MODULE 3
E-LEARNING

Infection Prevention and Control During Clinical Procedures

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INTRODUCTION

Infection is one of the leading causes of preventable death in hospitals every year.

CDC estimated there are approximately 2 million preventable infections in hospital every year, leading to 90,000 unnecessary deaths.

Infection control addresses factors related to the spread of infections within the health care setting (whether patient to patient, from patients to staff and from staff to patients, or among staff)

This include:

Prevention (via hand hygiene, hand washing, cleaning, disinfection, sterilization, vaccination and surveillance)

Monitoring/investigation of demonstrated or suspected spread of infection within a particular health care setting (surveillance and outbreak investigation) and management (interruption of outbreaks)

DEFINITION OF INFECTION

The invasion of bodily tissue by pathogenic microorganisms that proliferate, resulting in tissue injury that can progress to disease

The invasion and multiplication of microorganisms such as bacteria, viruses and parasites. those that are not normally present within the body.

Microorganisms that live naturally in the body are not considered infections. For example, bacteria that normally live within the mouth and intestine are not infections

INFECTION PREVENTION AND CONTROL

- Refers to policies and procedures used to minimize the risk of spreading infections, especially in hospitals and health care facilities.
- Effective infection prevention and control (IPC) supports the delivery of high quality and safe primary care

INFECTIOUS DISEASES

- Infectious diseases kill more people worldwide than any other single cause.
- Infectious diseases are caused by pathogenic organisms including bacteria, viruses, fungi and parasites.
- They maybe transmitted by other people, animals (zoonotic diseases) or environmental sources such as water and soil , depending on the specific pathogen.
- Person can be infected by touching, eating, drinking or breathing something that contains the pathogen.
- The symptoms and severity of infectious diseases vary greatly depending on the pathogen causing them

TYPES OF INFECTION

Primary infection: Initial infection with an organism to host constitutes primary infection

Secondary infection: When in a host whose resistance is lowered by pre existing infection, a new organism may set up a new infection

Local infection: Infection that is limited to a defined area or single organ with symptoms that resemble inflammation(redness, tenderness and swelling)

Systemic infection: Infection that spreads to whole body resulting in a septicaemia

Acute infection: It appears suddenly or last for a short time for example, URTI

Chronic infection: may occur slowly over a long period and may last months to years

Iatrogenic infection: Infection resulting due to therapeutic and diagnostic procedures

TYPES OF INFECTION

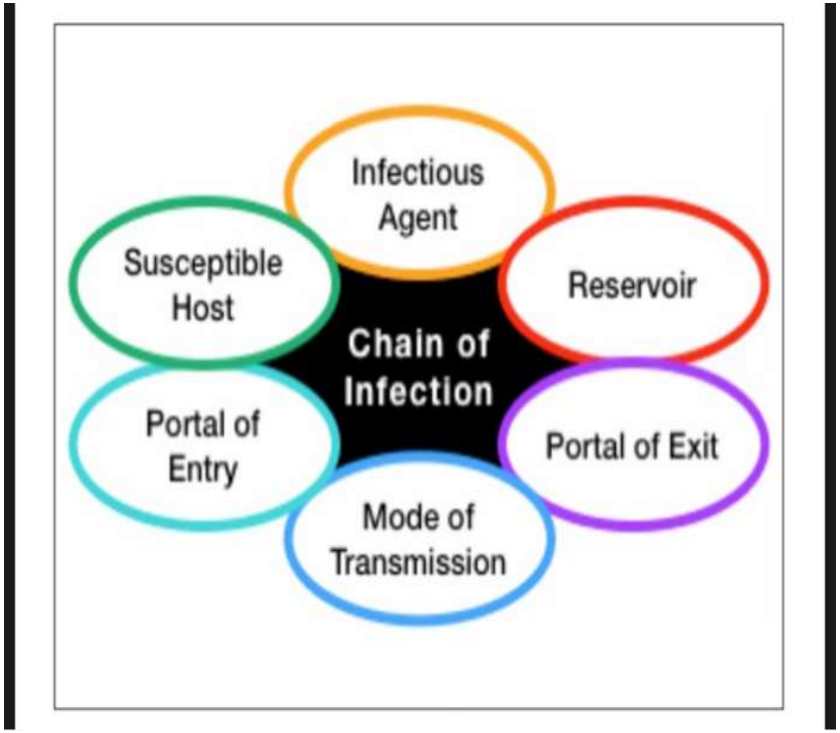
A **hospital-acquired infection** (HAI), also known as a nosocomial infection, is an infection that is acquired in a hospital or other health care facility.
• To emphasize both hospital and nonhospital settings, it is sometimes instead called a **health care–associated infection** (HAI or HCAI)

An **opportunistic infection** is an infection caused by pathogens (bacteria, viruses, fungi, or protozoa) that **take advantage of an opportunity not normally available**, such as a host with a weakened immune system, an altered micro biota (such as a disrupted gut micro biota), or breached integumentary barriers

CHAIN OF INFECTION

In order for infectious diseases to spread, several necessary steps must occur.

