

Infection Control Guidelines

For

Intermediate Long Term Care Sector

(ILTCs)

2nd Edition

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Introduction

Care is increasingly being delivered in a wide range of settings and the control of infection is an important and integral part of health and social care. Healthcare-associated infection (HAI) impacts, resident and client outcomes (Baker 2004). It has impact on morbidity, mortality and decreases quality of life. Health care providers, resident/clients, residents and clients may be exposed to infection through inadequate infection prevention and control practises.

The purpose of this guideline is to assist healthcare providers by providing a succinct guide to develop an effective infection control program with infection control policies that is applicable to their respective intermediate long term care setting, community care setting, sheltered home, behavioural health facilities, rehabilitation centres, and home care setting. Its aim is to prevent and control healthcare associated infections (HAIs).

Recommendations

- 1. Infection Prevention and Control (IPC) strategies should be designed to protect resident/clients, residents, clients, health care providers and the community.***
- 2. A systematic approach to IPC requires each health care provider to play a vital role in protecting everyone who utilizes the health care system, in all of its many forms: hospitals, clinics, offices, intermediate long term care, sheltered home, home care and community programs, etc.***
- 3. Continuing support for the IPC program must be an organizational priority.***

Transmission of Infection and Precautions

Transmission of infectious agents requires 3 elements:

- source (or reservoir) of infectious agents,

- susceptible host
- mode of transmission

This guideline describes the interrelationship of these elements in the epidemiology of HAIs in the long-term care setting, community care, sheltered home and home care.

Sources of infectious agents

Infectious agents are transmitted from human sources and inanimate environment. Human reservoirs include resident/clients, residents, clients, healthcare personnel and visitors. These individuals may have active infections, with either asymptomatic or asymptomatic infection or they are in incubation period of an infectious disease.

The main types of organism causing human infection include bacteria (e.g. *Salmonella* sp), viruses (e.g. Hepatitis A, B or C), fungi, or yeasts (e.g. *Candida* sp). Infected people may act as a source of infection for others because the microorganisms may be found in certain body fluids and could be passed on to others. The individuals may be transiently or chronically colonized with pathogenic microorganisms, particularly in the respiratory and gastrointestinal tracts. It is important to know that resident/clients' endogenous flora (e.g., bacteria residing in the respiratory or gastrointestinal tract) can also be the source of HAIs.

Susceptible hosts

Resistance among persons to pathogenic microorganism varies greatly. Some may be immune to infection or may resist colonization by an infectious agent. Some may become asymptomatic carriers. Others may develop clinical disease. The susceptible host is any person who is at risk to infection. Host factors such as extreme age, underlying chronic diseases, immobility, certain treatments with corticosteroids, poor functional status; incontinence, dysphagia, age related skin changes increase susceptibility to urinary, respiratory, cutaneous and soft tissue infections. Malnutrition can impair wound healing. Elderly with illnesses such as diabetes mellitus, respiratory diseases, cancer, weakened

immune system; breaks in the skin are factors that further increase the risk of acquiring infection. Resident self-care practise can improve host susceptibility (e.g. good oral hygiene, proper hydration, nutrition, skin, hand hygiene, respiratory etiquette and environmental factors) can reduce risk of infection. The host is the final and most important link in the chain of transmission. Residents need to be assessed on the risk factors for acquiring infections.

Modes of transmission

Infection control practises include Standard Precautions and Transmission-based Precautions where the former is applied to all resident/clients regardless of conditions. Transmission-based precautions refer to Contact Precautions, Droplet Precautions, Airborne Infection Isolation (All) Precautions and Protective Environment. Standard Precautions are to be adopted when managing all residents/clients at all times. It is based on the principle that all blood and body fluids, secretions, excretions except sweat, non-intact skin and mucous membranes may contain transmissible infectious agents. It includes a group of infection prevention measures that apply to all residents/clients regardless of whether infection is present or suspected. The recommended precautions to be taken for managing HIV, Hepatitis B and C residents are Standard Precautions. Hence, all healthcare facilities including ILTCs should not refuse admission to residents with HIV, Hepatitis B and C.

/ Standard Precautions

This includes the following;

1. Hand hygiene
2. Personal protective equipment (PPE)
3. Cough/respiratory etiquette
4. Needlestick / sharp injuries and blood or body fluid exposure prevention
5. Safe Injection
6. Environmental hygiene
7. Linen and waste management

1. **Hand Hygiene**

Hands contaminated with transient bacteria pose a significant risk for transmission of infection. The purpose of hand hygiene is to remove or destroy any bacteria picked up on the hands (transient bacteria). Hand hygiene remains the most important control measures in the ILTC, community care services, sheltered home and in other healthcare facilities. Improved hand hygiene practises have been associated with reduced HAI rates.

Waterless, alcohol-based handrubs with added emollients are now the preferred products for routine hand hygiene in healthcare settings, unless hands are visibly soiled. The WHO and CDC guidelines recommend that alcohol-based hand rub product be easily accessible and available at all healthcare facilities.

Visibly soiled hands are hands that show visible dirt or that are visibly contaminated with proteinaceous material, blood, or other body fluids (e.g. faecal material or urine). It requires handwashing with soap and water.

The use of unit-dose inserts of hand hygiene product instead of topping up partially empty dispensers is recommended to prevent contamination of hand hygiene product.

Appropriate hand moisturising lotions that are compatible with latex gloves and chlorhexidine be provided to minimize the occurrence of irritant contact dermatitis associated with hand antisepsis or handwashing.

In order to prevent dry hands it is recommended that hands are properly dried after handwashing and before putting on gloves. Thorough rinsing of hands should be done with water so that no product is left on the hands. Hands are to be moistened with water before the application of the handwash agent.

WHO recommends 5 moments of hand hygiene:

- Before attending to resident/client
- Before performing aseptic procedures
- After attending to resident/client

- After touching blood and body fluid
- After touching environment surrounding the resident/client

Other indications for hand hygiene include:

- Before eating
- Before preparing a meal,
- After visiting toilet and
- As and when hands are contaminated.

Hand hygiene technique

Manufacturer's recommendation is to be followed with respect to appropriate volume to be used for proper hand hygiene. Refer to Appendix A for steps in hand hygiene. Routine hand hygiene is done up to mid-forearms whereas surgical hand hygiene will require hand hygiene up to the elbow (see Appendix B Surgical Hand Rub).

2. Personal Protective Equipment (PPE)

Each employee is responsible for knowing where the equipment is kept and there should be adequate stock available. The type of PPE used should be appropriate for the procedure being performed and the type of exposure to blood, body fluid or pathogen anticipated. PPE available includes gloves, fluid resistant gowns or aprons, masks and eye protection (or face shields). (See Appendix B, Donning and Removing PPE)

A. **Gloves** should be worn whenever exposure to the following is planned or anticipated:

- Blood/blood products/body fluids with visible blood, excretions, secretions
- Urine
- Faeces
- Saliva

- Mucous membranes
- Wound drainage
- Drainage tubes
- Non-intact skin
- Amniotic, cerebral spinal, pericardial, pleural, peritoneal, synovial fluids
- Performing venepuncture or invasive procedures

B. **Masks and eyewear (or face shields)** should be worn during procedures that are likely to generate droplets/splashing of blood/body fluids.

C. **Gowns/Aprons (fluid resistant)** should be worn when there is potential for soiling clothing with blood/body fluids.

3. **Respiratory Hygiene /Cough Etiquette**

Respiratory hygiene is recommended for all staffs, residents and clients. The purpose is to prevent the transmission of all respiratory infections in healthcare settings, including influenza. The following infection prevention measures should be implemented at the first point of contact with a potentially infected person. These measures should be incorporated into infection prevention practises as one component of Standard Precautions. It is recommended that visual alerts be posted at appropriate locations (See Appendix D) to inform staffs, residents and clients to practise Respiratory Hygiene/Cough Etiquette.

The following measures to contain respiratory secretions are recommended for all individuals with signs and symptoms of a respiratory infection:

- Cover the nose/mouth when coughing or sneezing;
- Use tissues to contain respiratory secretions and dispose of them in the nearest

waste receptacle after use;

- Perform hand hygiene (e.g., handwashing with non-antimicrobial soap and water, alcohol-based hand rub, or antiseptic handwash) after having contact with respiratory secretions and contaminated objects/materials.

The facility shall teach Respiratory Hygiene/Cough Etiquette to residents/clients, family members, and visitors as needed.

