopoietic stem cell transplant unit) is not indicated.

Figure 5: Steps to Wearing a Gown

Source: *Figure 2-4 Gowning, in Complete Navy Nursing Manual for Hospital Training Purposes, Hospital Corpsman Revised Edition, page 2-35.*

Mouth, Nose, and Eye Protection

- 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], and 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, severe acute respiratory syndrome, 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 an attached shield, or a mask and goggles (in addition to gloves and gown).

Gloves

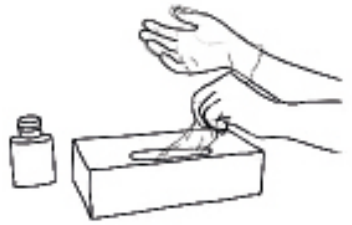
- Wear gloves when contact with blood or other potentially infectious materials, mucous membranes, non-intact skin, or potentially contaminated intact skin (e.g., with stool or urine in an incontinent patient) is anticipated.
- Wear gloves with fit and durability appropriate to the task.
- Wear disposable 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) using proper technique to prevent hand contamination.
- 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; this practice is associated with transmission of pathogens.
- Change gloves during patient care if the hands are moved from a contaminated body site (e.g., the perineal area) to a clean body site (e.g., the face).

Figure 6: How to don/wear and remove non sterile gloves

1. Take out glove from its original box

2. Touch only a restricted surface of the glove corresponding to the wrist (at the top edge of the cuff)

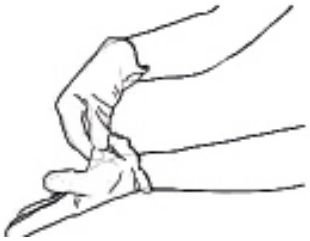
3. Don the first glove



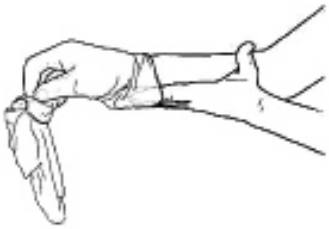
4. Take the second glove with the bare hand and touch only a restricted surface of glove corresponding to the wrist

5. To avoid touching the skin of the forearm with gloved hand, turn the external surface of the glove to be donned on the folded fingers of the gloved hand, thus permitting to glove the second hand

6. Once gloved, hands should not touch anything else that is not defined by indications and conditions for glove use



1 Pinch on glove at hte wrist level to remove it, without touching the skin of the forearm, and peel away from the hand, thus allowing the glove to turn inside out



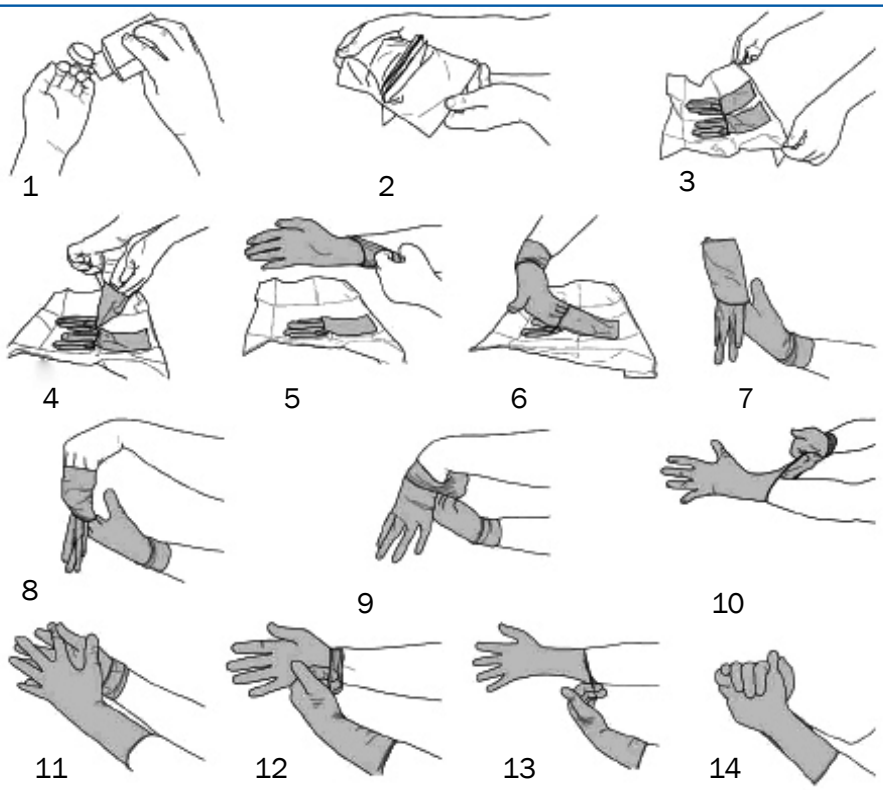
2. Hold the removed glove in the gloved hand and slide the fingers of the ungloved hand inside between the glove and the wrist. Remove the second glove by rolling it down the hand and fold into the first glove

3. Discard the removed gloves

Source: *World Health Organization, WHO Guidelines on Hand Hygiene in Health Care. Summary Geneva: WHO, 2009. Figure 11.4, pages 22–23.*

The purpose of this technique is to ensure maximum asepsis for the patient the health-care worker from the patient's body fluid(s). To achieve this goal, the skin of the health-care worker remains exclusively in contact with the inner surface of the glove and has no contact with the outer surface. Any error in the performance of this technique leads to a lack of asepsis requiring a change of gloves.

Figure 7: How to don/wear sterile gloves.



2. Check the package for integrity. Open the first non-sterile packaging by peeling it completely off the heat seal to expose the second sterile wrapper, but without touching it.

3. Place the second sterile package on a clean, dry surface without thoching the surface. Open the package and fold it towards the botton so as to unfold the paper and keep it open.

4. Using the thumb and and index finger of one hand, carefully grasp the folded cuff edge of the glove.

5. Slip the other hand into the glove in a single movement, keeping the floded cuff at the wrist level.

6-7. Pick up the second glove by sliding the fingers of the gloved hand underneath the cuff of the glove.

8-10. In a single movement, slip the second glove on to the ungloved hand while avoiding any contact/ resting of the gloved hand on surfaces other than the glove to be donned (contact/resting constitutes a lack of asepsis and requires a change of glove).

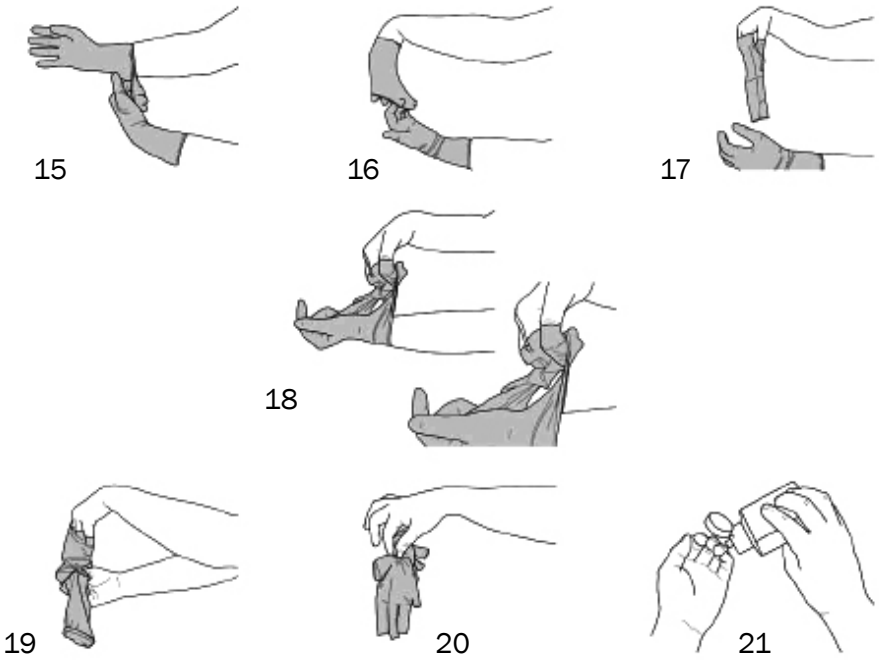
11. If necessary, after donning both gloves. adjust the fingers and interdigital spaces until the gloves fit comfortably.

12-13. Unfold the cuff of the first gloved hand by gently slipping the fingers of the other hand inside the fold, making sure to avoid any contact with a surface other than the outer surface of the glove (lack of asepsis requiring a change of gloves).

14. The hands are gloved and must touch exclusively sterile devices or the previously-disinfected patient's body area.

Source: *World Health Organization, WHO Guidelines on Hand Hygiene in Health Care Summary. Geneva: WHO, 2009. Figure 11.5, pages 22–23.*

Figure 8: How to remove sterile gloves.



15-17. Remove the first glove by peeling it back with the fingers of the oppeite hand. Remove the glove by rolling it inside out to the second finger joints (do not remove completely).
18. Remove the other glove by turning its outer edge on the fingers of the partially ungloved hand.
19. Remove the glove by turning it inside out entirely to ensure that the skin ot the health-care worker is always and exclusively in contact with the inner surface of the glove.
20. Discard gloves.
21. Perform hand hygiene after glove removal according to the recommended indication.

NB: Donning surgical sterile gloves at the time of a surgical intervention follows the same sequences except that:

- it is preceeded by a surgical hand preparation;
- donning gloves is performed after putting on the sterile surgical gown;
- the opening of the first packaging (non-sterile) is done by an assistant;
- the second packaging (sterile) is placed on a sterile surface other than that used for the intervention;
- gloves should cover the wrists of the sterile gown.

Source: *World Health Organization, WHO Guidelines on Hand Hygiene in Health Care Summary Geneva: WHO, 2009. Figure 11.5, pages 22–23.*

The use of double gloves is not recommended. Heavy duty rubber gloves should be worn for cleanings instruments, handling soiled linen, and dealing with spills.

Safe Handling of Sharps

Good Practice for Safe Handling and Disposal of Sharps

Needles and sharps are the most common mode of transmission of blood-borne pathogens to the health care worker.

- Precautions should be taken to prevent injuries by sharp instruments, especially hollow bore needles that have been used for venipuncture or other vascular access procedures.
- When a needle has to be removed from a syringe, do it with utmost care.
- Do not overfill a sharps container.
- Always dispose of your own sharps.
- Never pass used sharps directly from one person to another.
- During exposure-prone procedures, the risk of injury should be minimized by ensuring that the operator has the best possible visibility—for example, by positioning the patient, adjusting the light source, and controlling bleeding.
- Protect fingers from injury by using forceps instead of fingers for guiding sutures.
- Never recap, bend, or break disposable needles.
- Immediately after use, place needles and syringes in a rigid container until ready for disposal.
- Locate sharps disposal containers close to the point of use—for example, in patient's room, on the medicine trolley, and in the treatment room.

Dealing with Spills

Any spills must be attended to as soon as possible using the correct PPE and product dissolution. Spillages of blood and bodily fluids must be treated as clinical waste.

Blood/Body Fluid Spills

- All body fluid spillage must be cleaned up immediately.
- Wear appropriate protective clothing (gloves and apron).
- Ventilate the area, if possible.
- If there is broken glass, do not pick it up, even if wearing gloves. Use a plastic scoop or dustpan to gather the glass and dispose of it in the sharps box.
- Gross contamination should be removed first with paper towels, which are then discarded.
- Clean with a chlorine-releasing agent.
- Wash the area with detergent and water.
- Place used paper towels, gloves, etc in yellow plastic sack for disposal as clinical waste.
- Once clean-up is completed, ensure that the spillage kit is restocked.

Waste and Laundry Management

Follow proper waste disposal practices and handle all linen soiled with blood and/or body secretion as potentially infectious.