These steps are known as “chain of infection”. An infection will develop only if this chain remains intact.



VIDEO 1: CHAIN OF INFECTION

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UNIVERSAL PRECAUTIONS

Refers to the practice, in medicine of avoiding contact with patients' bodily fluids, by means of the wearing of nonporous articles such as medical gloves, goggles, and face shields.

The practice was introduced in 1985. In 1987, the practice of universal precautions was adjusted by a set of rules known as body substance isolation. In 1996, both practices were replaced by the latest approach known as **standard precautions.**

FUNDAMENTAL PRINCIPLES OF INFECTION PREVENTION

Standard Precautions

- Hand Hygiene
- Personal Protective Equipment (PPE)
- Disinfection & Sterilisation
- Environmental Hygiene
- Waste Management
- Linen Management
- Spillage Management
- Injection safety & Sharps management
- Respiratory Hygiene & Cough Etiquette

Standard precautions are meant to reduce the risk of transmission of blood borne and other pathogens from both recognized and unrecognized sources.

They are the basic level of infection control precautions which are to be used, as a minimum, in the care of all patients.

Fundamental principles of Infection Prevention

Transmission Based Precautions

- Contact
- Droplet
- Airborne
- Translocation

FOR EDUCATION PURPOSE, THIS MODULE WILL EMPHASIZE ONLY ON 3 PRINCIPLES OF INFECTION PREVENTION

- Hand Hygiene
- Personal Protective Equipment
- Disinfection and Sterilization

HAND HYGIENE IN HEALTH CARE SETTINGS

- Hand Hygiene is a general term used to describe cleaning hands by using soap and water, antiseptic wash or by using an alcohol-based hand rub (ABHR) solution.
- Hand Hygiene is considered as the single most important way to stop the spread of germs.
- If the hands of those caring for a patient, as well as the hands of the patient and their family/visitors, are kept clean, the risk of the patient getting an infection will be far less.
- Cleaning your hands can prevent the spread of germs, including those that are resistant to antibiotics and are becoming difficult, if not impossible, to treat.
- On any given day, about one in 31 hospital patients has at least one healthcare-associated infection (HCAI)

HAND HYGIENE
WHO, WHAT, WHEN, WHERE AND HOW ?

Who should practice?

Health Care Workers and patients

What ?

An alcohol-based hand rub (ABHR) or wash with soap and water.

When ?

Remember the Five (5) moments in Hand Hygiene (Refer Video 2)

The point of care
- time and place at which there is the highest likelihood of transmission of infection via healthcare staff, whose hands act as mediators in the transfer of microorganisms
- refers to the patient's immediate environment in which healthcare staff-to-patient contact or treatment is taking place.
- In the hospital, the environment is usually at the patient's bed, but in the other context it could be in a treatment room, cot, chair, ambulance or a patient's home.

Where?

Hand hygiene ideally should be carried out at the **point of care**.

How?

- Before performing hand hygiene: Expose forearms, remove hand or wrist jewellery and watch, ensure fingernails are clean, short and artificial nail or nail products are not worn and cover all cuts or abrasions with waterproof dressing
- Perform hand hygiene with soap and water when hands are visibly soiled.
- Unless hands are visibly soiled, an alcohol-based hand rub is preferred over soap and water in most clinical situations due to evidence of better compliance compared to soap and water.
- Ensure that supplies necessary for adherence to hand hygiene are readily accessible in all areas where patient care is being delivered.

VIDEO 2: HAND HYGIENE

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PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment, commonly referred to as “PPE”, is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses.

These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.

Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.

All PPE should be

- Located close to the point of use;
- Stored to prevent contamination in a clean/dry area until required for use (expiry dates must be adhered to);
- Single use items unless specified by the manufacturer
- Disposed of after use into the correct waste stream i.e. healthcare waste or domestic waste.

Reusable PPE items such as non-disposable goggles/face shields/visors must have a decontamination schedule with responsibility assigned.