4. Needlesticks or Sharp Injuries and Blood or Body Fluid Prevention

Inappropriate handling of sharps is a major cause of accidental exposure to blood borne viruses at healthcare settings. To minimize the risk of needlestick or sharp injury, needles, sharps and clinical waste should be handled carefully at all times. The following should be practised:

- Safety engineered sharps should be used
- Sharps should be placed in an appropriately labelled puncture resistant container.
- The container should be placed so healthcare workers can easily see the opening and reach across horizontally to use, whenever possible.
- Minimize handling of needles and sharps
- Not bend or recap needles or remove needles from disposable syringes
- Use scoop method if recapping of needle is necessary
- Use of devices such as click smart to remove surgical blade
- Do not pass sharp instrument directly to another person instead use a neutral zone for the staff to pick up the sharp instrument

5. Safe Injection Practices

The investigation of four large outbreaks of HBV and HCV among resident/clients was attributed to breaches in infection control practise. They were caused by reinsertion of used needles into a multiple-dose vial or solution container (e.g. saline bag), use of single needle/syringe to administer intravenous medication to multiple resident/clients, and preparation of medications in the same workspace where used needle/syringes were dismantled. Strict adherence to basic principles of aseptic technique for the preparation and administration of parenteral medications, use of sterile, single-use, disposable needle and syringe for each injection, and prevention of contamination of injection equipment and medication can prevent an outbreak. Whenever possible, use of single-dose is preferred especially when medications will be administered to multiple resident/clients. If a multi-dose vial must be used for multiple resident/clients, a new needle and syringe needs to be used with each aspiration. Additionally, the expiration date should be checked prior to use, and a visual inspection should be conducted to look for signs of contamination, including cloudiness or visible particles. Vial stoppers should be decontaminated using alcohol swab before the diaphragm is punctured with a new sterile needle. It is also important to store multi-dose vials properly and safely following manufacturers' instruction.

When treating an individual with known blood borne pathogens, individual vials should be stored with the individual supplies so they are used only on that individual.

Principles of infection control and aseptic technique need to be reinforced in training programs and incorporated into institutional policies.

6. Environmental Measures

Cleaning and disinfecting non-critical surfaces in resident/client-care areas are part of Standard Precautions. The cleaning and disinfection of all resident/client-care areas is

important for frequently touched or high touched surfaces, especially those closest to the resident/client, that are most likely to be contaminated (e.g., bedrails, bedside tables, commodes, doorknobs, sinks, surfaces and equipment in close proximity to the resident/client). The frequency of cleaning may need to change based on the resident/client's level of hygiene and the degree of environmental contamination and for certain for infectious agents whose reservoir is the intestinal tract. For example, residents/clients with stool and urine incontinence would need more frequent cleaning.

Blood Spills or other body fluids should be removed and the area decontaminated using the agency-approved blood spill kit. Gloves should be worn during cleaning and decontamination. The manufacturer's directions shall be followed for use of the product in cleaning and decontaminating spills. The disinfectant should have kill data against Hepatitis B and HIV or should be tuberculocidal.

It is recommended that work surfaces and hard floors be of smooth finished, intact, durable, of good quality, washable and impervious to fluids. During a suspected or proven outbreak where an environmental reservoir is suspected, routine cleaning procedures should be reviewed, and the need for additional trained cleaning staff should be assessed. Develop a cleaning schedule specifying the person responsible for cleaning. Audit programme for monitoring consistent and correct cleaning is performed.

Resident/client care equipment and instruments/devices

Medical equipment and instruments/devices must be cleaned and maintained according to the manufacturers' instructions to prevent resident/client-to-resident/client transmission of infectious agents. Cleaning to remove organic material must always precede high level disinfection and sterilization of critical and semi-critical instruments and devices because residual proteinaceous material reduces the effectiveness of the disinfection and sterilization processes. Noncritical equipment, such as commodes, intravenous pumps, and ventilators, must be thoroughly cleaned and disinfected before use on another

resident/client. All such equipment and devices should be handled in a manner that will prevent healthcare personnel (HCP) and environmental contact with potentially infectious material. It is important to include computers and personal digital assistants (PDAs) used in resident/client care in policies for cleaning and disinfection of non-critical items. The literature on contamination of computers with pathogens has been summarized and two reports have linked computer contamination to colonization and infections in resident/clients. Although keyboard covers and washable keyboards that can be easily disinfected are in use, the infection control benefit of those items and optimal management has not been determined.

7. Linen & Waste Management

Soiled linen and waste should be handled carefully to prevent personal contamination and transfer to other residents/clients. Waste should be bagged in impervious bags and segregated according to the national regulation. Soiled linen should be handled as little as possible. Gloves should be worn to handle linen wet with blood or body fluids. Linen shall be bagged in an impervious bag, placed in the designated location in the home or into the washing machine. Washing cycle temperature should reach 65°C for at least ten minutes, or 71°C for three minutes.

// Transmission Based Precautions

In addition to Standard Precautions used for all resident/clients, transmission-based precautions are used for resident/clients with specific diseases or pathogens. Some infectious agents may have more than one route of transmission (e.g. varicella zoster/chickenpox). Some are transmitted by direct or indirect contact, (e.g. *Staphylococcus aureus*, Respiratory Syncytial Virus (RSV), or by droplet, (e.g. influenza virus, B. pertussis or airborne routes (e.g. *M. tuberculosis*). Other infectious agents are rarely transmitted in healthcare setting via

percutaneous or mucous membrane exposure. Examples are hepatitis B (HBV) and hepatitis C viruses (HCV) and human immunodeficiency virus (HIV). The 3 main routes of transmission are contact, droplet and airborne.

I. Contact Precautions

Direct Contact Transmission – microorganisms are transmitted directly from person to person. Examples of contact transmission between residents/clients and HCP include the following

- i. Healthcare personnel acquires herpetic whitlow on a finger after contact with herpes simplex virus (HSV) when providing oral care to a resident/client/resident without using gloves or the resident/client acquire herpetic whitlow from an ungloved hand of a healthcare worker.
- ii. An ungloved HCP is infected with mites from a scabies-infested resident/client.

Indirect Contact Transmission – transfer of the infectious agent through a contaminated intermediate object or person. Contaminated hands of HCP are commonly known to contribute to indirect contact. Examples of indirect contact transmission are:

- i. Hands of healthcare personnel may transmit pathogens after contacting a colonized or infected person body site or contaminated inanimate object if hand hygiene is not performed before contacting another person.
- ii. Contaminated resident/client care devices (e.g. glucose monitoring devices, electronic thermometers) are shared between resident/clients without cleaning and disinfecting between residents/clients.
- iii. Contaminated instruments that are inadequately cleaned between resident/clients before disinfection or sterilization.

Contact precautions are intended to prevent transmission of microorganisms, which

are spread by direct or indirect contact with the resident/client or the resident's/client's environment. It is applied to residents/clients infected or colonized with MDRO, or resident/clients with excessive drainage wound faecal incontinence, or other discharges from the body that has increased potential for extensive environmental contamination and risk transmission.

Single room is preferred for residents who require Contact Precautions. When single room is not available, resident/client with the same infection can be cohorted in the same room. In multi-resident/client rooms, ≥ 2 meters spatial separation between beds is advised. When caring for such residents/clients, appropriate PPE should be worn when there is a potential contact with the resident/client or potentially contaminated areas in the resident's/client's environment. Donning PPE upon room entry and discarding before leaving resident/client room is practised to contain pathogens that can be transmitted through environmental contamination.

Gloves and hand hygiene

- a. Hand hygiene should be completed prior to donning gloves.
- b. Gloves should be worn while providing care for the resident/client.
- c. Gloves should be changed after having contact with infective material (e.g. faecal material and wound drainage).
- d. Gloves should be removed after providing resident/client care and hand hygiene should be performed immediately.
- e. After glove removal and hand hygiene, hands should not touch potentially contaminated environmental surfaces or items. (See Appendix C Putting On & Removal of PPE)

Gowns

- a. The disposable gown should be donned to provide resident/client care when there is likelihood of contamination.
- b. The disposable gown should be removed upon completing resident/client care or before leaving the room.
- c. After removal of the gown, clothing should not contact potentially contaminated environmental surfaces.

Resident Care Equipment

- a. Dedicated resident-care equipment should be considered for the resident/client.
- b. If use of common equipment or items is unavoidable, the items should be adequately cleaned and/or disinfected before use for another resident.

Resident/Family Education

Resident/client/family education should include methods to minimize the risk of infection transmission in the home.