Waste Management

Waste management is discussed in detail in Chapter 9. Here we will focus only on clinical waste, which is defined as any waste that might cause infection to any person coming into contact with it. Such waste might be wholly or partly the following:

- Body tissue
- Blood or other body fluids
- Excretions
- Drugs or other pharmaceutical products
- Swabs or dressings
- Syringes, needles, or other sharp instruments
- Any other waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar practice, investigation, treatment, care, teaching or research, or the collection of blood for transfusion

Laundry Management *

Collection and Handling

Except for linen from persons with rare, viral, hemorrhagic fevers, all soiled linen should be handled in the same way for all patients/residents. Linen should be handled with a minimum of agitation and shaking. Never place soiled linen on the floor. If clothes or linens are not soiled with blood or body fluids, sorting of clothes and linen may take place in the patient care area. Heavily soiled linen should be rolled or folded to contain the heaviest soil in the center of the bundle without contaminating your clothing. Large amounts of solid soil, feces, or blood clots should be removed from linen with a gloved hand and toilet tissue and placed into a bedpan or toilet for flushing. Excrement should not be removed by spraying with water.

Bagging and Containment

- Soiled linen should be bagged or put in a laundry cart at the site of collection.
- Bags should be tied securely and not over-filled when transported by cart, or hand
- Laundry carts used to collect or transport soiled linen do not need to be covered, but carts should be cleaned after each use.
- After they are emptied, linen bags should be washed. They should be washed after each use and can be washed in the same cycle as the linen contained in them.

Transport

If a laundry chute is used, all soiled linen must be securely bagged and tightly closed. Linen transported by cart should be moved in such a way that the risk of cross-contamination is minimized. Clean linen should be transported and stored in a manner that prevents its contamination and ensures its cleanliness. Separate carts should be used for dirty and clean linens. When linens are commercially laundered, clean and dirty laundry must be separated in the truck to ensure that there is no opportunity for mixing clean and dirty linens.

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*This section was adapted from Eastern and South Cheshire Clinical Commissioning Groups, *Infection Prevention and Control Manual, National Health Service, 2015.*

Washing and Drying

High temperature washes (>71.1°C) are necessary if cold water detergents are not used. An alternative is to use cold water and a cold water detergent. If low temperature water is used for laundry cycles, use chemicals suitable for low temperature washing at the appropriate concentrations. Use complete wash and rinse cycles.

Dry Cleaning

Clothing containing blood, body fluids or excrement that is sent to a community dry cleaner should be appropriately labelled. Dry cleaning personnel should be knowledgeable of procedures to handle soiled clothing.

Protection of Laundry Workers and Others Handling Laundry

Workers should protect themselves from potential infection from soiled linen by wearing appropriate PPE (i.e., gloves and gowns or aprons) when handling soiled linen. Personnel should wash their hands whenever they change or remove gloves. All caregivers and laundry workers should receive training in procedures for handling soiled linens. Laundry workers, like other health care providers, should be offered hepatitis B immunization.

5

ADDITIONAL TRANSMISSION-BASED PRECAUTIONS

Microorganisms are transmitted by three main routes

- Contact
- Droplet
- Air

All three routes play a major role in health care associated–infections.

Infection by direct or indirect contact: Infection occurs through direct contact between the source of infection and the recipient or indirectly through contaminated objects.

Airborne infection: Infection usually occurs by the respiratory route, with the agent present in aerosols (infectious particles less than 5 µm in diameter).

Droplet infection: Large droplets (greater than 5 µm in diameter) carry the infectious agent.

Contact Precautions

Use contact precautions in addition to standard precautions for patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact with the patient or patient care items. Contact transmission precautions apply to patients with either of the following conditions:

- Presence of stool incontinence (may include patients with norovirus, rotavirus, or Clostridium difficile), draining wounds, uncontrolled secretions, pressure ulcers, ostomy tubes and/or bags draining body fluids
- Presence of generalized rash

Specific Precautions

- Prioritize placement of patients in an examination room if they have stool incontinence, draining wounds, uncontrolled secretions, or skin lesions that cannot be covered.
- Perform hand hygiene after removal of personal protective equipment (PPE), before and after touching the patient, and after contact with respiratory secretions and contaminated objects or materials. Use soap and water when hands are visibly soiled (e.g., with blood or body fluids) and after caring for patients with known or suspected infectious diarrhea (e.g., from Clostridium difficile or norovirus).

- Clean and disinfect the examination room.
- Instruct patients with known or suspected infectious diarrhea to use a separate bathroom, if available; clean and disinfect the bathroom before it is used again.
- Instruct the patient to wear a face mask when exiting the examination room, avoid coming into close contact with other patients, and practice respiratory hygiene.
- Clean and disinfect the examination room (in addition to performing standard precautions).
- Place patient in a single room. Special air handling or ventilation is not necessary. Only allow contact with patients who are infected with the same organism.
- Wear a mask when working within 1 meter (3 feet) of a patient with meningitis.
- In open wards there should be adequate spacing between each bed to reduce the risk of cross-contamination or infection occurring from direct or indirect contact or droplet transmission. Optimum spacing between beds is 1–2 meters (3–6 feet).

Patient Transport

Limit the movement and transport of the patient from the room to transport for essential purposes only. If transport or movement is necessary, minimize dispersal of droplets from the patient.

Patient Care Equipment

Where possible, dedicate patient care equipment to a single patient. Otherwise, ensure that all items are adequately cleaned and disinfected.

Personal Protective Equipment (PPE use)

A variety of protective barriers used alone, or in combination, to protect mucous membranes, skin, and clothing from contact with recognized and unrecognized sources of infectious agents in health care settings.

- Wear gloves when touching the patient and the patient's immediate environment or belongings.
- Wear a gown if substantial contact with the patient or the patient's environment is anticipated.

Droplet Transmission and Precautions

In the case of droplets (large particle droplets more than 5µm in size), the mechanism of transfer of the organism is quite distinct from either direct or indirect contact transmission. Droplets are generated from the patient primarily during coughing, sneezing, and certain procedures such as suctioning and bronchoscopy. Transmission occurs when droplets containing microorganisms generated from the infected person are propelled a short distance through the air and deposited on the conjunctivae, nasal mucosa, or mouth of another person. Because droplets do not remain suspended in the air, special air handling and ventilation are not required.

Precautions should be applied to patients known or suspected to be infected with a pathogen that can be transmitted through droplets. These pathogens include, but are not limited to the following

- Respiratory viruses (e.g., influenza, parainfluenza virus, adenovirus, respiratory syncytial virus, human metapneumovirus).
- Bordetella pertussis
- Neisseria meningitides, group A streptococcus (for first 24 hours of therapy).

Specific Precautions

- Place the patient in an examination room with a closed door as soon as possible (prioritize patients who have excessive cough and sputum production). If an examination room is not available, the patient should be given a face mask and placed in a separate area as far from other patients as possible while awaiting care.

PPE use

- Wear a face mask, such as a procedure or surgical mask, when in close contact with the patient; put on the face mask before entering the examination room.
- If substantial spraying of respiratory fluids is anticipated, wear gloves and gown as well as goggles (or a face shield in place of goggles).

Airborne Transmission and Precautions

Airborne transmission occurs through dissemination of either airborne droplet nuclei (small particle residue less than 5μm in size) of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may be inhaled by a susceptible host within the same room or over a longer distance from the source patient. Microorganisms transmitted by airborne transmission include mycobacterium tuberculosis, measles, and the varicella virus.

Use airborne transmission precautions with patients known or suspected to be infected with a pathogen that might be transmitted by the airborne route. These pathogens include, but are not limited to

- Tuberculosis
- Measles
- Chickenpox (until lesions are crusted over)
- Localized (in immunocompromised patient) or disseminated herpes zoster (until lesions are crusted over)

Specific Precautions

- Have the patient enter through a separate entrance to the facility (e.g., dedicated isolation entrance), if possible, to avoid the reception and registration area.

- Place the patient immediately in an airborne infection isolation room.
- If such a room is not available, give the patient a face mask (e.g., a procedure or surgical mask) and place the patient immediately in an examination room with a closed door.
- Initiate protocol to transfer the patient to a health care facility that has the recommended infection control capacity to properly manage the patient.

PPE use

- If substantial spraying of respiratory fluids is anticipated, wear gloves, a gown, and goggles or a face shield.
- Perform hand hygiene before and after touching the patient and after contact with respiratory secretions and/or body fluids and contaminated objects or materials. Use soap and water when hands are visibly soiled (e.g., with blood and body fluids).
- Instruct the patient to wear a face mask when exiting the examination room, avoid coming in close contact with other patients, and practice respiratory hygiene.
- Once the patient leaves, the examination room should remain vacant for one hour before anyone enters. However, adequate wait time may vary depending on the ventilation rate of the room and should be determined accordingly.
- If staff must enter the room during the wait time, they should use respiratory protection (in addition to using standard precautions).

Patient placement requirements

- Single room; negative air pressure
- Self-closing devices on doors to keep the door closed
- The ventilation system should provide a means to discharge air from the room to the outside, such as an exhaust fan. It should be on emergency power.
- Ensure that all doors and windows in the isolation room remain properly closed. The opening at the bottom of the door is sufficient to provide a controlled air flow path.
- The TB isolation room needs to be checked for negative pressure.
- To check for negative pressure, a thin strip of tissue should be held parallel to the door with one end in front of the gap. The direction of the tissue's movement will indicate the direction of air movement.

Respiratory protection

- Heavy duty N95 or N97 masks should be used for patients with open or suspected pulmonary tuberculosis. Surgical masks should be worn for patients with meningococcal or suspected meningococcal meningitis.
- Nonimmune or pregnant staff should not enter the room of patients known or suspected to have rubella or varicella. Persons with immunity to varicella and rubella do not require masks.

Patient transport

- Movement or transport of the patient from the room must be limited to essential purposes only.
- If transport or movement is necessary, minimize patient dispersal of organisms.

For tuberculosis

- Respiratory precautions should be taken for smear-positive pulmonary tuberculosis.
- A separate room is recommended for such patients.
- Elective surgery for patients with active TB infection is not recommended. Elective operative procedures on patients with active pulmonary or laryngeal TB should be postponed until the patient is no longer infectious.

Visitor policy for patients in isolation

- The ward sisters and doctors concerned have the responsibility of informing the patients' relatives of the measures to be taken and the importance of restriction of visitors.
- The patient and the relatives must be given detailed health education about the cause, spread, and prevention of the infection. The need for isolation and restriction of visitors should be discussed with them.
- Handwashing after all contact with the patient must be stressed.
- Visitors must wear an N95 respirator. Be aware of restrictions on visitation due to outbreak or other conditions within the facility.
- No more than two adult visitors should be allowed at a time during hospital visiting hours, and the length of their stay should be governed by the needs of the patient.
- Children below 12 years of age should not be allowed into isolation areas.
- Visitors' footwear, bags, and other belongings should be left outside the room.
- Visitors should not be allowed to sit on the patient's bed. There should be a separate sitting arrangement for caregiver.
- Visitors should wash their hands well with soap and water before entering and when leaving the room.

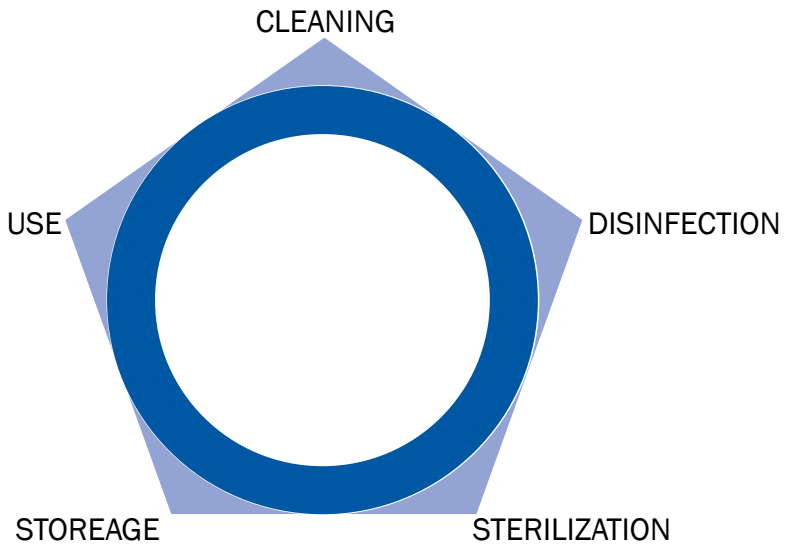
6

DECONTAMINATION

Decontamination is a general term used to describe the destruction or removal of microbial contamination to render an item or the environment safe. The term decontamination includes cleaning, disinfection, and sterilization. The objective of decontamination is to protect individuals who handle surgical instruments and other items that have been in contact with blood or body fluids. The objective is also to protect patients. Once instruments and other items have been decontaminated, they are safe to use.