PPE: GLOVES

Glove wearing by HCWs is recommended for two main reasons:

1. To prevent microorganisms which may be infecting, commensally carried, or transiently present on HCWs' hands from being transmitted to patients and from one patient to another; and

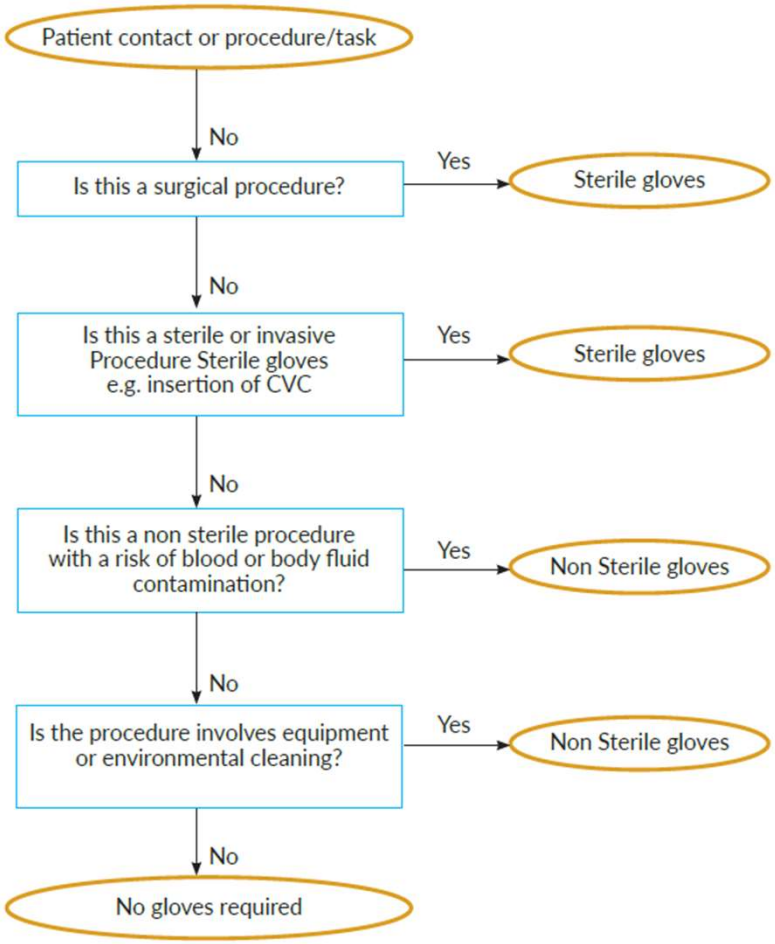
2. To reduce the risk of HCWs acquiring infections from patients.

Gloves must be:

- Worn when exposure to blood and/or other body fluids is anticipated/ likely.
- Changed immediately after each patient and/or following completion of a procedure or task;
- Changed if a perforation or puncture is suspected; and
- Appropriate for use, fit for purpose and well-fitting to avoid excessive sweating and interference with task performance.

Double gloving is recommended during some Exposure Prone Procedures (EPPs) such as orthopaedic and gynaecological operations or when attending major trauma incidents.

For appropriate glove use and selection:



PPE: ISOLATION GOWNS AND APRONS

Clinical and laboratory coats or jackets worn over personal clothing for comfort and/or purposes of identity are not considered PPE.

Disposable plastic aprons should be worn when there is a risk that clothing or uniform may become exposed to blood, body fluids, secretions and excretions, with the exception of sweat.

Full body gowns need only be used where there is the possibility of extensive splashing of blood, body fluids, secretions or excretions and should be fluid repellent.

The practice of routine gowning upon entrance into an intensive care or other high-risk area does not prevent colonisation or infection of patients.

Removal of isolation gowns before leaving the patient care area is advised to prevent opportunities for possible contamination outside the patient's room.

ISOLATION GOWN

Plastic Aprons

PPE: FACE PROTECTION (MASKS, GOGGLES, FACE SHIELDS)

Masks are used for three primary purposes in healthcare settings:

a. to protect health care workers from contact with infectious material from patients, for example respiratory secretions and sprays of blood or body fluids as defined in standard and droplet precautions.
b. worn by healthcare workers when engaged in procedures requiring sterile technique to protect patients from exposure to infectious agents carried in a healthcare worker's mouth or nose.
c. placed on coughing patients to limit potential dissemination of infectious respiratory secretions from the patient to others (Respiratory Hygiene/ Cough Etiquette).