Standard Precautions with gloves and gown may be considered for example:

- i. Multi-drug resistant organisms (e.g. MRSA, VRE, ESBLs, KPCs, resistant *Acinetobacter baumannii*)
- ii. Scabies
- iii. *Clostridium difficile* and other infectious causes of diarrhoea
- iv. Uncontained draining wounds

II. Droplet Precautions

Droplet transmission involves contact of the conjunctivae or mucous membranes of the nose or mouth of a susceptible person with large-particle droplets (larger than 5 micron in size) containing microorganisms generated from a person who is infected. Droplets are generated when an infected person coughs, sneeze or talk and during procedures such as suctioning and administering nebulized medications, and cough induction by chest physiotherapy. Transmission occurs when droplets containing microorganisms generated from the infected person are propelled a short distance through the air (usually less than one metre) and deposited on the host's conjunctivae, nasal mucosa, or mouth. Because droplets do not remain suspended in the air, special air handling and ventilation are not required to prevent droplet transmission. Droplets can also contaminate the surrounding environment and lead to indirect contact transmission. The area of defined risk of one meter around the resident/client is based on epidemiologic and simulated studies of selected infections. This makes it different from airborne transmission. Using this distance for donning masks has been effective in preventing transmission of infectious agents via the droplet route.

- a. Personnel shall observe Droplet Precautions (i.e., wearing a surgical or procedure mask with eye protection when within 1.5 metre of the resident), in addition to Standard Precautions, when examining a resident with symptoms of a respiratory infection, particularly if fever is present and the resident/client is actively coughing.
- b. Single room is preferred for Droplet precautions. However, if single room is not available, consult infection control personnel on other resident placement options (e.g. cohorting resident/client with same organisms in the same room). Spatial separation of 2 meters is important for resident/clients in multi-bed rooms with infections transmitted by droplet route.
- c. These precautions should be maintained until it is determined that the cause of

symptoms is not an infectious agent that requires Droplet Precautions

Mask

A surgical mask should be worn when entering the area where the resident is located. When transporting such residents outside the room, the resident should wear a mask if tolerated and follow Respiratory/Cough Hygiene Etiquette.

Resident/Family Education

Resident/family education should include methods to minimize the risk of infection transmission in the home.

i. Droplet Precautions may be considered for example:

- ii. Influenza
- iii. *Mycoplasma pneumonia*
- iv. Rhinovirus
- v. Strep pharyngitis or pneumonia

III. Airborne Infection Isolation (All) Precautions

Airborne transmission can occur with a few infectious agents that can travel on tiny respiratory particles called droplet nuclei (small particle residue [5 μ or smaller in size] containing microorganisms or dust particles containing the infectious agent. Microorganisms carried in this manner remain suspended in the air for long periods of time and can be dispersed widely by air currents. A susceptible host within the same room or over a longer distance from the source client may inhale these. Environmental controls are important – special air handling and ventilation help reduce airborne transmission. Microorganisms

transmitted by airborne transmission include *Mycobacterium tuberculosis*, *Rubeola* (Measles), *Varicella* (Chickenpox), and disseminated zoster (widespread shingles). In settings where environmental controls are not available, use a hierarchy of control which means using personal protective equipment. Immune individuals do not require PPE (*Varicella* and *Rubeola*).

Airborne infection isolation (All) precautions prevent transmission of infectious agents that remain infectious over long distance when suspended in the air. Preferably, the resident is placed in an All room (single room) equipped with special air handling and ventilation system.

The N95 mask is to be used in addition to Standard Precautions in caring for residents/clients known or suspected to be infected with a disease spread by very small droplet nuclei.

Masks

- a. The N95 mask should be worn at all times, when entering the home of a resident with a known or suspected communicable disease transmitted by the airborne route.
- b. Susceptible persons entering the home of a resident with measles, chickenpox or disseminated zoster shall wear a N95 mask. Preferably, caregivers immune to these diseases should provide care.
- c. The N-95 respirator is required to be worn for resident/clients known or suspected of having TB (pulmonary or laryngeal), smallpox, when performing aerosol-generating procedures.

Resident/family education

- a. Resident/family education should include methods to minimize the risk of infection transmission in the home.

Diseases

- i. Tuberculosis
- ii. Chickenpox
- iii. Disseminated Zoster
- iv. Measles
- v. Smallpox
- vi. Hemorrhagic fevers (Ebola, Lassa, Marburg)

Discontinuation of Isolation Precautions

Contact, Droplet and All Precautions remain in effect for a limited period of time during the infectious period. It is practised during the resident illness or when there is risk for transmission of infectious agent.

Recommendations

1. ***All health care settings must develop and implement a hand hygiene program, including hand hygiene agents available at the point-of-care in acute care settings and easily accessible in all other health care settings. In health care facilities this program must also include:***
 - a) Demonstrable senior administration commitment;***
 - b) Written policies and procedures;***
 - c) Education in hand hygiene indications and techniques;***
 - d) a hand care program; and***
 - e) a program to measure hand hygiene compliance.***

2. ***IPC must be consulted and involved in all hand hygiene product selection and trials in the health care setting.***
3. ***Each health care setting should have a policy authorizing any regulated health care professional to initiate the appropriate Transmission-based Precautions at the onset of symptoms. [BII]***
4. ***The health care setting should have a policy that permits discontinuation of Transmission-based Precautions in consultation with the IPC Professional or designate. [BIII].***

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Multi-Drug Resistant Organisms (MDROs)

Multi-drug resistant organisms (MDRO) are microorganisms that are resistant to one or more classes of antimicrobial agents. Although the name of the organism may suggest resistance to only one antibiotic (e.g. MRSA or VRE), they are often resistant to multiple classes of antimicrobial agents. MDROs typically include MRSA, VRE, and carbapenemase producing resistant *Enterobacteriace* (CRE).

Over the years, the number of MDROs in healthcare has been increasing, because the use of antimicrobial agents has resulted in the development of resistant strain. Residents of ILTCs may be colonized or infected with multidrug-resistant organisms when they are admitted, or may develop these infections through antibiotic medication during their stay. If left unchecked the spread of MDROs will increase the burden on healthcare infrastructure e.g. isolation rooms, as well as increase healthcare cost.

The prevention and control of MDROs is both a national priority, as well as a priority of healthcare institutions or facilities. The Ministry of Health (MOH) has developed MDRO guidelines with the objective of controlling the emergence of new MDROs of low incidence and to prevent it from becoming endemic. For MDROs already endemic, the national objective is to control and reduce their incidence in all Singapore healthcare facilities.

Role of Antimicrobial Management in Healthcare Facilities

Appropriate use of antimicrobials plays a major role in preventing the selection of further antimicrobial resistance in bacteria. Healthcare facilities should employ a collaborative group of infectious disease physician, pharmacists, microbiologists and IPC personnel to work with heads of departments and clinicians throughout the facility to ensure that there is appropriate and effective management of antimicrobial use for all resident/client care activities in the healthcare facility.

The following interventions for management of antimicrobial usage should be applicable to both acute and long-term care settings, where applicable:

- Restricted formulary as recommended by the facility's Pharmacy and Therapeutics Committee or equivalent committee
- Clinical guidelines on use of antimicrobials for treatment and prophylaxis. Guidelines should be discipline or disease specific. There should be a system in place within the facility to monitor and ensure compliance to such guidelines
- Restricted and appropriate laboratory reporting of antimicrobial susceptibility
- Educational program for MDROs and use of antimicrobials
- Antimicrobial audit and feedback program e.g. antimicrobial stewardship program (ASP)

Nationally, establish good communication and coordination on MDRO issues. MDRO carriage status should be communicated appropriately between healthcare facilities (taking into consideration principles of resident/client confidentiality) to allow appropriate infection prevention and control (IPC) measures to be taken in the receiving facility.

Escalation and Containment of New MDROs or MDRO Clusters and Outbreaks

The escalation to MOH when there is new MDRO case, clusters or outbreaks in a timely manner is critical. These provide opportunities for assistance or coordination in infection control efforts or outbreak investigation.

Containment and Prevention of Future Clusters or Outbreaks

Every healthcare institution/facility is responsible to contain and prevent future MDRO clusters and outbreaks. The healthcare facility must put in place all necessary infection control interventions to arrest the cluster or outbreak, and conduct epidemiological investigations to determine the source of the cluster or outbreak in a timely manner. MOH is

to be notified for possible assistance and updated on the progress of the situation. After the cluster or outbreak has ceased, lessons or gaps in infection control processes should be identified and control measures instituted to close the gaps to prevent future occurrences.

The healthcare facility must work with the National Public Health Laboratory (NPHL), when necessary, to determine if there is clonal spread. Where the cluster or outbreak situation exceeds the infection control or epidemiological capabilities within the facility, it is the responsibility of the institution to inform MOH so that necessary assistance can be mobilized.