The life cycle of decontamination illustrates the salient features of decontamination, each step being as important as the next.

Figure 9: The decontamination life cycle



Source: *Health Building Note 13 (HBN13), Department of Health, United Kingdom,2004*

Decontamination Tips

- Use a plastic container for decontamination to help prevent dulling of sharps due to contact with metal containers; and
- Rusting of instruments due to a chemical reaction (electrolysis) that can occur

Portions of this chapter adapted from Decontamination and Reprocessing of Medical Devices for Health-care Facilities (c) World Health Organization and Pan Americal Health Organization, 2016 and Infection Prevention Practices Standard and Guideline, 2003.

between two different metals (i.e., the instrument and the container) when they are placed in water.

- Do not soak metal instruments that are electroplated (i.e., not 100% stainless steel) even in plain water for more than an hour because rusting will occur.

Cleaning

Instruments should be rinsed immediately with cool water to remove visible organic material. The removal of visible soil, organic and inorganic material from objects and surfaces is cleaning. This is accomplished manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential before high-level disinfection and sterilization because inorgnic and organic materials that remain on the surfaces of instruments interfere with the effectiveness of these processes. Medical devices should be disassembled to allow effective cleaning. The life of the instruments is prolonged if soil and debris are vemoved regularly.

Soaking of instruments in disinfectant prior to cleaning

Soaking of instruments in 0.5% chlorine solution or any other disinfectant before cleaning is not recommended for the following reasons:

- It may damage/corrode the instruments
- The disinfectant may be inactivated by blood and body fluids, which could become a source of microbial contamination and formation of biofilm
- Transportation of contaminated items soaked in chemical disinfectant to the decontamination area may pose a risk to health-care workers and result in inappropriate handling and accidental damage
- May contribute to the development of antimicrobial resistance to disinfectants

Source: *Decontamination and Reprocessing of Medical Devices for Health-care Facilities (c) World Health Organization and Pan Americal Health Organization, 2016*

Rinsing: Rinsing following cleaning is necessary to remove loosened soil and residual detergent.

Drying: Drying is an important step that prevents microbial growth and dilution of chemical disinfectants, which may render them ineffective. Devices should be air-dried or dried by hand with a clean, non-linting cloth preferably single use. Dry stainless steel devices immediately after rinsing to prevent spotting.

Disinfection

Disinfection is a process where most microbes are removed from a defined object or surface.

Disinfectants may be classified according to their ability to destroy different categories of microorganisms. The agent which destroys only vegetative bacteria is termed a low level disinfectant. If the agent is capable of rendering mycobacteria nonviable, it is termed as an intermediate level disinfectant. It is safe to assume that all the other categories of microbes which are classified more susceptible are also destroyed if efficacy against mycobacteria can be demonstrated. High level disinfection is in other words sterilization wherein all microbial life is destroyed inclusive of endospores.

Chemical disinfectants: Various chemical agents are used to disinfect items or equipment in a health-care setting.

An Ideal Disinfectant:

- Must have high germicidal activity
- Will rapidly kill a wide range of microorganisms, including spores
- Is chemically stable
- Is effective in the presence of organic compounds
- Is compatible with the surface being disinfected
- Has the ability to penetrate into crevices (desirable)
- Must be inexpensive and aesthetically acceptable

Types of commonly-used chemical disinfectants:

- Ortho-phthaladehyde
- Glutaraldehyde
- Formaldehyde
- Peracetic acid
- Hydrogen peroxide
- Chlorine-based compounds
- Alcohol
- Chlorine dixoide

Note: The disinfectant to be used us in the process of being finalized by MOHFW and service provides will be imformed later.

Table 2: Level of disinfection/cleaning required for patient care equipment

Application	Spaulding- Classification	Level of risk	Level of reprocessing required	Examples	Storage of reprocessed instrument
Entry or penetration into sterile tissue, cavity or bloodstream E.g. Into vascular system Into sterile cavity Into sterile tissue	Critical	High	Sterile Sterilization by steam under pressure or an automated low temp chemical sterilant system, other liquid chemical sterilant or ethylene oxide sterilization.	Surgical procedure, entry into sterile tissue, arthroscopy, biopsies, intravascular cannulation	Sterility must be maintained. - packaged items must be allowed to dry before removal from the sterilizer - the integrity of the wrap must be maintained - wraps should act as effective bio- barrier during storage - store away from potential environmental contaminants - unpackaged sterile items must be used immediately
Contact with intact nonsterile mucosa or non-intact skin,	Semi-Critical	Medium	Disinfection Heat tolerant items - steam sterilize where possible - if unable to steam sterilize - use thermal disinfection Heat-sensitive items - low temperature automated chemical sterilant systems - chemical disinfectant	Respiratory therapy, gastroscopy	Store to protect from environmental contaminants.

Continue

Application	Spaulding-Classification	Level of risk	Level of reprocessing required	Examples	Storage of reprocessed instrument
Intact skin, no contact with the patient	Non-critical	Low	Items must be cleaned - Clean after each use with detergent and water. - if disinfection is required follow with appropriate disinfectant e.g. 70% alcohol.	Beds, sinks, etc.	Store in a clean dry place

Source: *Practical Guidelines for Infection control in Health Care Facilities. WHO Regional office for Western Pacific, Manila, Regional office for South-East Asia, New Delhi. p. 28.*

Table 3: Disinfection of General Equipment

Equipment	Frequency of Change	Recommendation
Oral Thermometer	Single for all IPD patients	After each use, the thermometer is disinfected by wiping with a swab saturated with 70 percent isopropyl alcohol. For OPD: Each thermometer is kept in a separate dry holder. After each outpatient session, the thermometer holder is washed in warm water and detergent, and the thermometer is disinfected in 70 percent alcohol for 5 minutes. Other methods for thermometer: immersion in gluteraldehyde, or hexachlorophene and cetrimide for at least 10 minutes
Rectal Thermometer	After each patient	Thoroughly wash with detergent and water, then dry. Store dry and separately from oral thermometers. Disinfect with 70 percent alcohol for 5 minutes.
Auriscope	After each patient	Disposable earpieces should be used where possible; when not available clean in detergent and water. Disinfect in CSSD or 70 percent alcohol for 5 minutes.
Ear pieces	After each patient	Wash with hot water and detergent, store dry. Disinfect in CSSD or 70 percent alcohol for 5 minutes.
Patient shaving (preop)	After each patient	Use disposable OR shaver blade, not a razor.
Sphygmomanometer Cuffs	As required	Change covers regularly (1 per week) and wash inflatable section in detergent and water, dry thoroughly or use 70 percent alcohol. Change after each use in infected patients.
Bed ends and frames, bedside locker, cardiac table, baby bassinets		Mop with 1% sodium hypochlorite. Allow to dry.

Continue

Equipment	Frequency of Change	Recommendation
Bowls/bedpans/urinals		Disinfect in a rinse temperature of a minimum 82°C for 2 minutes. If not possible, bed pans, urine pots, and kidney trays should be kept 7% percent Lysol for 24 hours or 3–5% sodium hypochlorite solution for 30 minutes. Then wash with soap and water and dry in sunlight.
Bowls (washing)		Clean with detergent and water and store dry or as above.
Cleaning cloths, brushes, and equipment		These are supplied daily from the laundry and then discarded to wash. Wash brushes and buckets in detergent and water. Hang or invert to dry; then store dry.
Curtain rails		For bed ends
Hand basins		Clean with detergent and water.
Lockers		Clean with detergent and water as necessary and again after patient discharge.
Mattresses and pillows		All should be covered with an impervious plastic cover and should be wiped over with detergent and water if visibly contaminated. Mattresses should be cleaned regularly, with the covers removed, if contaminated. If possible, keep in sunlight for 24 hours. Plastic and rubber covers of mattresses and pillows should be washed with soap and water and cleaned with a suitable disinfectant.
Mop heads and bucket		Clean mops daily. At the completion of each task of floor mopping, the mops should be thoroughly washed in a bucket containing hot water and detergent. Squeeze as much water out of mop as possible and shake strands loose. Leave hanging to dry in the sun if possible, or in the cleaner's room. The bucket should be turned upside down to allow overnight drainage. Detachable mop heads should be sent to the laundry, while reusable mops should be cleaned in hot soapy water and left to dry, ideally in the sun.

Continue

Equipment	Frequency of Change	Recommendation
Nail brushes		The use of nail brushes is discouraged because they cause skin damage, which may cause an increase in bacterial flora. If a nailbrush is required, a sterile, antiseptic impregnated brush may be used. Reusable brushes require autoclaving between uses.
Toilet bowls		Brushing at least daily with a commercial bowl cleanser. Additional cleaning may be necessary for stubborn stains.
Toilet brushes		Rinsed in flushing water and store to dry.
Walls		Remove visible soiling with detergent as necessary.
Clinic trolleys		Clean with a cloth dampened with detergent and water.
Ampoules/vials		Wipe neck (ampoule) or top surface of rubber cap (vials) with a 70% isopropyl alcohol impregnated swab and allow to dry before opening or piercing.
Cardiac monitors, defibrillators, and ECG equipment		If devices come into contact with patients, the surface must be cleaned and disinfected.
Fixtures and fittings		In clinical areas, wipe until damp and dust daily with detergent solution.
Furniture and ledges (bulged or elevated parts)		In clinical areas, clean until damp and dust daily with warm water and detergent.

Source: *National Accreditation Board for Hospitals & Healthcare Providers (NABH). Hospital Infection Control Manual for Small Healthcare Organizations. New Delhi: NABH, n.d.; p. 28.*

Sterilization

Sterilization is defined as a process where all microbes are removed from a defined object, inclusive of bacterial endospores.

Methods of Sterilization Used

i. Steam autoclave
ii. Hot air oven

Table-4: Sterilization with Procedure Recommendations.

STERILIZATION	RECOMMENDATIONS
Hot Air Oven	160°C for 1 hour, 180°C for 30 minutes
Autoclave	**Gravity-Displacement:** • 30 min holding time at 1210C • 1.1kg/cm2or15lb/in2(PSI) **Pre-vacuum:** • 3 min holding time at 134 0C • 2.2kg/cm2or32lb/in2(PSI)

Source: *National Accreditation Board for Hospitals & Healthcare Providers (NABH). Hospital Infection Control Manual for Small Healthcare Organizations. New Delhi: NABH, n.d.; p. 27.*

Steam Sterilization Autoclave Use Guideline

Steam sterilization in an autoclave is one of the most common forms of sterilization used in health care facilities. Steam sterilization requires moist heat under pressure, so there must be sources of both water and heat. Heat can be provided by electricity or by another fuel source (e.g. kerosene burner), depending on the type of autoclave being used. It is important to know whether an autoclave or a dry-heat oven is being used, since different procedures are used with each. Remember that if an autoclave is used, it must have a source of water (either the machine is hooked up directly to a water source or water is put into the machine before the cycle begins) and a pressure gauge.

Wrapping Items Before Sterilization

Wrapping items before steam and dry-heat sterilization helps decrease the likelihood that they will be contaminated before use. To wrap instruments and other items for steam sterilization, use two layers of paper, newsprint, or muslin or cotton fabric. Do not use canvas for steam sterilization, since steam may not penetrate this material. Under optimal storage conditions and with minimal handling, properly wrapped items can be considered sterile as long as they remain intact and dry.

Steps of Steam Sterilization

Step 1: Decontaminate, clean, and dry all instruments and other items to be sterilized.

Step 2: Open or unlock all jointed instruments and other items, such as hemostats and scissors and disassemble those with sliding or multiple parts. This allows steam to reach all surfaces of the item. Avoid arranging the instruments and other items together tightly, because this prevents steam from reaching all surfaces.

Step 3: If instruments and other items are to be wrapped before steam sterilization, use two layers of paper, newsprint, or cotton or muslin fabric (do not use canvas). Instruments and other items should not be placed in a closed container. If drums are being used, make sure the holes of the drum are open.

Step 4: Because there are many types of autoclaves in use around the world, it is difficult to provide guidance on the specific instructions for operating each. Follow the manufacturer's instructions whenever possible. In general, sterilize wrapped items for 30 minutes and unwrapped items for 20 minutes at 121 degrees C (250 degrees F) and 106 kPa (15lb/in 2) pressure. (Do not begin timing until the autoclave reaches the desired temperature and pressure.)