Two types of mask available, the surgical mask and particulate respirator such as N95, used to prevent inhalation of small particles that may contain infectious agents transmitted via the airborne route.

- Personal eyeglasses and contact lenses are NOT considered adequate eye protection.
- Disposable or non-disposable face shields may be used as an alternative to goggles.
- Removal of a face shield, goggles and mask can be performed safely after gloves have been removed, and hand hygiene performed.

FACE SHIELD AND SURGICAL MASK

AS COMPARED WITH GOGGLES, A FACE SHIELD CAN PROVIDE PROTECTION TO OTHER FACIAL AREAS IN ADDIT THE EYES.

Goggles and Surgical Mask

PPE: Respiratory protection

Air-purifying respirators (APRs) work by removing gases, vapours, aerosols (droplets and solid particles), or a combination of contaminants from the air through use of filters, cartridges, or canisters.

- Personal respiratory protection is required when dealing with micro-organisms that spread by droplet and airborne route. It should be worn during the performance of aerosol-generating procedures (for examples intubation, bronchoscopy and suctioning) of patients with SARS, MERS-CoV infection, avian influenza, pandemic influenza and other novel respiratory syndromes. In these instances, surgical masks are not effective protection.

- The respirator provides protection against inhalation of very tiny (<5 microns in size) airborne particles to the HCWs.

- Respiratory protection currently requires the use of a respirator with N95 or higher filtration (Table A)

- N series respirators provide protection against non-oil-based aerosols including *Mycobacterium tuberculosis* and the '95' indicates that the mask material is capable of 95 % efficient filtration of particles 0.3 µ m in diameter.

- The appropriate respirator for a particular situation will depend on the environmental contaminant(s).

Table A: Type of respirator

Filtering Facepiece Respirator (FFR)	
• Disposable • Covers the nose and mouth • Filters out particles such as dust, mist, and fumes • Select from N, R, P series and 95, 99, 100 efficiency level • Does NOT provide protection against gases and vapours • Fit testing required	
Powered Air Purifying Respirator (PAPR)	
• Can be used to protect against gases, vapours, or particles, if equipped with the appropriate cartridge, canister, or filter • Battery-powered with blower that pulls air through attached filters or cartridges • Provides eye protection • Low breathing resistance • Loose-fitting PAPR does NOT require fit testing and can be used with facial hair • Tight-fitting PAPR requires fit testing	

DISINFECTION AND STERILIZATION

- Infection prevention and control require the use of sterile medical equipment for aseptic procedures in hospital and health care settings. Reusable medical equipment must be reprocessed before it can be re-used.

- Reprocessing critical and semi-critical single-use medical equipment is not encouraged.

- Safe reprocessing of medical equipment is very important to ensure sterility to:

a. prevent transmission of microorganisms to personnel and clients/ patients
b. minimizing damage to medical equipment/devices from foreign material (e.g., blood, body fluids, saline and medications) or inappropriate handling.

DISINFECTION AND STERILIZATION

Patient Care Equipment

- All single-use medical equipment should preferably not be re-used.
- Healthcare facilities should ensure that all reusable medical equipment such as blood glucose meters and other point-of-care devices, surgical instruments, endoscopes) is cleaned and reprocessed appropriately prior to use on another patient.
- Reusable medical equipment must be cleaned and reprocessed (disinfection or sterilization) and maintained according to the manufacturer's instructions and MOH protocol.
- HCWs must wear appropriate PPE when handling and reprocessing contaminated patient equipment.

DISINFECTION AND STERILIZATION

Disinfection of Reusable Medical Equipment

Disinfection is the inactivation of disease-producing microorganisms.
Disinfection does not destroy bacterial spores or prions.
Disinfection of medical items/equipment falls into two major categories:

- high-level disinfection
- low-level disinfection

Reusable medical equipment/devices must be thoroughly cleaned before disinfection or sterilization to physically remove contaminants from the items/equipment.

The process for cleaning would include pre-cleaning (disassembly, sorting, soaking), cleaning, rinsing, drying, physical inspection, lubrication and wrapping.

Sterilization of Reusable Medical Equipment

Sterilization is the elimination of all disease - producing microorganisms, including spores for example *Clostridium* and *Bacillus* species and prions.

The preferred method for sterilization of heat-resistant equipment is steam (pre-vacuum sterilisers are preferred).

The preferred sterilization method for heat sensitive instruments would be low temperature sterilization.

VIDEO 3: DISINFECTION AND STERILIZATION

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