Infection Prevention and Control Measures for MDROs in Healthcare Settings

Strong leadership and clinical governance is required for successful prevention and control of MDROs. A continuous quality improvement approach is to be adopted to ensure that the appropriate infection prevention and control strategies are fully implemented. The aim is to reduce, and where possible, eliminate all resident's/client's harm that is caused by MDROs.

IPC Programme and Risk Assessment

An effective and comprehensive IPC programme is essential to control MDROs.

Ideally it should incorporate the following

1. Processes for monitoring infection control problems, including outbreaks of MDROs
2. Education of employees in IPC practises
3. Processes for development and updating of IPC policies and procedures
4. Access to microbiology or laboratory services
5. Policies for management of antimicrobial use in the healthcare institution
6. Findings of pharmacy and therapeutics reviews and relevant clinical guidelines
7. Role of the healthcare facility in national MDRO prevention and control

Activities to reduce MDROs infections begin with an assessment of the specific risks in the healthcare facility. When MDROs are introduced into a healthcare facility, a number of factors aid the transmission and persistence of MDROs in the environment. These include:

1. Presence of vulnerable residents/clients, such as those with compromised immunity from underlying medical or surgical conditions, those who have indwelling devices including endotracheal tubes, vascular catheters or urinary catheters
2. The reservoir of infected or colonised residents
3. The selective pressure exerted by antimicrobial use
4. The effectiveness of local IPC measures

It is best to perform an MDRO Risk Assessment annually. The facilities should be familiar with risk assessment principles such as the use of likelihood and impact analyses to support prioritization and action.

Steps to performing an MDRO risk assessment include:

1. Establish the baseline incidence and/or prevalence MDRO rates for the whole healthcare facility or for specific unit(s) in the facility.
2. Identify high-risk populations and/or units based on incidence and/or prevalence rates, local demographic risk data, and known risk factors from scientifically based evidence.
3. Evaluate MDRO data for the facility and/or the specific unit(s) over time to characterize MDRO prevalence or transmission rates to determine if enhanced interventions are needed.
4. Conduct appropriate surveillance for MDROs, taking into account the above risk factors and MDRO data, in order to identify MDRO cases early for infection control.

5. Identify clusters in MDRO transmission in the resident/client population and/or unit(s) to determine if enhanced interventions are needed.

From the MDRO surveillance and risk assessment, the institution/facility should develop and implement an appropriate IPC programme that targets MDROs in the facility.

This requires each institution to have the following IPC components:

1. IPC staffing and/or hours assigned to IPC
2. Knowledge of IPC interventions in place (e.g. Hand Hygiene Programme, Contact Precautions, etc.)
3. Status of IPC interventions e.g. measurement parameters and compliance rates
4. Comprehensive line list of identified resident/clients with MDROs (colonization and infection)
5. Facility antibiogram

Successful implementation depends on the availability and timeliness of clinical diagnostic laboratory services, resources and support. A definite timeline for implementation should be developed.

Infection Prevention and Control Measures for MDRO in ILTC Setting

Residents/clients colonised with an MDRO may be encountered in healthcare facilities outside of the acute care institutions or facilities settings such as nursing homes, community care services, day care or rehabilitation centres. All the healthcare facilities including non-acute setting should have the capabilities and capacity to look after residents/clients with MDROs. None should be declined admission to an ILTC facility or other non-acute setting because of carriage of MDRO. However, strategies should be in place to control the spread of such organisms.

Due to risk assessment, the appropriate IPC guidance differs according to the setting or type of healthcare facility. For example, the isolation of resident/clients in acute care

institutions or facilities differs from that for nursing homes because there are more immunocompromised resident/clients and greater use of devices in acute care institutions or facilities. For residents in nursing homes, the nursing home is generally their long-term residence, and isolation for asymptomatic resident/clients who are colonised with MDRO(s) is not indicated.

Alternatively, residents/clients with MDROs may be cared for in their own home or in social homes e.g. homes run by the Ministry of Social and Family Development (MSF).

MDRO-colonised Residents in Residential ILTC Facilities

Residents/clients colonised with an MDRO do not pose a risk to healthy members of the community (including family members). However, all healthcare facilities should endeavour to prevent transmission of MDROs.

Generally, Standard Precautions should be implemented when dealing with all residents/clients in all healthcare facilities regardless of whether they are infected or colonised with an MDRO, viz.

- Hand hygiene should be performed
- Contact Precautions when managing specific resident/clients according to the resident/client's individual situation and the prevalence of MDROs in the institution/facility

The following situations may arise in residential nursing homes:

A. Relatively healthy independent residents or clients colonised with a MDRO:

Standard Precautions are adequate, with emphasis on ensuring that gloves and aprons are used when dealing with secretions, draining wounds, stool, ostomy bags or tubes and pressure ulcers.

B. Dependent residents/resident/clients OR those with uncontrolled secretions/excretions OR suffering from an infection with a MDRO:

Contact Precautions are recommended in this situation. Single room accommodation or treatment is preferable if available. If single rooms are not available, cohorting of residents with the same MDRO is acceptable. If cohorting is not possible, then residents colonised or infected with an MDRO should be placed in a room with others considered to be at low risk for acquisition of an MDRO (i.e. not immunocompromised, not on antimicrobials, without open wounds, drains or urinary catheters) or those who have an anticipated short duration of stay.

For the nursing home setting, the implementation of Infection Control Precautions practised in an acute care setting may have adverse psychological consequences for the resident, where the facility is also their home. This should be considered when implementing Contact Precautions and isolation.

The mobile nursing home resident who is incontinent, confused and/or wandering poses a particular infection control risk when colonised with MDROs. Decisions regarding the best precautions to use for such resident/clients should be made on a case-by-case basis. If the spread of a MDRO within an ILTC is not controlled by the Infection Control precautions mentioned, intensified infection control measures may be required and expert advice should be sought.

MDRO-colonised Clients in Non-Residential ILTC Facilities and Other Ambulatory Care Settings

Although the risk of MDRO transmission is lesser in non-residential ILTC facilities and day care settings, these facilities must be able to manage MDROs clients.

Basic infection prevention and control measures are to be implemented to prevent possible spread of healthcare associated infections e.g. easy access to hand hygiene facilities (sink or alcohol hand rub agent), policies and procedures on environmental hygiene developed and implemented.

Whenever possible, separate session for clients colonised with MDRO are to be done. However, if this is not feasible, all items used and environmental surfaces should be disinfected immediately between clients (refer to MOH Environmental Cleaning Guidelines).

Other Aspects of Control of MDRO for All ILTCs, Sheltered Home and Day Care

Settings

These include:

- Pre-admission review of referrals for MDROs so that appropriate precautions can be prepared before residents'/clients' arrival at healthcare setting
- Maintaining a list of residents infected or colonised with a MDRO: Methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin Resistant *Enterococcus* (VRE), carbapenemase-producing carbapenem resistant *Enterobacteriaceae* (CP-CRE)
- Monitoring of MDRO culture results of specimens sent to the local microbiology laboratory, if any
- Communicating information relating to the MDRO Clinical Records Information of a MDRO colonised resident or resident/client to other receiving or transmitting facilities, such as upon referral to the hospital or other healthcare facilities
- Ensuring adequate environmental cleaning

MDRO-colonised Persons at Home or in Social Homes

Standard Precautions including hand hygiene should be implemented. Single-use person care equipment should be used where possible. Where possible, dedicated person care equipment should be used which should remain in the person's home until they are discharged from the home-care service. Where equipment cannot be left in the person's home (e.g. stethoscopes) or not designated as single person use, they should be cleaned and disinfected using a low to intermediate level disinfectant before leaving the person's

home. Alternatively, the item of equipment should be placed in a plastic bag for transport to another site for cleaning and disinfection.

Methicillin Resistant *Staphylococcus aureus* (MRSA)

The term is used to describe a number of strains of the bacterium *Staphylococcus aureus* that have developed resistance to antibiotics commonly used to treat staphylococcal infections. MRSA is an opportunistic bacterium, which may colonise and grow readily on the skin and mucous membranes of a person, without harm to that person. It is commonly isolated from warm, moist body sites such as the nose, groin and perineum. MRSA colonisation can lead to infection such as infected skin lesions.

Surveillance for MRSA in Residential ILTCs

Consider short term MRSA Active Surveillance to determine incidence and or prevalence. This could be used to evaluate the success of an intervention that was implemented in response to increased MRSA infections or a MRSA outbreak.

Management of MRSA Resident/Clients in ILTCs

None should be declined admission to an ILTC because of carriage of MRSA. Protocols should be in place to control the spread of MRSA in the ILTCs.

In addition to setting up an Infection Prevention and Control Programme and putting in place appropriate risk assessment, precautionary measures are recommended for residents/clients known to be colonised or infected with MDROs.