Step 5: Arrange all packs drums, or unwrapped items in the chamber of the autoclave in a way that allows steam to circulate freely.

The units of pressure marked on an autoclave's pressure gauge may vary from one autoclave to another. The following amounts of pressure (which are approximately equivalent) are the desired pressure for autoclaving

- 15lb/in2 (15 pounds per square inch)
- 106 kPa (106 KILOPASCALS)
- 1 atm (1 atmosphere)
- 1 kgf/cm2 (1 kilogram of force per square centimeter)
- 776 torr
- 776 mmHg (776 millimeters of mercury)

Step 6: If the autoclave is automatic, the heat will shut off and the pressure will begin to fall once the sterilization cycle is complete. If the autoclave is not automatic, turn off the heat or remove the autoclave from the heat source after 30 minutes if item are wrapped, 20 minutes if items are unwrapped. Wait until the pressure gauge reads "zero" to open the autoclave. Open the lid or door to allow the remaining steam to escape. Leave instrument packs or items in the autoclave until they dry completely, which can take up to 30 minutes.

Note: Items must be removed dry. Once removed from the autoclave, damp packs draw microorganisms from the environment and should be considered contaminated.

Step 7: Remove the packs, drums, or unwrapped items from the autoclave using sterile pickups. To prevent condensation after removing packs or drums from the autoclave place them on a surface padded with sterile paper or fabric until they are cool. Wait until the packs, drums, or items reach room temperature (which may take up to several hours) before storing.

Step 8: Store items properly. Proper storage is as important as the sterilization process itself

- Wrapped items: Under optimal storage conditions and with minimal handling properly wrapped items can be considered sterile as long as they remain intact and dry. For optimal storage, place sterile packs in closed cabinets in areas that are not heavily trafficked, have moderate temperature, and are dry or low humidity. When in doubt about the sterility of a pack, consider it contaminated and resterilize it.

- Unwrapped items: Use unwrapped items immediately after removal from the autoclave or keep them in a covered, sterile container.

Remember

Scissors should be sterilized individually by wrapping with a towel. It should be made sure that towels that are used in sterilization of scissors have no detergent residue.

About Autoclave Maintenance

The autoclave should be checked each time it is used to make sure that it is functioning properly. The autoclave is not working correctly if

- Steam comes out of the safety valve instead of the pressure valve. If this happens, the pressure valve must be cleaned and inspected.
- Steam comes out from under the lid or around the door. If this happens the gasket must be cleaned and dried, or replaced.

If any repairs are necessary, they should be made before the autoclave is used again. To ensure that the autoclave is properly maintained.

- Routine maintenance should become standard procedure. Someone should be assigned to be responsible for this task at the facility.
- Follow the manufacturer's instructions whenever possible since autoclave maintenance varies depending on the type of autoclave.
- Post the autoclave manufacturer's maintenance instruction on a wall near the autoclave.

Routine Maintenance of Autoclaves

Autoclave maintenance should be part of every sterilization procedure. If the autoclave is faulty, sterilization will not be achieved.

Daily

- Remove the outlet screen and clean with detergent and a brush under running water.
- Clean the chamber using a cloth. Do not use abrasive cleansers or steel wool, as these will scratch the surface and increase corrosion.
- Clean the door or lid gaskets with a cloth and check for defects. Replace defective gaskets.
- Clean the shelves in the autoclave or the basket or cart that holds packs (including the wheels of the cart) with detergent and a cloth.

Weekly

Check the manufacturer's instructions for maintenance of the exhaust line. If the instructions are unavailable, flush the exhaust line or chamber drain to keep it free of material that may interfere with air and steam leaving the chamber as follows

- Remove the outlet screen

- Pour 1 litre of detergent and hot water solution down the drain with a funnel
- Pour 1 litre of hot water down the drain to rinse out the detergent solution
- Replace the screen

Note: These guidelines apply to most but not all autoclaves.

- Steam must contact all surfaces. Before sterilization, open or disassemble instruments and other items, pack the autoclave loosely, and use open containers with holes on the bottom or open drums with the holes open.
- Always sterilize instruments and other items for the correct amount of time at the correct pressure and temperature.
- Be sure items are completely dry before removing them from the autoclave.

Storage

Once the instruments have been cleaned, disinfected and sterilized, they should be moved to an area where they are allowed to cool. When the packs are cooled, they are then placed in a sterile store until delivery to the point of use. The storeage area needs to be a restricted area and away from any windows or traffic. Sterile items should be handled as little as possible.

7

LABORATORY BIOSAFETY

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

Policy Statement

- All laboratory personnel and others whose work requires them to enter the laboratory shall be knowledgeable about the chemical and biological hazards with which they will come in contact through their normal work in the laboratory, and be trained in appropriate safety precautions and procedures.
- All situations in the laboratory that should be dealt with as an emergency shall be clearly identified and made known to all employees of the laboratory.
- All laboratory employees shall be competently trained to deal with emergency procedures.
- All laboratories shall have clear written procedures for dealing with spillages or other accidental contamination.
- The laboratory shall be kept neat, orderly and clean, and storage of materials not pertinent to the work shall be minimized.
- Protective laboratory clothing (uniforms, coats, gowns) shall be made available, and worn properly by all personnel including visitors, trainees, and others entering or working in the laboratory. Protective laboratory clothing shall not be worn in non-laboratory areas. Suitable footwear with closed toes and heels and preferably with non-slip soles shall be worn in all laboratory areas.
- Safety face and eyewear, (e.g., glasses, goggles, face shields, or other protective devices) shall be worn when necessary to protect the face and eyes from splashes, impacting objects, harmful substances, UV light, or other rays.
- Eating, drinking, smoking, storing food or utensils, applying cosmetics, and inserting or removing contact lenses shall not be permitted in any laboratory work area. Contact lenses shall be worn only when other forms of corrective eyewear are not suitable, and always with goggles.

Adapted from Republic of Trinidad and Tobago Ministry of Health (MOH), Pan American Health Organization. Infection Prevention and Control Policies and Guidelines for Health Care Services. 2nd ed. Port of Spain, Trinidad and Tobago: MOH, 2011.

- Long Hair Shall be Tied Back or Restrained.
- Oral Pipetting is Prohibited in Any Laboratory.
- Hypodermic needles and syringes shall be used only for parenteral injection and aspiration of fluids from laboratory animals and diaphragm bottles. Extreme caution shall be used when handling needles and syringes to avoid auto-inoculation and the generation of aerosols during use and disposal. Needles shall not be bent or re-capped, and shall be promptly placed in a puncture-resistant container for disposal.
- Gloves shall be worn for all procedures that might involve direct skin contact with toxins, blood, infectious materials, or infected animals. Gloves shall be removed carefully and decontaminated with other laboratory wastes before disposal. Reusable gloves shall be appropriately decontaminated.
- Hands shall be washed before leaving the laboratory and at any time after handling materials known or suspected to be contaminated, and after removal of gloves.
- Work surfaces shall be cleaned and decontaminated with suitable disinfectant at the end of the day and after any spill of potentially dangerous material. Loose or cracked work surfaces should be replaced.
- All technical procedures shall be performed in a manner that minimizes the creation of aerosols.
- All contaminated or infectious liquid or solid materials shall be decontaminated before disposal or reuse. Contaminated materials that are to be autoclaved or incinerated at a site away from the laboratory shall have the outside disinfected chemically or be double-bagged and then transported to the autoclave or incinerator in durable leak-proof containers which are closed and wiped on the outside with disinfectant before being removed from the laboratory.
- Access to the laboratory shall be severely restricted at Levels 3 and 4. Decisions on entry into Levels 1 and 2 laboratories shall be at the discretion of the principal investigator (e.g. only persons who have been advised of the potential hazards and meet any specific requirements such as immunization shall be allowed to enter the laboratory area).
- Hazard warning signs shall be posted outside laboratories operating at Levels 2, 3 or 4. Where the infectious agent(s) used in the laboratory require special provisions for entry, the relevant information shall be included in the sign.
- All spills, accidents/incidents and overt or potential exposures shall be reported in writing to the supervisor. The Accident/Incident Spill Report Form and Post-Exposure Form shall be completed. Appropriate medical evaluation, surveillance, and treatment shall be provided as required.
- Laboratory personnel shall be protected against relevant infection by immunization where possible and show immunity.

Laboratory Guidelines

- The validity of test results is as much a function of the laboratory analysis as of the proper collection and handling of specimens.
- Specimens from all patients shall be treated as potentially infectious.
- All specimens for laboratory examination shall be carefully collected using Standard Precautions in their collection, and transported to the laboratory in such a manner to prevent breakage or spillage. The caps of all containers shall be tightly sealed and the requisition forms placed in a separate envelope rather than wrapped around the specimen container. This separation will prevent the forms getting contaminated.
- Specimens shall be collected in well-constructed containers with a secure lid to prevent leakage during transport.
- All specimens submitted to the laboratory shall be accompanied by a requisition form issued by the department for which testing will be done. Requisition forms shall be properly labelled so that all data required by the headings on the forms are provided.
- Additional information relevant to the nature of the specimen, time of collection, treatment regimen of the patient, which may impact on the testing and reporting shall be supplied.
- Requisition sheets shall be affixed to, but not stapled to the outside of the plastic bag.
- Transportation of specimens to the laboratory shall be under the conditions required for preservation of the specimen‘s integrity and protection of the health care worker.
- Gloves shall be worn when handling and processing specimens.
- Laboratory procedures shall minimize splashing, spattering and generation of droplets.
- Laboratory workers shall follow mechanical pipetting procedures.
- Work areas shall be cleaned after spills of blood, body fluids, or other potentially infectious material and after completion of work.
- Contaminated equipment needing servicing or repair shall be cleaned externally and internally.
- Disposable specimen containers shall be encouraged.

Classification of Agents

The inherent risks of a pathogen are judged according to

- The severity of the disease it causes
- Routes of infection
- Its virulence and infectivity
- Existence of effective therapies
- Immunization

- Presence or absence of vectors.

Biological agents are classified into four risk groups, which primarily reflect the judgements made on their inherent risk. There are four corresponding levels of containment. Table 5 summarizes the risk groups and levels of containment.

Handling of Specimens in the Laboratory

In relation to handling of specimens in the laboratory, the patient is considered no longer infectious 2 weeks after initiation of treatment.

Preparation of Ziehl-Neelsen Smears

One of the aims in handling sputum specimens safely is to reduce the formation and exposure to aerosols containing live Mycobacterium tuberculosis.

Reduction of formation of aerosols and reduction of exposure to aerosols.

- Containers should be carefully opened. Avoid vigorous shaking of the sputum.
- Class I safety cabinets should be used, and should be correctly positioned in the laboratory to prevent outflow of air into the laboratory. The cabinets should be serviced regularly.
- The concentration method use of 1% hypochlorite not only increases the sensitivity of the Ziehl-Neelsen smear but also increases the safety of handling the specimen by killing the organisms.
- Broken orange sticks should be used instead of loops or swabs for preparing smears.
- In the absence of a centrifuge or a safety cabinet, the smears should be prepared in a well-ventilated area.

Disposal of Specimens and Containers

- For disposal of waste jars, use 0.25% hypochlorite (2500 ppm available chlorine) or where cultures are done; use a 2% phenol solution.
- Decontaminate, clean and autoclave specimen containers before disposal or incineration.