MDRO Bundle

Measuring the compliance with precautionary measures on a routine basis will provide the healthcare institution with information on its success in these interventions. For ease of implementation and monitoring, the following precautionary measures may be packaged into an MDRO Bundle:

- Active surveillance
- Antimicrobial management, including antimicrobial stewardship programmes
- Practise of isolation precautions such as contact precautions for resident/clients or residents identified with MDROs
- Hand hygiene in accordance with institutional guidelines
- Environmental hygiene in accordance with institutional guidelines
- Antiseptic body baths (or wipes for bedridden resident/clients or residents) to reduce bio-burden in resident/clients or residents identified with MDROs

Vancomycin Resistant *Enterococcus* (VRE)

The incidence of VRE is increasing and similar efforts should be made to minimize transmission. Residents/clients diagnosed with VRE should preferably be isolated or cohorted. None should be declined admission to an ILTC including welfare homes, sheltered homes, homes for the disabled because of carriage of VRE. Protocols should be in place to control the spread in the ILTCs.

Carbapenemase-producing carbapenem resistant *Enterobacteriaceae* (CP-CRE)

Enterobacteriaceae is a term used to describe groups of Gram-negative bacilli that commonly live in the enteric tract or bowel. It includes organisms such as *Escherichia coli* (*E. coli*), *Klebsiella pneumonia* (*K. pneumoniae*), *Enterobacter cloacae*, and *Citrobacter freundii*. β -lactam antimicrobials comprise some of the most commonly used agents, such as penicillins, cephalosporins, monobactams and carbapenems. The production of β -lactamases

by *Enterobacteriaceae* is a key mechanism for the development of resistance to the various types of β -lactam antimicrobials.

None should be declined admission to an ILTC because of carriage of CP-CRE. Protocols should be in place to control the spread. CP-CRE resident/clients should be placed in a single room or cohorted with other CP-CRE resident/clients. If cohorting is not possible, then those residents colonized or infected with CP-CRE should be placed in a room with residents considered to be at low risk for acquisition of an MDRO (i.e. not immunocompromised, not on antimicrobials, without open wounds, drains or urinary catheters).

Use Contact Precautions for CP-CRE resident/clients who require total care or who have draining wounds or faecal or urinary MDRO guidelines incontinence or uncontrolled secretions.

- a. Wear gloves when touching resident's intact skin or surfaces and articles in close proximity to the resident/client. Don gloves upon entry into the room.
- b. Wear gown whenever anticipating that clothing will have direct contact with the resident/client or potentially contaminated environmental surfaces or equipment in close proximity to the resident/client. Don gown upon entry into the room. Remove gown and wash hands before leaving the resident/client-care environment
- c. After gown removal, ensure that the clothing is not in contact with the resident care environment
- d. Do not share equipment between resident/clients. If equipment such as glucometers must be shared, carefully disinfect the equipment between resident/clients, following manufacturer's guidelines

Practise Standard Precautions for CP-CRE residents who are mainly independent. If residents are cohorted, a clean gown and gloves are to be used between residents.

Cleaning and decontamination of environment and resident/client-care equipment

1. Local policies for environmental cleaning and equipment decontamination, waste and linen management should state the necessary standards, and should be applied rigorously
2. Wards should be cleaned regularly as part of a general programme of environmental hygiene
3. Adequate hand hygiene facilities and alcohol-based handrub should be available for staff and visitor hand decontamination before and after contact with the resident/client or their immediate environment
4. Instruments or equipment should preferably be single-resident/client use
5. Multiple-resident/client-use items should be decontaminated appropriately before use on another resident/client in accordance with local policy or manufacturer's instructions
6. All resident/client care equipment or supplies must be effectively cleaned and disinfected before use on another resident/client
7. The room in which a resident/client with an MDRO has been cared for should be cleaned after the resident/client's discharge with a chlorine releasing agent, such as hypochlorite, with special attention to frequent-touch areas, horizontal surfaces and dust-collecting areas (e.g. ventilation grids). For equipment that could not withstand chlorine, alternatives may be considered with guidance from IPC team. Curtains should be removed and laundered if not single-use disposable curtains. Pillows and mattress covers should be checked for damage
8. After an outbreak or incident of MDRO colonisation or infection, isolation rooms (or the whole of a ward after more extensive outbreaks) must be cleaned with appropriate disinfectant thoroughly to reduce environmental contamination.
9. Documents including the nursing notes and resident/client's chart should not be taken into the room

10. Only essential equipment and supplies should be taken into the resident/client's room. Stockpiling of supplies should be avoided

Antiseptic body wash or wipes

- a. Antiseptic e.g. 4% chlorhexidine, liquid chlorhexidine (2%) or 2% chlorhexidine-impregnated wipes, octenidine or equivalent products; are used to bathe resident/clients daily in acute care setting. Chlorhexidine, if used, is usually not used above the jaw line or on open wounds
- b. In long-term care settings this type of an intervention might be used on targeted high-risk residents (e.g., residents that are totally dependent upon healthcare personnel for activities of daily living, are ventilator dependent, are incontinent of stool, or have wounds whose drainage is difficult to control) or high-risk settings (e.g., ventilator unit)

Linen

- a. All linen from resident/clients infected with or colonised with MDRO should be considered to be contaminated or infected including bedding and adjacent curtains. Linen should be removed from the bed with minimal agitation and should be further managed in accordance with local policy and national guidance, where provided

Re-usable bedpans and urinals

- a. Dedicated bedpans or urinals are not required, provided that the bedpan washer or disinfectant is in working order

Crockery and cutlery

- a. No special precautions are necessary with these items

Resident/client movement and transport

- a. When a resident/client with an MDRO is transferred to another healthcare facility, the clinical team is responsible for the resident/client and should inform the receiving clinical and infection control staff of the resident/client's MDRO Clinical Record Information
- b. During actual transportation between departments, it is important to maintain resident/client confidentiality
- c. As the resident/client is not normally in direct contact with surrounding environmental surfaces or the staff members clothing during transportation, aprons or gloves are not required unless directed by Standard Precautions

Ambulance transportation

- a. Ambulance staff should adhere to Standard Precautions with all resident/clients
- b. To minimise the risk of cross infection with any infectious agent, ambulance staff should use an alcohol based hand gel or rub after contact with all resident/clients as part of standard precautions
- c. If ambulance transfer is required, the ambulance service should be notified in advance of any infection risk by the responsible ward staff
- d. The resident/client may travel with other resident/clients unless notified to the contrary; transport should not be shared if the resident/client is deemed at high risk of transmission of MDRO, e.g. if they have diarrhoea, discharging lesions which cannot be covered with an impermeable dressing, or if the other residents/clients requiring

transport are especially vulnerable e.g. immunocompromised or if recommended by the IPC team

- e. Unnecessary equipment and linen should be removed before transporting resident/client
- f. Resident/clients on stretchers should be wrapped in a clean sheet before leaving the ward
- g. Blankets and sheets should be placed into a separate laundry bag after transport of resident/client
- h. Local areas of resident/client contact e.g. chair and stretcher should be cleaned and disinfected as per local decontamination policy
- i. After resident/client contact, protective clothing and gloves should be removed and hands decontaminated using an alcohol-based handrub if visibly clean hands or antiseptic handwash, if necessary. Fumigation and prolonged airing of the ambulance is not necessary.

Deceased Resident

The infection Control precautions for handling deceased residents/clients are the same as those used for live residents/clients. Any lesions should be covered with impermeable dressing. Plastic body bags are not necessary, but may be used as part of general practice in accordance with Standard Precautions for all residents.

Infectious Diseases

(A) Common Cold

Acute viral rhinopharyngitis, or acute coryza, usually known as the common cold, is a contagious, viral infectious disease of the upper respiratory system, primarily caused by rhinoviruses (picornaviruses) or coronaviruses. It is the most common infectious disease in humans; there is no known cure, but it is rarely fatal.

Signs and symptoms

Common symptoms are sore throat, runny nose, nasal congestion, coughing and sneezing; sometimes accompanied by 'pink eye', muscle aches, fatigue, malaise, headaches, muscle weakness, uncontrollable shivering, loss of appetite, and rarely extreme exhaustion. Fever is more commonly a symptom of influenza, another viral upper respiratory tract infection (URTI) whose symptoms broadly overlaps with the cold but are more severe.

Incubation period

The typical common cold incubation period is from 2-5 days, but symptoms can appear in as little as 10 hours after the virus first enters the nose.

Route of transmission

The common cold virus is transmitted mainly from droplet spread (via coughing or sneezing) or contact with the saliva or nasal secretions of an infected person.