Table-5: Summary of Risk Group and Level of Containment

Risk Group	Containment Level
1 • Agents most unlikely to cause human disease	• Good microbiological practice recommended for all work with micro-organisms. This should minimise risks for inadvertently culturing pathogenic organisms or non-pathogenic organisms proving harmful
2 • Agents that may cause human disease and may be a hazard to laboratory workers but unlikely to spread to community • Laboratory exposure rarely produces infection • Effective prophylaxis or treatments are usually available	• Good microbiological practice mandatory • Most work can take place on the open bench but safety cabinets are required for operations generating significant aerosols
3 • Agents that may cause serious human disease and may be a hazard to laboratory workers • May be high risk of spread to community • Effective prophylaxis is usually available	• Risks of airborne contamination reduced by working in safty cabinets (usually open fronted)
4 • Agents that may cause severe human disease and are a serious hazard to laboratory workers • May be high risk of spread to community • Usually no effective prophylaxis or treatment available	• Work performed in closed cabinets in maximum containment laboratories

Source: *Adapted from Republic of Trinidad and Tobago Ministry of Health (MOH). Pan American Health Organization Infection Prevention and Control Policies and Guidelines for Health Care Services, 2nd ed. Port of Spain, Trinidad and Tobago: MOH, 2011.)*

Biological Spill

Biological spills outside biological safety cabinets will generate aerosols that can be dispersed in the air throughout the laboratory. These spills can be very serious if they involve micro-organisms that require Level 3 Containment, since most of these agents have the potential for transmitting disease by infectious aerosols. To reduce the risk of inhalation exposure in such an accident, occupants should leave the laboratory immediately. The laboratory should not be re-entered to decontaminate or clean up the spill for at least 30 minutes. During this time the aerosol may be removed from the laboratory via the exhaust ventilation systems, such as biological safety cabinets or chemical fume hoods, if present (see Table 6 for cleaning and disinfection in the laboratory).

Spills on the Body

- Remove contaminated clothing.
- Wash exposed area vigorously with soap and running water for one minute.
- Obtain medical attention (if necessary).
- Report the incident to the laboratory supervisor.

Biosafety Level 1 Organism Spills

- Wear disposable gloves.
- Soak paper towels in disinfectant and place over spill.
- Place towels in a plastic bag for disposal.
- Clean up spill area with fresh towels soaked in disinfectant.

Biosafety Level 2 Organism Spills

- Alert people in immediate area of spill.
- Put on personal protective equipment. This may include a laboratory coat with long sleeves; back fastening gown or jumpsuit, disposable gloves, disposable shoe covers, safety goggles, mask or full-face shield.
- Cover spill with paper towels or other absorbent materials.
- Pour a freshly prepared 1:10 dilution of household bleach around the edges of the spill and then into the spill. Avoid splashing.
- Allow a 20-minute contact period.
- After the spill has been absorbed, clean up the spill area with fresh towels soaked in disinfectant.
- Place towels in a plastic bag and incinerate or burn.

Biosafety Level 3 Organism Spills

- Attend to injured or contaminated persons and remove them from exposure.
- Alert people in the laboratory to evacuate.
- Close doors to affected area.

- Call appropriate emergency number for emergency response.
- Have a person knowledgeable of the incident/accident and laboratory assist emergency personnel on arrival.

Cytotoxic Spills

General Procedures

- Follow appropriate guidelines established by the laboratory.
- Immediately clean up spills and breakages of cytotoxic/antineoplastic drugs.
- Remove broken glass carefully.
- Identify the spill with a warning sign so that other people in the area will not be contaminated.

Personnel Contamination

- Remove the gloves or gown immediately.
- Wash the affected skin area immediately with soap (not germicidal cleanser) and running water.
- For eye exposure, immediately flood the affected eye with water or normal saline designated for the purpose for at least five minutes.
- Obtain medical attention immediately.

Clean-up of Small Spills

- Immediately clean spills of less than 5 ml or 5 gm outside a hood.
- Wear gowns, double surgical latex gloves, and eye protection for the procedure.
- Wipe up liquid with absorbent gauze pads. Wipe solids with wet absorbent gauze. Then clean the spill areas (three times) using a detergent solution followed by clean water.
- Place broken glass fragments in a small cardboard or plastic container and then into a disposal bag, along with the used absorbent pads and any non-cleanable contaminated items.
- Place reusable glassware or other contaminated items in a plastic bag and wash in a sink with detergent by a trained employee wearing double surgical latex gloves.

Clean-up of Large Spills

- For spills of amounts larger than 5 ml. or 5 gm. the spread should be limited by gently covering with absorbent sheets of spills-control pads or pillows or, if a powder is involved, with damp cloths or towels. Be sure not to generate aerosols.
- Access to the spill areas should be restricted.
- Wear personal protective equipment with the addition of a respirator when there is any danger of airborne powder or an aerosol being generated. The dispersal of particles into surrounding air and the possibility of inhalation is a serious matter and should be treated as such.
- Chemicals in activators, with the exception of sodium thiosulfate, which can be used

safely to inactive nitrogen mustard, may produce hazardous by-products and should not be applied to the spilled drug.

- Clean all contaminated surfaces with detergent solution and then wipe with clean water. All contaminated absorbents and other materials should be disposed of in the disposal bag.

Table-6: Cleaning and Disinfection in the Laboratory

Item	Agent	Procedure/Remarks
Safety cabinet	• Sodium hypochlorite 1:100 • To treat spills, refer to policy. • If cultures inoculated in the cabinet are consistently contaminated, fumigate with formaldehyde.	• Ensure cabinet is sited correctly. If not, it will not function effectively. • Check air-flow regularly and change filters as per manufacturer's instructions • Fumigate only if absolutely necessary and before filters are changed. • Fumigation is a high-risk procedure and should be supervised by experienced personnel.
Bench tops	• Sodium hypochlorite 1:100 • To treat spills, refer to policy.	• Wipe at the end of each day or as necessary.
Floor	• Liquid detergent and water • To treat spills, refer to policy.	• Wash floors daily and as necessary.
Walls	• Liquid detergent and water • To treat spills refer to policy	• Walls adjacent to bench top that may come into contact with contaminated aerosols should be disinfected at the same time. • Wash walls weekly.
Other laboratory glassware and instruments	Steam sterilize where possible to render glassware safe to hand. If disinfection is necessary, use: • Sodium hypochlorite 1:100	• Rinse thoroughly first with tap water. • Never top-up discard jars. • Use 'in-use' disinfectant test to monitor effectiveness of disinfectant as level of organic matter will vary daily. • Wash container thoroughly after use. • Soak equipment for at least 30 minutes. • Rinse clean according to laboratory requirements.

Source: *Ministry of Health, Trinidad and Tobago, in collaboration with the Pan American Health Organization. Infection Prevention and Control: Policies and Guidelines for Health Care Services. MOH, 2011. Originally published in Zimbabwe Essential Drugs Action Program. Disinfection in Health Care Facilities in Zimbabwe. Harare: Ministry of Health and Child Welfare, 2001, p. 45.*

8

HOUSEKEEPING

General Principles

Routine cleaning is necessary to ensure a hospital environment which is visibly clean and free from dust and soil. Ninety 90 percent of microorganisms are present within "visible dirt", and the purpose of routine cleaning is to eliminate this dirt. Neither soap nor detergents have antimicrobial activity, and the cleaning process depends essentially on mechanical action.

The frequency of cleaning and cleaning agents used for walls, floors, windows, beds, curtains, screens, fixtures, furniture, baths and toilets, and all reused medical devices must be specified.

Housekeeping in General Wards

- The floor should be cleaned at least three times every 24 hours. Detergents and copious amounts of water should be used during one of the cleanings. Germ-free solution (floor cleaning) or any other equivalent disinfectant may be used to mop the floor for the remaining cleanings.
- The walls should be washed with a scrubber, using detergent and water whenever necessary
- High dusting should be done once in a month and when necessary
- Fans and lights should be cleaned with soap and water once a month. This should be handled by the electrical department
- All work surfaces should be disinfected by wiping with 2 percent bacillocid and then cleaned with detergent and water twice a day
- Cupboards, shelves, beds, lockers, IV stands, stools and other fixtures should be cleaned with detergent and water once a week (by Nursing Aides)
- Curtains should be changed once a month and once every 15 days in critical areas or whenever soiled
- In certain high-risk areas such as the ICU, more frequent changes of curtains are required
- Patients' cots should be cleaned every day with 0.5% Bacillocid solution. In the isolation ward, cleaning should be done daily.
- Storerooms should be mopped once a day and high dusted once a month.
- Bathroom floors should be scrubbed with a broom and cleaning powder once a day and cleaned at frequent intervals. For disinfection, phenol can be used.

Adapted from National Accreditation Board for Hospitals & Healthcare Providers (NABH). Hospital Infection Control Manual for Small Healthcare Organizations. New Delhi: NABH, n.d.; pp. 40–48.

- Toilets should be cleaned with a brush using a detergent three times daily. Disinfection may be done using phenol. A stain-removing liquid can be used to remove stains.
- Wash basins should be cleaned with cleaning powder every morning and with a stain-removing liquid once a month.
- Regular air conditioning maintenance is essential. The electrical section should draw up a protocol for this.
- Follow proper procedures for effective uses of mops, cloths, and solutions.
- Prepare floor cleaning solutions daily or as needed, and replace with fresh solution frequently.
- Clean mop heads daily, at the beginning and end of each day.
- The mop head should be changed every day and the wash sent to the laundry every day.
- A laundered mop head should be used in the morning.
- The water should be changed twice in a room when it appears to be dirty.
- When cleaning patient rooms or contaminated areas, washing laundry or instruments, collecting and disposing of trash, or using any type of cleaner (cleaning equipment), personnel must wear utility gloves and protective shoes. Wear a mask, rubber apron, and goggles if there are spills or when expecting anything to splash.
- For mopping floors and cleaning blood spills, a housekeeping cart should be used.

Patient Linen

- Bed linen may be changed once in 2 days and whenever soiled with blood and body fluids.
- Patients' gowns should be changed every day and whenever soiled with blood or body fluids.
- Dry, dirty linen should be sent to the laundry for regular wash.
- Linen soiled with blood or body fluids should be packed in leakproof bags and sent for primary wash.

Mattresses and Pillow Covers

- Clean and disinfect moisture-resistant mattress covers between patient uses by using bacillocid
- If the mattress cover is completely made of fabric, change these covers and launder before patient use
- Launder pillow covers and washable pillows in the hot water cycle before patient use or when they become contaminated with body substances
- Rubber sheets: Rubber sheets should be cleaned with soap and water, disinfected, dried, powdered, rolled and stored
- Thermometer: In areas where a common thermometer is used like OPDs, it should be washed with plain tap water and disinfected between patients with an alcohol swab
- Plastic buckets and dustbins should be cleaned with detergent powder once every week
- Emesis basins, bed pans, and urinals should be cleaned with detergent powder and water once in a week.

Housekeeping in Isolation Ward

Before admission: The admitting physician should inform the Sister In-charge of the Isolation Ward at least one hour prior to admission, mentioning the diagnosis, sex, and the general state of the patient.

Prerequisites for Isolation

- A provision for disinfecting of the hands is ideally placed prominently at the entrance of an isolation room.
- The mattress and pillow should have an impervious cover such as mackintosh so that it can easily be damp dusted.
- Clean gowns should always be available.
- Separate urinals, bed pans should be used for each patient.
- A bin lined with an appropriate colour-coded plastic cover should be available in each room for disposal of medical waste.
- Rooms should be isolated according to disease conditions and should be well lit.

Cleaning Procedure for Isolation Ward

- Linen should be taken out of the bed taking care not to shake the linen during this action. The linen should be bagged properly before being sent to the laundry in a leak-proof bag.
- All other articles like IV stands and furniture should be cleaned with detergent and disinfected with 2 percent bacillocid.
- Walls should be cleaned with detergent and disinfected with 2 percent bacillocid.
- Bathrooms should be cleaned with detergent and disinfected with phenol.

At Discharge (Terminal Disinfection)

- Pillows and mattress should be cleaned with detergent, disinfected with 2% Bacillocid, and dried in sunlight for 24 hours.
- Bed sheets, curtains, gowns, and dusters must be removed and sent to the laundry.
- After disinfection, wash the room, walls, windows, doors, bathrooms, sink, and furniture with soap solution after thorough high dusting in that cubicle.
- One percent sodium hypochlorite solution should be used to soak bed pans, urinals, and emesis basins for 15–20 minutes. Wash with detergent and dry.
- Bath basins, buckets, jugs, and mugs should be washed with 1% sodium hypochlorite solution and dried in sunlight if possible.
- Rubber sheets should be cleaned with detergent and dried.
- Soak the thermometer tray and its contents in 2% Bacillocid after cleaning.
- Fumigate with Bacillocid if indicated.

Housekeeping in Operating Theatre (OT)

The operating room complex should be absolutely clean at all times. Dust should not accumulate in any part of the operating room. Soap solution is recommended for cleaning floors and other surfaces. Operating rooms should be cleaned daily and the entire operating room complex cleaned thoroughly once a week.