Infection Control measures

Droplet Precautions are to be adopted by the healthcare worker i.e. use of surgical masks when taking care of the resident/client. It is also recommended that resident/clients with influenza wear surgical masks when they are in common activity areas to prevent spread to others. In addition, the following are recommended:

- Good personal health and hygiene habits
- hand washing
- avoiding spitting
- covering the nose and mouth when sneezing or coughing

The best way to avoid a cold is to wash hands thoroughly and regularly; and to avoid touching the eyes, nose, mouth, and face. To prevent infection, washing or disinfecting hands has been found to be effective, as this minimizes person-to-person transmission of the virus.

Treatment

There are no antiviral drugs approved to treat or cure the infection; all medications used are palliative and treat symptoms only. Treatment that may help alleviate symptoms include: analgesics, decongestants, and cough suppressants, getting plenty of rest, drinking fluids to maintain hydration, gargling with warm salt water, using cough drops, throat sprays.

Reference:

1. Eccles R (November 2005). "Understanding the symptoms of the common cold and influenza". *Lancet Infect Dis* 5 (11): 718–25. doi:10.1016/S1473-3099(05)70270-X. PMID 16253889.

(B) Influenza

Influenza, commonly referred to as the flu, is an infectious disease that affects birds and mammals. The name *influenza* comes from the Italian *influenza*, meaning "influence" (Latin: *influentia*).

Signs and symptoms

Symptoms of influenza can start quite suddenly one to two days after infection.

Symptoms may include:

- Body aches, especially joints and throat
- Extreme coldness and fever
- Fatigue
- Headache
- Irritated watering eyes
- Reddened eyes, skin (especially face), mouth, throat and nose

Incubation period

The incubation period of influenza is usually 2 days but can range from 1-5 days.

Route of transmission

Typically, influenza is transmitted through the air by coughs or sneezes, creating aerosols containing the virus. Bird droppings, saliva, nasal secretions, faeces and blood can also transmit influenza. Infection can also occur through contact with these body fluids or through contact with contaminated surfaces.

Infection control measures

Droplet Precautions are to be adopted by the healthcare worker i.e. use of surgical masks when taking care of the resident/client. It is also recommended that residents/clients

with influenza wear surgical masks when they are in common activity areas to prevent spread to others. In addition, the following are recommended:

- Good personal health and hygiene habits
- Hand washing
- Avoiding spitting
- Covering the nose and mouth when sneezing or coughing

In particular, hand-washing with soap and water, or with alcohol-based hand rubs, is very effective at inactivating influenza viruses. These simple personal hygiene precautions are recommended as the main way of reducing infections during pandemics. Although surgical masks might help prevent transmission when caring for the sick, evidence of beneficial effects is mixed in the community.

Since influenza spreads through both aerosols and contact with contaminated surfaces, surface sanitizing may help prevent some infections. Sunlight, disinfectants and detergents can inactivate influenza viruses. As the virus can be inactivated by soap, frequent hand washing reduces the risk of infection.

Vaccinations against influenza are usually given to people in developed countries and to farmed poultry. The most common human vaccine is the trivalent influenza vaccine (TIV) that contains purified and inactivated material from three viral strains. The TIV carries no risk of transmitting the disease, and it has very low reactivity. A vaccine formulated for one year may be ineffective in the following year, since the influenza virus evolves rapidly, and new strains quickly replace the older ones. The influenza vaccine is recommended as an annual vaccine to protect against seasonal influenza and prevent healthcare-associated outbreaks.

Treatment

Antiviral drugs can be used to treat influenza, with neuraminidase inhibitors being particularly effective.

Pandemic Flu

Please refer to MOH website for updates on national control measures and management of Pandemic Flu

(https://www.moh.gov.sg/content/moh_web/home/diseases_and_conditions/pandemic-preparedness.html)

References

1. Suarez, D; Spackman E, Senne D, Bulaga L, Welsch A, Froberg K (2003). "The effect of various disinfectants on detection of avian influenza virus by real time RT-PCR". *Avian Dis* 47 (3 Suppl): 1091–5.
2. Aledort JE, Lurie N, Wasserman J, Bozzette SA (2007). "Non-pharmaceutical public health interventions for pandemic influenza: an evaluation of the evidence base". *BMC Public Health* 7: 208.
3. Grayson ML, Melvani S, Druce J, *et al.* (February 2009). "Efficacy of soap and water and alcohol-based hand-rub preparations against live H1N1 influenza virus on the hands of human volunteers". *Clin. Infect. Dis.* 48 (3): 285–91.
4. MacIntyre CR, Cauchemez S, Dwyer DE, *et al.* (February 2009). "Face mask use and control of respiratory virus transmission in households". *Emerging Infect. Dis.* 15 (2): 233–41.
5. Bridges CB, Kuehnert MJ, Hall CB (October 2003). "Transmission of influenza: implications for control in health care settings". *Clin. Infect. Dis.* 37 (8): 1094–101.

(C) Tuberculosis (TB)

This is caused by *Mycobacterium tuberculosis* complex. Route of transmission is again airborne. However, a resident/client who has completed 2 weeks of effective treatment with anti-tuberculosis drugs is rendered non-infectious and hence, will not require airborne infection isolation precautions. However, he/she is not cured yet at this stage and must continue with the treatment until he/she has completed the whole course of treatment. Stopping TB treatment prematurely before completion of the entire 6 to 9 months course of treatment may result in the resident/client remaining infectious or create opportunity for the development of multi-resistance in the TB bacilli. TB may be acquired through breathing in nuclei droplets containing the TB bacilli.

Causes & risk factors

TB is transmitted via nuclei droplets from a person with the disease i.e. it is airborne transmission. The risk of developing active TB disease is higher in:

- Persons with prolonged close contacts with someone known to have untreated TB
- Persons with underlying medical conditions such as HIV disease and diabetes
- Persons who have a weakened immune system e.g. due to drugs or sickness
- Persons who have poor nutritional status
- Drug addicts

Signs & symptoms

Symptoms of TB disease depend on the area affected. Some people may not develop any obvious symptom. Some common symptoms of TB include:

- a persistent cough that lasts 3 weeks or longer
- night sweats

- fatigue
- weight loss
- low-grade fever
- chest pain
- coughing up blood or sputum

Screening & diagnosis

If the resident has a cough that persists longer than 3 weeks or any of the other symptoms, medical attention is warranted for assessment to determine if he has TB.

Infection Control measures

Airborne Infection Isolation (All) precautions are to be adopted in care of the TB resident/client. This involves the following:

1. Isolation of resident/client (suspected and confirmed active TB) in a negative pressure room. Where possible, this room is to comply with the CDC recommendations i.e. minimum of 12 air changes per hour, etc. Alternatively, opening the windows, keeping the door closed and turning off the air conditioning unit may create negative pressure in the room.
2. The isolation room should be equipped with its own toilet facility.
3. Healthcare workers and visitors are to wear N95 masks when entering the isolation room.

A diagnosis of tuberculosis infection is notifiable to the Ministry of Health. The law also mandates the reporting of suspected TB cases. Although the TB Control Unit does contact tracing of the public, it is advisable that residents in same cubicle be assessed for risk of acquiring TB. Persons exposed to a potentially contagious case of tuberculosis will have a Mantoux test done to determine if isoniazid prophylaxis is required.

Management:

I. Active TB

Residents/clients with, or suspected to have active TB disease should seek medical treatment as soon as possible. A chest x-ray and sputum diagnostic tests will be done to evaluate for TB disease. Resident/clients diagnosed with TB are prescribed multiple drug therapy for at least 6 months.

To be effective in treatment of TB and prevent the risk of developing drug resistance, it is very important that residents/clients follow their doctors' instruction to take the drugs exactly as prescribed and complete the whole course of treatment even if resident/clients do not have symptoms anymore and start to feel better. This can also help prevent the spread of TB in our community.

II. Latent TB Infection (LTBI)

Initial TB infection usually goes unnoticed. The TB bacteria can remain in the body without showing symptoms for years, sometimes decades. This is called latent TB infection (LTBI). LTBI is not a disease and persons with LTBI cannot spread TB to others. About 10% of those with LTBI will develop active TB disease during their lifetime. Half of such persons do so in the first two years after acquiring the infection. The risk of developing active disease is higher in persons with underlying medical conditions (e.g. diabetes), weakened immune system due to infection and illnesses, and young children under five years of age. It is advisable to have a regular program for screening for TB in the residents.

Isoniazid is given as chemoprophylaxis to persons with LBTI for 6 to 12 months to reduce the risk of developing active TB disease in the future.