Before the start of the first case

Wipe all furniture, equipment, room lights, suction points, operating tables, surgical light reflectors, other light fittings, and slabs with 2% Bacillocid solution. This should be completed at least 1 hour before surgery.

After each case

- **Linen:** Gather all soiled linens and towels that are blood-stained, pack in a leakproof bag or bin with a lid, and transport to the laundry for wash. Other linens should also be transported to laundry. Appropriate personal protective equipment should be used while handling soiled linen. Disposable drapes should be disposed of in the biomedical red bag.
- **Instruments:** Used instruments should be cleaned immediately by the scrub nurse and the attender. All instruments should first be decontaminated in 1% sodium hypochlorite solution for 20 minutes and then soaked in a multi-enzyme cleaner for 30 minutes, followed by a scrubbing with a brush using liquid soap in warm water and then dried. They should then be sent for sterilization to the central sterile supply department.
- **Environment:** Wipe used equipment, furniture, and operating room tables with detergent and water. If there is a blood spill, disinfect with sodium hypochlorite before wiping. Empty and clean suction bottles and tubing with disinfectant.

After the last case

The same procedure as mentioned above should be followed. In addition, the following should be carried out

- Wipe overhead lights, cabinets, waste bins, equipment, and furniture with a detergent.
- Wash floor and wet mop with liquid soap and then remove water, and wet mop with a disinfectant solution.
- Clean the storage shelves, scrub and clean sluice room.

Surface cleaning in OT

- Surface Cleaning: All surfaces in OT have to be cleaned with 2 percent bacillocid thoroughly in between cases.
- Biohazard Cleaning: After biohazard or infected cases, all surfaces must be cleaned with 2 percent bacillocid spray.

Primary Disinfection

Following surgery, primary decontamination should be performed before forwarding to Laundry or CSSD. Use freshly prepared disinfectant and discard disinfectant after use. Persons handling linen should be adequately protected with gloves.

Boyles Apparatus

- Surface Cleaning: Use 2 percent bacillocid.
- Biohazard Cleaning: Disinfect with 2 percent bacillocid.

Air Conditioner

The air conditioner filter should be washed once a week before reuse.

Operating Room Servicing

Complete servicing for operating rooms should be done for a week, once a year. Each room is done in rotation.

Housekeeping in intensive care unit, labor room, and postpartum recovery room

In addition to routine cleaning, thorough cleaning with soap and water should be done once a week. A brush can be used in hard-to-reach areas.

Routine Cleaning Procedure

- Remove all portable equipment.
- Wipe lights and other fixtures with a damp cloth and detergent.
- Clean doors, hinges, facings, and glass inserts, and rinse with a moistened cloth.
- Wipe down walls with clean cloth and detergent.
- Scrub floor using detergent and water.

Stainless Steel Surfaces

- Wash with detergent, rinse and clean with warm water
- Replace portable equipment: clean wheel castors by rolling across toweling saturated with detergent
- Wash (clean) and dry all furniture and equipment, such as suction holders, foot and sitting stools, Mayo stands, IV poles, basin stands, X-Ray view boxes, hamper stands, all tables in the room, hoses to oxygen tank, kick buckets and holder, and wall cupboard
- After washing floors, allow disinfectant solution to remain on the floor for 5 minutes to ensure destruction of bacteria
- Do not remove or disturb delicate equipment

- While wiping cabinets, see to it that the solution does not get inside and contaminate sterile supplies
- Operating rooms and scrub rooms should never be dry dusted.

Maintenance and Repairs

- Machinery and equipment should be checked, cleaned and repaired routinely on weekends. Urgent repairs should be carried out at the end of the day's list
- Air-conditioners and suction points should be checked, cleaned and repaired on a weekly basis
- Preventive maintenance on all equipment should be carried out every Saturday, and major work to be done at least once a year
- Surveillance of housekeeping procedures should be done on a routine basis every month by the Nurse/ any suitable person as defined by the Infection prevention and Control Committee.

Cleaning methods for blood spills and body substances

- Clean spills with a 0.5-1.0 percent chlorine solution
- Clean spills of blood, body fluids and other potentially infectious fluids immediately

a. Cover the area immediately with any absorbent material like tissue paper, old newspaper, and gauze piece.
b. For small spills: While wearing utility or examination gloves, remove visible material using a cloth soaked in a 0.5-1.0 percent chlorine solution, then wipe clean with a disinfectant cleaning solution.
c. For large spills: While wearing gloves, flood the area with a 0.5-1.0 percent chlorine solution, mop up the solution, and then clean as usual with detergent and water.

NOTE: *Wait for a few minutes, preferably 15 minutes after pouring chlorine solution. After disinfection thorough cleaning of the floor with soap and water is necessary.*

Cleaning Soiled and Contaminated Cleaning Equipment

Step 1 - Decontaminate cleaning equipment that has been contaminated with blood or body fluids by locally available and approved disinfectants.
Step 2 - Wash cleaning buckets, cloths, brushes and mops with detergent and water daily, or sooner if visibly dirty.
Step 3 - Rinse in clean water.
Step 4 - Dry completely before reuse. (Wet cloths and mop heads are heavily contaminated with microorganisms.)

NOTE: *Hot water may be used as an alternative to disinfection for environmental cleaning for some objects.*

Soaking of instruments in disinfectant prior to cleaning

Soaking of instruments in 0.5% chlorine solution or any other disinfectant before cleaning is not recommended for the following reasons:

- It may damage/corrode the instruments
- The disinfectant may be inactivated by blood and body fluids, which could become a source of microbial contamination and formation of biofilm
- Transportation of contaminated items soaked in chemical disinfectant to the decontamination area may pose a risk to health-care workers and result in inappropriate handling and accidental damage
- May contribute to the development of antimicrobial resistance to disinfectants

Source: *Decontamination and Reprocessing of Medical Devices for Health-care Facilities. WHO and Pan American Health Organization, 2016. Page 45*

9

WASTE MANAGEMENT

- Hospital waste is a potential reservoir of pathogenic micro-organisms and requires appropriate, safe and reliable handling. The main risk associated with infection is sharps contaminated with blood
- There should be a person or team or persons responsible for the organization and management of waste collection, handling, storage and disposal
- Waste management should be conducted in coordination with the infection control team.

Steps in the management of hospital waste include

- Generation
- Segregation/separation
- Collection
- Transportation
- Storage
- Treatment
- Final disposal.

Waste management practices must meet national and local requirements; the following principles are recommended as a general guide

Principles of waste management

- Develop a waste management plan that is based on an assessment of the current situation and which minimizes the amount of waste generated
- Segregate clinical (infectious) waste from non-clinical waste in dedicated containers
- Transport waste in a dedicated trolley
- Store waste in specified areas with restricted access
- Collect and store sharps in sharps containers. Sharps containers should be made of plastic or metal and have a lid that can be closed. They should be marked with the appropriate label or logo, e.g. a biohazard symbol for clinical (infectious) waste (see picture below).

Adapted from National Accreditation Board for Hospitals & Healthcare Providers (NABH). Hospital Infection Control Manual for Small Healthcare Organizations. New Delhi: NABH, n.d.; pp. 49–50, and Waste Management Manual of DGHS

- Mark the storage areas with a biohazard symbol.
- Ensure that the carts or trolleys used for the transport of segregated waste collection are not used for any other purpose – they should be cleaned regularly.
- Identify a storage area for waste prior to treatment or being taken to final disposal area.

Treatment of hazardous and clinical/infectious waste

Each health care facility should identify a method for the treatment of clinical/infectious waste. This may consist of transportation of infectious waste to a centralized waste treatment facility or on-site treatment of waste.

Methods of disposal

Sharps

- Puncture-proof containers storing discarded sharps should be autoclaved, shredded, and sent to the landfill; microwaved, shredded, and sent to the landfill; or treated by plasma pyrolysis.
- Alternatively, sharps may be disposed by deep burial in a secure area. Burial should be 2 to 3 meters deep and at least 1.5 meters above the groundwater level.

Waste requiring incineration

- Anatomical parts and animal carcasses
- Cytotoxic drugs (residues or outdated)
- Toxic laboratory chemicals other than mercury

Waste that may be incinerated

- Patient-contaminated non-plastics and non-chlorinated plastics

Waste that should not be incinerated

- Chlorinated plastics
- Volatile toxic wastes such as mercury; plastics, non-plastics contaminated with blood, body fluids, secretions and excretions and infectious laboratory wastes

Such wastes should be treated by steam sterilization in autoclavable bags or microwave treatment. Shredding may follow both these methods. If neither method is available, chemical treatment with 1% hypochlorite or a similar disinfectant is recommended. However, excessive use of chemical disinfectants should be avoided as it may be a health and environmental hazard.

Radioactive Waste

- This should be dealt with according to national laws.

For further details, please refer to

- Waste management manual of Directorate General of Health Services
- Pruss A, Giroult E, Rushbrook P, eds. 1999. Environmental Management Practices. In: Safe management of wastes from health-care activities. Geneva: World Health Organization; 19–45

MONITORING INFECTION PREVENTION PRACTICES AND INFECTION-MONITORING ACTIVITIES

10

Monitoring Infection Prevention Practices

Keeping records of infections that occur in hospitals is a time-honored way of monitoring the effectiveness of infection prevention practices. In particular, keeping records on postoperative infections can help to identify breaks in recommended infection prevention practices. For example, when a series of similar infections occurs over a short time period, "troubleshooting" should be done to identify the possible cause(s). Assume a number of surgical wound infections occur in patients undergoing elective cesarean section.

- Are recommended infection prevention practices being followed in the operating rooms and/or on the wards?
- Is the operative site (incision area) being cleaned preoperatively, especially if client hygiene is poor?
- Is an approved antiseptic at the correct concentration being used to prepare the operative site?
- Do any members of the surgical team have long fingernails and/or wear colored nail polish?
- Are reused disposable surgical gloves being used?
- Are the infections linked to any particular surgical team or person?
- Are instruments and equipment being thoroughly cleaned before sterilization or high-level disinfection?
- Is the sterilizer (autoclave) working correctly?
- Is sterilization or high-level disinfection being timed correctly?

If the answer to any of these questions is no, further information about the identified area(s) should be collected and the problem identified before deciding whether training, better equipment, or management reinforcement is the corrective action needed.

Reprinted from Tietjen L, Bossemeyer D, McIntosh N. Infection Prevention Guidelines for Healthcare Facilities with Limited Resources. Baltimore: Jhpiego, 2003.

Purpose of Surveillance

Traditionally, surveillance has been used to:

- Determine baseline rates of nosocomial infections.
- Evaluate infection control measures (e.g., management of multidrug-resistant infections).
- Monitor good patient care practices.
- Meet the safety standards required by regulatory agencies.
- Detect outbreaks and exposures.

Where time and resources are limited, routine use of case findings should focus on high-risk areas such as intensive care and postoperative units.

GLOSSARY

Airborne infection: The infection usually occurs by the respiratory route, with the agent present in aerosols (infectious particles under 5 μm in diameter).

Airborne precaution: A transmission-based precaution used to interrupt transmission from patients known or suspected to be infected with agents transmitted person to person by the airborne route.

Alcohol-based hand rub: An alcohol-containing preparation (gel, foam, or liquid) designed to reduce the number of viable microorganisms on dry, unsoiled hands.

Alert/de-alert: Enabling of an electronic communication warning "flag" that indicates multiresistant organism colonization or infection in a patient's clinical records. De-alert is the inactivation of the electronic infection control alert flag.

Anteroom: A room for staff to put on and remove personal protective equipment.

Antimicrobial: A chemical substance, usually a drug that inhibits or destroys bacteria, viruses, fungi, or protozoa.

Antimicrobial stewardship: An ongoing program within a health organization for judicious antimicrobial use to improve patient outcomes, ensure cost-effective therapy, and reduce adverse sequelae of antimicrobial use, including antimicrobial resistance.

Aseptic technique: Consists of a set of practices aimed at minimizing contamination; is particularly used to protect the patient from infection during clinical procedures. The five essential principles of aseptic technique are sequencing, environmental control, hand hygiene, maintenance of aseptic fields, and personal protective equipment. While the principles of aseptic technique remain constant for all procedures, the level of practice will change depending upon a standard risk assessment.

Body substance: Used instead of body fluid to emphasize the need for precautions to prevent contact with solid tissue, feces, blood (including dried blood), and body fluids. This does not include intact skin, hair, and sweat.

Cleaning: The removal of visible soil (e.g., inorganic and organic material) from objects and surfaces by manually or mechanically using water with detergents or enzymatic products.

Clinical governance: A clearly defined framework of accountability at all levels in an organization for continuously improving the quality of its service and safeguarding high standards of patient care.

Clinical waste: Also known as "infectious waste"; includes waste directly associated with blood, body fluids secretions and excretions, and sharps. It also includes laboratory waste that is directly associated with specimen processing, human tissues (including instruments, material, or solutions containing free-flowing blood), and animal tissue used for research.

Colonization: A person has a specific pathogenic organism, usually a multidrug-resistant organism on or in the body without the production of an immune response or disease.

Contact: The touching of any patient or his/her immediate surroundings, or performing any procedure on a patient.

Contact precaution: A transmission-based precaution used to interrupt the transmission of infectious agents that are spread by direct or indirect contact with the patient or the patient's environment.

Contact transmission: Microorganisms that are transmitted by direct contact with hands/equipment or indirect contact between infected or colonized patient and a susceptible patient.

Critical items: A medical device that comes into contact with blood or normally sterile tissue and must be sterile at the time of use. Note: A critical medical device confers a high risk of infection if it is contaminated with microorganisms.

Disinfection: A process of removing microorganisms without complete sterilization.

Droplet infections: Large droplets carry the infectious agent (under 5 µm in diameter).

Droplet precaution: A transmission-based precaution used to interrupt droplet transmission occurring from patients known or suspected to be infected with agents transmitted person to person by respiratory droplets.

Fit check: A check to ensure that the P2/N95 mask fits each time it is put on.

Hand hygiene: A general term applying to processes aiming to reduce the number of microorganisms on hands. This includes application of a waterless antimicrobial agent (e.g., alcohol-based handrub) to the surface of dry, unsoiled hands, or use of soap/solution (plain or antimicrobial) and running water (if hands are visibly soiled), followed by patting dry with single-use towels.

Health care–associated infection: Infections acquired in health care facilities and infections that occur as a result of health care interventions, and that may manifest after people leave the health care facility.

Health care workers/providers: All staff delivering or supporting health care services in a public health organization. Any person employed or contracted by a health agency either on a permanent, temporary, casual, volunteer, or agency basis.

High-level disinfection: For items classified as critical (entering body cavities or mucous membranes). This will destroy all microorganisms, with the exception of heavy contamination by bacterial spores.

Key parts: Parts of equipment/instruments/consumables that if contaminated by infectious material increase the risk of infection. Contamination may occur by direct or indirect contact with the key site(s), other key parts, or liquid infusions.

Definitions in this glossary are drawn from the following sources: (1) Ducel G, Fabry J, Nicolle L, eds. 2002. Prevention of Hospital-Acquired Infections. 2nd ed. Geneva: WHO. (2) Estee Tork M, Moran E, Cooke F. 2016. Oxford Handbook of Infectious Diseases and Microbiology. 2nd ed. Oxford, UK: Oxford University Press. (3) Government of New South Wales (NSW) Clinical Excellence Commission. 2017. Infection Prevention and Control Policy. Sydney, Australia: Government of NSW. (4) World Health Organization. 2004. Practical Guidelines for Infection Control in Health Care Facilities. Geneva: WHO.

Key site: The area on the patient that must be protected from pathogenic microorganisms. Key sites are medical device access sites, surgical sites, or open wounds.

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

Monitor: To check, supervise, observe critically, or record the progress of an activity, action, or system on a regular basis to identify change.

Negative-pressure room: A single-occupancy patient care room used to isolate those with a suspected or confirmed transmissible airborne communicable disease. Environmental factors are controlled in negative-pressure rooms to minimize the transmission of infectious agents that are usually transmitted from person to person by droplet nuclei associated with coughing or aerosolization of contaminated fluids. The air handling system provides negative pressure by air flow into the room and direct exhaust of air from the room to the outside of the building or recirculation of air through a high-efficiency particulate air filter before returning to circulation (i.e., the direction of air flow is from the outside adjacent space into the room).

Noncritical item: A medical device that only comes into contact with intact skin.

Outbreak: A state characterized by an increased incidence of an infection greater than what is typically expected in a particular health care setting. The clustering of cases by microorganism, time, person, and place may signal the possibility of an outbreak.

Personal protective equipment: A variety of protective barriers used alone, or in combination, to protect mucous membranes, skin, and clothing from contact with recognized and unrecognized sources of infectious agents in health care settings.

Point of care: The time and location where an interaction between a patient and clinician occurs for the purpose of delivering care.

Reprocessing: All activities required to ensure that a used reusable medical device is safe for its intended purpose. This is a multistep process that includes cleaning, inspection and assembly, functional testing (if applicable), disinfection (if applicable), packaging and labeling, and sterilization (if applicable).Satellite reprocessing unit: Unit in any location outside a central reprocessing unit that performs high-level disinfection of semicritical reusable medical devices and/or sterilizing of critical reusable medical devices (e.g., endoscopy units, medical imaging).

Semicritical items: Equipment or devices that come into contact with mucosal membranes or nonintact skin. Such items include but are not limited to respiratory therapy and anesthesia equipment, gastrointestinal endoscopes, bronchoscopes, laryngoscopes, esophageal manometry probes, anorectal manometry catheters, endocavitary probes, prostate biopsy probes, infrared coagulation devices, transvaginal probes, and diaphragm fitting rings.

Standard precautions: Represent the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered. These evidence-based practices are designed

to protect and prevent spread of infection among patients and health care personnel.

Sterility assurance level: The acceptable level of sterility is one in a million, or 106. This means that statistically, of 1 million products being sterilized by the same method, one will be unsterile.

Sterilization: The destruction of all microorganisms. This is defined as a decrease in microbial load. Sterilization can be either conducted by physical or chemical means.

Transmission-based precautions: Additional clinical practices in situations where standard precautions alone may be insufficient to prevent transmission of infection; for example contact, droplet, and airborne precautions or a combination of these precautions.

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REFERENCES

Bangal VB, Borawake SK, Shinde KK, Gavhane SP. 2014. Study of surgical site infections following gynaecological surgery at tertiary care teaching hospital in rural India. International Journal of Biomedical Research. 5(2):113–16. doi: 10.7439/ijbr.v5i2.527.

Begum A, Bari S, Azad AK, Hossain I, Saha PR. 2017. Prevention of nosocomial infection and role of hand hygiene compliance in a private hospital of Bangladesh. Bangladesh Critical Care Journal. 5(2): 83–7.

Bhuiyan MU, Luby SP, Zaman RU, et al. 2014. Incidence of and risk factors for hospital-acquired diarrhea in three tertiary care public hospitals in Bangladesh. Am J Trop Med Hyg. 91(1):165–72. doi: 10.4269/ajtmh.13-0484.

Ducel G, Fabry J, Nicolle L, eds. 2002. Prevention of hospital-acquired infections: A practical guide. 2nd ed. Geneva: World Health Organization.

Faruquzzaman. 2011. Positive associations of nosocomial infections in surgical ward with etiological clinical factors. Bratisl Lek Listy. 112(5):273–7.

Hasan Z. 2010. How big a challenge to initiate three basic infection control practices in hospitals of Bangladesh? Bangladesh J Med Microbiology. 04 (02): 1–2.

Lynch P. 1997. Surveillance, outbreak investigations, and exposures. In: Infection

Prevention with Limited Resources: A Handbook for Infection Committees. Chicago: ETNA Communications.

Mayon-White RT, Ducel G, Kereselidze T, Tikomirov E. 1988. An international survey of the prevalence of hospital-acquired infection. J Hosp Infect. 11 Suppl A:43–8.

Republic of Trinidad and Tobago Ministry of Health (MOH), Pan American Health Organization. 2011. Infection Prevention and Control Policies and Guidelines for Health Care Services. 2nd ed. Port of Spain, Trinidad and Tobago: MOH.

Shamsuzzaman AKM. 2015.Development of strategies for infection prevention and control in hospital setting: Bangladesh perspectives. Bangladesh Journal of Infectious Diseases. 2(1):1–2.

Tikhomirov E. 1987. WHO Programme for the control of hospital infections. Chemioterapia. 6(3):148–51.

World Health Organization (WHO). 2004. Laboratory Biosafety Manual. 3rd ed. Geneva: WHO.

WHO. 2009. WHO Guidelines on Hand Hygiene in Health Care. Geneva: WHO.

REFERENCES

Association for Professionals in Infection Control and Epidemiology (APIC). 2015. Guide to Preventing Central Line-Associated Bloodstream Infections. Washington, DC: APIC.

Canadian Committee on Antibiotic Resistance (CCAR). 2007. Infection Prevention and Control Best Practices for Long Term Care, Home and Community Care including Health Care Offices and Ambulatory Clinics. Canada: CCAR.

Centers for Disease Control and Prevention (CDC) National Center for Emerging and Zoonotic Infectious Diseases. 2016. Guide to Infection Prevention for Outpatient Settings: Minimum Expectations for Safe Care. Atlanta, Georgia: CDC.

Daw KK, Kolli TN, Robinson FG. 2015. Safety and Infection Prevention Manual (Exposure Control Plan). Columbus, Ohio: The Ohio State University College of Dentistry.

Eastern Cheshire Clinical Commissioning Group (ECCCG), South Cheshire Clinical Commissioning Group. 2015. Infection Prevention and Control Manual 2015. Macclesfield, UK: ECCCG.

EngenderHealth. 2001. Infection Prevention: A Reference Booklet for Health Care Providers. New York City: EngenderHealth.

Federal Ministry of Health (FMOH) Ethiopia. 2004. Infection Prevention Guidelines for Healthcare Facilities in Ethiopia. Addis Ababa: FMOH.

Georgetown Public Hospital Corporation. 2013. Infection Prevention and Control Manual. Georgetown, Guyana: Ministry of Public Health.

Interior Health. 2016. Infection Prevention and Control Manual. Kelowna, British Columbia, Canada: Interior Health.

Jhpiego. 2012. National Infection Prevention and Control Standards for Hospitals in Tanzania: Standards-Based Management and Recognition for Improving Infection Prevention and Control Practices: An Assessment Tool. Baltimore: Jhpiego.

National Institute for Health and Care Excellence (NICE). 2014. Infection Prevention and Control. London: NICE.

Public Health Ontario, Provincial Infectious Diseases Advisory Committee. 2015. Infection Prevention and Control for Clinical Office Practice. Toronto: Queen's Printer for Ontario.

Singapore Ministry of Health (MOH). 2016. National Infection Control Guidelines. Draft. Singapore: MOH.

Strengthening Pharmaceutical Systems. 2009. Infection Control Assessment Tool. 2nd ed. Arlington, Virginia: Management Sciences for Health.

Tietjen L, Bossemeyer D, McIntosh N. 2003. Infection Prevention Guidelines for Healthcare Facilities with Limited Resources. Baltimore: Jhpiego.

World Health Organization (WHO). 2004. Practical Guidelines for Infection Control in Health Care Facilities. India: WHO.

WHO. 2017. SAVE LIVES: Clean Your Hands: WHO's Global Annual Campaign Advocacy Toolkit. Geneva: WHO.

DGHS :Medical Waste Management training manual.

ANNEXES: SPECIAL SITUATIONS

Annex 1: Prevention of Health Care–Associated Pneumonia

Pneumonia is an inflammation of the lung parenchyma caused by a microbial agent. Health care–associated pneumonia is pneumonia that occurs 48 hours or more after hospital admission and that was not present at the time of admission.

In general, it is believed that the colonization of the upper respiratory tract precedes the development of health care–associated pneumonia. The probable sources of colonization are thought to be both:

- Endogenous, including from the stomach and intestines (uncommon) and upper respiratory tract, and
- Exogenous, from either another patient or health care provider, which most probably is transmitted via the provider's hands.

Examples of causes of exogenous colonization:

- Patients with abnormal swallowing, such as those who have depressed consciousness, respiratory tract instrumentation, and/or mechanically assisted ventilation
- Patients with gastrointestinal tract instrumentation or diseases, or who have just undergone surgery, especially thoracic and/or abdominal surgery
- Patients receiving mechanical ventilation, aspiration of oropharyngeal pathogens, or leakage of bacteria-containing secretions around the endotracheal tube cuff.