References

1. Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005.
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Accessed on 1 June 2014.
2. Tuberculosis. Health Promotion Board, Singapore.
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3. Tuberculosis. Ministry of Health, Singapore.
https://www.moh.gov.sg/content/moh_web/home/diseases_and_conditions/t/tuberculosis.html. Accessed on 1 June 2014.

(D) Scabies

Scabies is an itchy and contagious skin infestation caused by a mite, *Scarcoptes scabies*. It is a common infestation in long-term care settings and transmissible if not given prompt appropriate medical attention. Infection control measures should be employed to prevent and manage the infestations should it occur.

Signs & Symptoms

Early symptoms are severe itching (pruritis) at night followed by itching and skin rash. The rash is pimple-like (papular), itchy (pruritic) known as 'scabies rash'. Much of the body may be affected or parts like webs of fingers, wrist, elbow, armpit, penis, nipple, waist, buttocks and shoulder blades.

Incubation period

The incubation period is 2-6 weeks. However, the infested person can spread scabies during this time even if there are no symptoms. Intense itching can lead to scratching and skin sores.

Route of transmission

Transmission occurs primarily by the transfer of the impregnated female mites during person-to-person, skin-to-skin contact with occasional transmission via fomites (e.g. bedding or clothing). Human scabies mites often are found between the fingers and on the wrists.

Prevention

Early detection, treatment, and implementation of appropriate isolation and infection control practises are essential in preventing scabies outbreaks. ILTCs should maintain a high index of suspicion that undiagnosed skin rashes and conditions might be scabies, even if characteristic signs or symptoms of scabies are absent (e.g. no itching). The onset of

scabies in a staff person who has had scabies before can be an early warning sign of undetected scabies in a resident/client. Skin scrapings can be used to confirm diagnosis.

All resident/clients are screened for history of scabies infestation on admission to ILTC (intermediate long term care sector). If present, prophylactically treat with a scabicide e.g. Malathion 0.5% lotion for 3 consecutive days. The healthcare staff must be vigilant and alert to identify resident/clients with scabies eruptions. A routine inspection of skin on bathing and examination of skin when resident/client complains of itches and rashes, should be carried out for early and prevention of scabies outbreak. Every skin condition and symptoms of itching are notified to the doctor for assessment to rule out scabies. Staffs are to report scabies infestations of self or close family members to Department Heads on a regular basis.

The following steps should be taken to prevent re-infestation and to prevent the mites from spreading to other people:

- **Clean all clothes and linen**

Use hot, soapy water to wash all clothing, towels and bedding used at least two days prior to treatment. Scabies mites will die if exposed to a temperature of 50°C for 10 minutes. Dry with high heat. Dry-clean items that cannot be washed at home.

- **Starve the mites**

Consider placing items cannot be washed in a sealed plastic bag for a couple of weeks. Mites die if they do not eat for a week.

Infection Control Measures

Standard Precautions and Contact Precautions are to be applied in the management of the scabies resident/client. Gloves and gowns should be worn and changed in between each resident/client care.

Multiple cases or crusted scabies of the Norwegian type

Early detection of new cases, practise of Standard Precautions and transmission based precautions and identifying and treating single and isolated cases early prevents transmission. However, small outbreaks can occur. When more than one scabies case is detected in a room or cubicle, outbreak measures should be adopted at once to prevent further infestation of other resident/clients and staff. Isolation procedures and cohort nursing with designated staff to the infested resident/clients can reduce the potential for further transmission. Direct skin-to-skin contact between a resident/client with crusted scabies and his/her caretakers and visitors should be eliminated with the practise of following strict Contact Precautions, including the use of protective garments such as gowns and gloves. The resident's/client's room should be cleaned thoroughly. Bedding and clothing used by a person with scabies should be changed daily or when soiled and machine-laundered using the hot water and hot dryer cycles, where possible. Rooms should be thoroughly cleaned and vacuumed after use. Environmental disinfection using pesticide sprays or fogs generally is unnecessary and is discouraged.

All staff, volunteers, and visitors who may have been exposed to a resident/client with crusted scabies, or to clothing, bedding, or furniture used by such a resident/client, should be identified and treated at the same time. This is to prevent re exposure as the 'infested' person can spread scabies during the asymptomatic period. Symptoms of scabies can take weeks to appear the first time in an infested person.

Surveillance

Scabies infestation in long term care settings is inevitable. A good surveillance system to capture clinical information about confirmed and suspected scabies resident/clients should be in place and used for systematic review to facilitate early identification and response to potential outbreaks. All new resident/clients and staff should be screened and treated for skin conditions suggestive of possible scabies. Communication to institutions where the resident/clients are admitted from, visitors and family members of staff is vital.

Education

All staffs should be informed and reinforced on scabies infestation periodically to keep their knowledge and skills intact for the identification and management of scabies.

Reference:

1. Scabies. Health Promotion Board, Singapore. <http://www.hpb.gov.sg/HOPPortal/dandc-article/736>. Accessed on 1 June 2014.

(E) Gastroenteritis (GE)

Elderly residents with gastroenteritis must be tested as soon as possible to minimise the effects of outbreaks in aged care facilities. Gastroenteritis (also known as gastro, gastric flu, and stomach flu, although unrelated to influenza) is inflammation of the gastrointestinal tract, involving both the stomach and the small intestine and resulting in acute diarrhoea. The inflammation is caused most often by an infection from certain viruses or less often by bacteria, their toxins, parasites, or an adverse reaction to something in the diet or medication.

Different species of bacteria can cause gastroenteritis, including *Salmonella*, *Shigella*, *Staphylococcus*, *Campylobacter jejuni*, *Clostridium*, *Escherichia coli*, *Yersinia*, and others. Some sources of the infection are improperly prepared food, reheated meat dishes, seafood, dairy, and bakery products. Each organism causes slightly different symptoms but all result in diarrhoea. Viruses causing gastroenteritis include rotavirus, norovirus, adenovirus and astrovirus. Viruses do not respond to antibiotics.

Risk factors include consumption of improperly prepared foods or contaminated water and travel or residence in areas of poor sanitation. The loss of fluids through diarrhoea can cause severe dehydration, which is one cause of death in diarrhoea sufferers. Along with water, sufferers also lose dangerous amounts of important salts, electrolytes, and other nutrients. Depending on the degree of dehydration, this can be done by giving the person oral rehydration therapy (ORT) or through intravenous delivery.

Signs and symptoms

It's usually of acute onset, normally lasting 1–6 days, and is self-limiting.

- Nausea and vomiting
- Diarrhoea
- Loss of appetite
- Headaches
- Abdominal pain

- Abdominal cramps
- Bloody stools (dysentery - suggesting infection by amoeba, *Campylobacter*, *Salmonella*, *Shigella* or some pathogenic strains of *Escherichia coli*)
- Fainting and Weakness

Incubation period

The incubation period ranges from 18-72 hours. During this incubation period, while the virus is multiplying inside those infected cells, the resident/client is asymptomatic.

Route of transmission

Gastroenteritis may be spread through food or person-to-person contact, or a combination of both. Infectious gastroenteritis is caused by a wide variety of bacteria and viruses.

Infection Control Measures

Contact Precautions are to be applied when managing the GE resident/client:

- Gloves
- Gown
- Handwashing - Refer to Appendix A for steps in hand hygiene.
- Resident/client isolation

Gloves should be worn when coming into contact with items that may be contaminated, such as clothing, bedding or environmental surfaces. Remove the gloves after caring for the resident/client, and wash hands with soap. Gloves alone do not guarantee prevention of transmission.

Gowns should be worn if direct care (e.g. bathing or lifting) is provided or when there is contact with secretions / excretions (changing linens). In addition, gowns should be worn

when coming into contact with environmental surfaces that are likely to be contaminated. Gowns should be removed and discarded prior to leaving the resident/client room.

Persons can reduce their chance of getting infected by frequent handwashing, prompt disinfection of contaminated surfaces with household chlorine bleach-based cleaners, and prompt washing of soiled articles of clothing. If food or water is suspected to be contaminated, it should be avoided.

Environmental Cleaning

The toilet should be cleaned with 5000 parts per million (ppm) sodium hypochlorite after use.

(F) Norovirus

Noroviruses are highly contagious and can spread easily from person to person. They are found in the stool or vomit of infected people.

Signs and symptoms

The disease is usually self-limiting with the following as signs and symptoms:

- characterised by nausea
- vomiting
- diarrhoea
- abdominal pain
- and in some cases, loss of taste
- general lethargy
- weakness
- muscle aches
- headache
- low-grade fever

Incubation period

When a person becomes infected with norovirus, the virus begins to multiply within the small intestine. After approximately 1 to 2 days, norovirus symptoms can appear. This period between the norovirus transmission and the start of norovirus symptoms is known as the "norovirus incubation period." In some cases, the norovirus incubation period can be as short as 12 hours after exposure.