Prevention recommendation

Aspiration:

- Avoid intubation and mechanical ventilation whenever possible.
- Nurse the ventilated patient in semi-recumbent position between 30 and 40 degrees, especially during feeding and transport, unless there is a contraindication.
- Decrease the duration of intubation by assessing the patient's readiness for weaning.
- Ensure that gastric tube is in the proper position every time before feeding.
- For long-term ventilated patients, use gastrostomy tube feeding to lower the risk of aspiration.

Colonization of the aerodigestive tract:

- Consistent and thorough hand hygiene is the most effective means of preventing colonization/infection caused by exogenous microorganisms.
- Provide oral care, such as 0.12% chlorhexidine antiseptic oral rinse to ventilated patients, at regular interval.

These special situation annexes are adapted from The National Infection Prevention and Control Guidelines for Acute Healthcare Facilities. Singapore: Ministry of Health, 2017.

Contamination of respiratory care equipment:

- Practice standard precautions during respiratory care.
- Maintain aseptic technique and wear mask and gloves when performing intubation procedures.
- Use the oral route for insertion of the endotracheal tube if there is no contraindication.
- Perform endotracheal suctioning only when indicated. Measure the depth of suction catheter insertion beforehand and carry out suctioning procedures using aseptic technique.

Annex 2: Prevention of Intravascular Catheter-Related Infections

The term catheter-related bloodstream infection (BSI) has been used interchangeably with central line–associated bloodstream infection. In general, a central line–associated bloodstream infection is a primary BSI in a patient that had a central line in the 48-hour period before developing the BSI. Most frequently, coagulase-negative staphylococci, Staphylococcus aureus, Corynebacterium spp., and enteric gram-negative bacilli cause BSIs.

Prevention recommendations:

- Appropriate education, training, and competency assessment are important.
- Practice hand hygiene, combined with aseptic techniques, before catheter insertion and during subsequent catheter care.
- Maximal sterile barrier precautions require persons inserting central venous to wear a mask and cap, a sterile gown, and sterile gloves and to use a large (head-to-toe) sterile drape over the patient during placement.
- Use of 2% chlorhexidine with 70% isopropyl alcohol preparation has been reported to be effective in preventing catheter-related bloodstream infection.

Annex 3: Prevention of Catheter-Associated Urinary Tract Infections

Urinary tract infections are the most common type of nosocomial infection worldwide. Urinary tract infections are estimated to cause about 32% of health care–associated infections in the acute care setting in the United States. Of these, approximately 75% are associated with a urinary catheter.

A case fulfilling all of the criteria below may be termed as a catheter-associated urinary tract infection:

1. The patient had an indwelling urinary catheter that had been in place for > 2 days on the date of event (day of device placement = day 1) and was either:

- Still present on the date of event, or
- Removed the day before the date of event.

2. The patient has at least one of the following signs or symptoms:

- Fever (> 38.0 °C)

- Suprapubic tenderness
- Costovertebral angle pain or tenderness
- Urinary urgency
- Urinary frequency
- Dysuria

3. The patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of ≥ 105 CFU/ml.

Risk factors:

- Duration of catheterization
- Female gender
- Anatomical or functional abnormalities of the urinary tract
- Insertion of the catheter outside the operating theater
- Diabetes mellitus
- Poor catheterization technique or breaks in aseptic technique

Prevention recommendations:

- Insert urinary catheter using aseptic technique. Aseptic technique refers to the practices that help to reduce the risk of post-procedure infection in patients by decreasing the likelihood of microorganisms entering the body during the clinical procedure. Sterile equipment and aseptic technique must be used during insertion of intermittent urinary catheters in health care settings.
- Ensure meatal cleaning and environmental disinfection.
- Review urinary catheter daily.
- Check that the catheter has been continuously connected to the drainage system.
- Ensure that patients are aware of their role in preventing urinary tract infection (i.e., that they perform routine daily meatal hygiene).
- Regularly empty urinary drainage bags, each into a clean container.
- Maintain unobstructed flow.

Annex 4: Prevention of Surgical Site Infections

Surgical site infections (SSIs) are an important source and the most common type of health care–associated infection, accounting for 20% of the infections. SSIs occur after an invasive (surgical) procedure. The most commonly isolated organisms in SSIs are Staphylococcus aureus, coagulase-negative Staphylococcus spp., Enterococcus spp., Klebsiella pneumonia, and Escherichia coli.

SSIs are defined as infections occurring up to 30 days after surgery (or up to 90 days after surgery in patients receiving implants, where day 1 is the date of procedure) and affecting either the incision or deep tissue at the operation site. *

* Centers for Disease Control and Prevention (CDC). 2018. National Healthcare Safety Network (NHSN) Manual. Chapter 9: Surgical Site Infection (SSI) Event. Accessed at: https://www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf

The most common source of pathogens for SSIs is the endogenous flora of the patient's skin, mucous membranes, and hollow viscera. The exposed tissues are at risk of contamination when mucous membranes or the skin are incised. Exogenous sources of SSI pathogens include members of the surgical team, the operating room environment, including air, and all surgical instruments and materials brought to the sterile field during an operation.

Preoperative measures

1. Preparation of patients

- Whenever possible, identify and treat all infections remote to the surgical site before an elective operation. Postpone elective operations until such infections are resolved.
- Control serum blood glucose levels in all diabetic patients; particularly avoid hyperglycemia perioperatively.
- Encourage tobacco cessation.
- Unless contraindicated, patients should be instructed to or assisted in performing two preoperative shampoo baths or showers with chlorhexidine gluconate, or equivalent, on the night before and the morning of the surgery to reduce the number of microorganisms on the skin and reduce the risk of subsequent contamination of the surgical wound.
- Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation. If hair is to be removed, remove immediately before the operation, preferably with electric clippers with a single-use head. Alternatively, a use a depilatory agent after testing for tissue irritation.

2. Skin preparation prior to operation

- Thoroughly wash and clean at and around the incision site to remove gross contamination before performing antiseptic skin preparation.
- Use an alcohol-containing antiseptic agent for skin preparation.
- Apply preoperative 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.

3. Theater wear

Discard all used theater wear before leaving the operating area to prevent health care workers, patients, and visitors from being exposed to the risk of contamination.

- Patients:
- Give patients theater wear that is appropriate for the procedure and provides easy access to the operative site and areas for placing devices (e.g., intravenous cannulae).
- Health care providers in all areas:
- Wear dedicated non-sterile attire
- Staff should keep their movements in and out of the operating area to a minimum.
- Health care providers in semi-restricted and restricted areas of the surgical or invasive procedure setting:

- Wear clean surgical attire, including shoes, head covering, surgical masks, and identification badges.
- Ensure that head cover or cap covers the hair on the head and face fully when entering the operating room.
- Ensure that the surgical mask covers the mouth and nose fully when entering the operating room if an operation is about to begin or already under way, or if sterile instruments or equipment are exposed. Wear the mask throughout the operation.
- Scrubbed team members must put on sterile gloves after donning a sterile gown. Use surgical gowns that are effective barriers against liquid penetration.

4. Hand decontamination

Decontaminate hands before surgery to minimize the risk that the resident flora of microorganisms that normally colonize the skin and any transient organisms acquired by touch contaminate the surgical wound. While transient microorganisms are readily removed by soap and water, scrubbing with antiseptics such as alcohol or detergent solutions containing chlorhexidine and povidone-iodine may be required to eliminate microorganisms that reside in deep crevices and hair follicles.

- Health care providers should not wear artificial fingernails or arm or hand jewelry in the perioperative environment.
- Health care providers should keep natural finger nails short and follow a standardized procedure for hand hygiene. Staff should perform surgical hand cleansing before donning sterile gloves for surgical or other invasive procedures.
- After performing a preoperative surgical scrub or alcohol-based surgical hand antisepsis, 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.
- Before subsequent operations, wash hands using either an alcohol-based hand rub or an antiseptic surgical solution. If hands are soiled, wash them again with an antiseptic surgical solution.

5. Antibiotic prophylaxis and mechanical bowel preparation

- Administer an antibiotic prophylaxis only when indicated, and select it based on its efficacy against the most common pathogens causing surgical site infections for a specific operation and published recommendations. Do not use antibiotic prophylaxis routinely for uncomplicated clean surgeries without prosthetic implants.
- Administer by the intravenous route the initial dose of prophylactic antimicrobial agent, within one hour before incision to maximize tissue concentration. Vancomycin and fluoroquinolones can be given 2 hours before incision. However, do not routinely use vancomycin to reduce the risk of surgical site infection.
- Stop prophylaxis within 24 hours after non-cardiac surgeries; and within 48 hours for cardiac surgeries.
- Give antibiotic treatment (in addition to prophylaxis) to a patient having surgery on dirty or infected wounds.

Intraoperative measures

1. Ventilation and movement of staff

- Do not routinely use ultraviolet radiation in the operating room to prevent surgical site infection.
- Keep operating room doors closed except as needed for passage of equipment, personnel, and patients. Limit the number of people entering the operating room to necessary personnel only.
- The traffic in the operating room should be minimized. Scrubbed personnel should remain close to the sterile field.

2. Sterile gown, gloves, and drapes

- The operating team should wear sterile gowns or sterile procedure attire in the operating theater during the operation or procedure.
- Change scrub suits that are visibly soiled, contaminated, and/or penetrated by blood or other potentially infectious materials.
- Consider wearing two pairs of sterile gloves when there is a high risk of glove perforation, because the consequences of contamination may be serious (e.g., operating on a patient who is a hepatitis C carrier or known to have a high viral load of any blood-borne virus).
- Use sterile drapes to establish a sterile field and place them on the patient, furniture, and equipment to effectively prevent cross-contamination. Once the sterile field is established, avoid shifting or moving of the sterile drape.
- Use sterile drapes that are effective barriers to liquid penetration.
- Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection. Use an iodophor-impregnated incise drape, if one is needed, unless the patient has an iodine allergy.

3. Asepsis and surgical technique (source)

- Adhere to standard principles of asepsis for all procedures, including when placing intravascular devices and spinal or epidural anesthesia catheters, and when dispensing and administering intravenous drugs.
- Assemble sterile equipment and solutions immediately before use.
- Handle tissue gently, maintain effective hemostasis (see below), minimize devitalized tissue and foreign bodies, and eradicate dead space at the surgical site.
- Maintaining effective hemostasis:
- Maintain patient normothermia and prevent inadvertent perioperative hypothermia.
- Maintain optimal oxygenation during surgery and ensure that an appropriate hemoglobin saturation is maintained during surgery and recovery.
- Maintain adequate perfusion during surgery.
- Do not use intraoperative skin re-disinfection or topical antimicrobials in abdominal surgery to reduce the risk of surgical site infection.
- At the end of the operation, cover surgical incisions with an appropriate interactive dressing such as a semipermeable film membrane with or without an absorbent.

- 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.
- 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.

Postoperative measures

1. Changing dressings

To prevent microorganisms on hands, surfaces, and equipment from being introduced into the wound, use an aseptic non-touch dressing technique for the management of a postoperative wound.

2. Postoperative cleansing

The most appropriate and preferred cleansing solution is sterile normal saline because it is nontoxic and the isotonic solution does not damage healing tissues. The objective is to remove excess wound exudate or any mobile slough and wound debris.

3. Topical antimicrobial agents for wound healing by primary intention

To reduce the risk of surgical site infection, do not use topical antimicrobial agents for surgical wounds that are healing by primary intention.

4. Dressings for wound healing by secondary intention

Use an appropriate interactive dressing to manage surgical wounds that are healing by secondary intention.

5. Antibiotic treatment of surgical site infection and treatment failure

Antibiotic treatment is not routinely recommended for all SSIs. For minor infections, drain pus by removing sutures and applying antisepsis. When surgical site infection is suspected, give the patient an antibiotic for the likely organism. In choosing an antibiotic, consider the results of microbiological sensitivity tests and local sensitivity patterns.

6. Debridement

Debridement is the process of removing necrotic material or slough within the wound margin. The slough acts as a medium for bacterial proliferation and therefore delays the healing process.

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MCHIP Maternal and Child Health Integrated Program