Route of transmission

The viruses are transmitted by faecally contaminated food or water and by person-to-person contact. Norovirus transmission can happen in one of several ways, including:

- Eating foods or drinking liquids that are contaminated with norovirus
- Touching surfaces or objects contaminated with norovirus and then putting your hands in your mouth
- Having direct contact with another person who is infected and showing symptoms (e.g. when caring with the illness, or sharing foods or eating utensils with someone who is ill).

Contagiousness

People infected with norovirus are usually contagious from the moment they begin feeling ill to at least 3 days after recovery. Some people may be contagious for as long as 2 weeks after recovery. Therefore, it is particularly important for people to use good hand washing and other hygienic practises after they have recently recovered from norovirus illness.

Outbreaks of norovirus infection often occur in closed or semi-closed communities, such as long-term care facilities, hospitals, prisons, dormitories, and cruise ships where once the virus has been introduced, the infection spreads very rapidly by either person-to-person transmission or through contaminated food. Many norovirus outbreaks have been traced to food that was handled by one infected person.

Infection Control measures

Contact Precautions are to be applied when managing resident/clients with Norovirus infections:

- Gloves - should be worn when coming into contact with items that may be contaminated, such as clothing, bedding or environmental surfaces. Remove the gloves after caring for the resident/client, and perform hand hygiene with alcohol hand rub or soap and water. Gloves alone do not guarantee prevention of transmission.

- Gown is to be worn if direct care (bathing or lifting) is provided or when in contact with secretions / excretions (changing linens). In addition, gowns should be worn when coming into contact with environmental surfaces likely to be contaminated. Gowns should be removed and discarded prior to leaving the resident/client room.
- Handwashing - Refer to Appendix A for steps in hand hygiene.
- Resident/client isolation

Environmental Cleaning

Norovirus is rapidly inactivated by chlorine-based disinfectants, but because the virus particle does not have a lipid envelope, it is less susceptible to alcohols and detergents. Frequent cleaning of common toilets is recommended. The toilet is to be cleaned with 5000 ppm sodium hypochlorite after use.

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(G) Pneumonia

Introduction

Pneumonia or lower respiratory tract infection is the second most common health care related infection in long-term care settings. It has substantial morbidity and mortality, being the second cause of deaths in Singapore in the last few years (Health Facts, Singapore 2012). Most resident/clients who have this pneumonia are the infants, young children, and persons greater than 65 years of age; persons who have severe underlying disease, immuno-suppression, depressed sensorium, and/or cardiopulmonary disease; and persons who have had thoraco-abdominal surgery.

Epidemiology

The reported distribution of etiologic agents that cause healthcare associated pneumonia differs between hospitals. In general hospital acquired bacterial pneumonias are frequently polymicrobial and Gram-negative bacilli. However, *Staphylococcus aureus*, especially MRSA and other Gram-positive cocci, including *Streptococcus pneumoniae* are common pathogens, too.

The incidence of pneumonia in hospitalized resident/clients might result from colonization of the pharynx by gram-negative bacilli and the subsequent entry of these organisms into the lower respiratory tract. There are also evidence of aerobic gram-negative and they are likely to result from colonization in comatose resident/clients, in resident/clients treated with antimicrobial agents, and in resident/clients who have hypotension, acidosis, diabetes mellitus, leucocytosis, leucopenia, pulmonary disease, or nasogastric or tracheal tubes in place. Other conditions e.g., malnutrition, severe illness, or postoperative state can increase adherence of gram-negative bacteria.

Signs & Symptoms

Health care associated pneumonia is difficult to diagnose. Traditionally symptoms of fever and cough with radiologic evidence of new or progressive pulmonary infiltrate, leucocytosis and suggestive sputum cultures. In ILTC settings, it is even more difficult because of unavailability of diagnostic tests, the general inability of resident/clients to provide good sputum specimens and difficulty in interpreting sputum cultures and chest radiographs.

Prevention and Control Measures

Droplet Precautions are to be applied with Standard Precautions.

Infection Control measures

1 Placement of Resident/client

A single room is ideal for the management of a resident/client with pneumonia. Alternatively, a bed placed near the window for better ventilation and airflow may be used.

2 Standard Precautions

2.1 Hand Hygiene

- Clean hands before and after touching resident/clients.
- Clean hands after touching respiratory secretions or respiratory equipment and after removal of gloves.
- Use alcohol based antiseptic hand-rub if hands are not visibly soiled after coming into contact with mucous membrane, respiratory secretions or contaminated objects.

2.2 Gloving

- Wear gloves when handling respiratory secretions or objects contaminated with respiratory secretions
- Change gloves and clean hands upon removal before moving on to care for another resident/client

2.3 Gowning

- Wear gown when soiling from respiratory secretions is anticipated.
- Change gown in between care of resident/clients.

3 Care of resident/client with tracheostomy

- Perform tracheostomy care under aseptic conditions
- Wear gown to change tracheostomy tube under sterile condition with aseptic technique.
- Change inner tubes of tracheostomy daily. Replace metal inner tubes with one that has undergone sterilisation or high level disinfection
- Clean the skin around the wound daily with saline and dressed it with sterile dressing.
- Autoclave or disinfect reusable equipment using a non-toxic chlorine product, rinse off with sterile water or normal saline, dry aseptically before re-insertion.

4 Suctioning of respiratory tract secretions

- Suction only if necessary
- Wash hands, wear gloves, surgical masks and goggles when doing suctioning.
- Use sterile single use catheter for each series of suctioning
- Use a separate sterile bowl set for each suctioning procedure.
- Use sterile water to remove secretions from the suction catheter if catheter is to be used for re-entry into the resident/client's lower respiratory tract normal saline to loosen secretions

- Carry out intermittent suction gently.
- Change suction collection tubing and suction collection canister at least once every 24 hours.

5 Sterilisation or disinfection and maintenance of respiratory equipment

- Thoroughly clean all equipment and devices to be sterilised or disinfected. Methods are steam sterilisation by autoclaving or high level disinfection with a chlorine-based product for 30 minutes, followed by appropriate rinsing with sterile water, drying and packaging.

Use sterile water for humidifiers and nebulisers and for rinsing and dispense it aseptically. No topping up of sterile water when respiratory equipment is in use. Periodically, drain and discard any condensate that collects in the tubing of respiratory equipment.

- Change nasal prongs and masks when visibly soiled or malfunctioning.
- For small volume medication nebulizers, in between treatment for the individual resident/client, clean, disinfect, rinse with sterile water if needed and dry. Wherever possible, use aerosolised medications in single dose vials. If multi-dose medication vials are used, follow manufacturer's instructions for handling, storing and dispensing the medications
- Resuscitator (air-viva) and intubation equipment- disconnect parts, rinse and pack for steam sterilisation. High-level disinfection with chlorine based product can also be used, if possible.

6 Modifying host's risk for infection

6.1 Prevention of aspiration

- Discontinue the use of feeding tubes and respiratory tubes when not indicated.

- In the absence of medical contra-indications, place at risk resident/client in semi recumbent position i.e. propped up at 30-45 degrees
- Routine check of position of feeding tubes
- Withhold enteral feeding if the residual volume in the stomach is >100mls or if bowel sounds are not heard upon auscultation of the abdomen.
- Administer enteral nutrition intermittently in small boluses rather than continuously by using flexible, small-bore enteral tubes.
- Usually a Percutaneous Endoscopic Gastronomy (PEG) tube to maintain nutrition for resident/clients with repeated episodes of pneumonia due to aspiration.

6.2 Reduction of oral–pharyngeal colonisation

- Develop and implement a comprehensive oral hygiene program
- Components include oral cavity assessments and attention to decay teeth and less than optimal oral health, daily or twice a day oral toilets and brushing of teeth with a fluoride toothpaste and brush
- Limit the use of gargle unless used for treatment of oral conditions.

6.3 Pneumococcal Vaccination

- If possible, establish a program for the administration of pneumococcal vaccination for persons at high risks for severe pneumococcal pneumonia.

7 Staff Education

All staff concerned must be educated regarding the risk factors, pathogenesis and infection control procedures of preventing and managing healthcare-associated bacterial pneumonia. Other interventions are compliance and performance related using surveillance or performance improvement tools and techniques.

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(H) Urinary tract infections

Urinary tract infections are the most frequent infections; while most resident/clients are asymptomatic, the prevalence rates of bacteriuria are 25% to 50%. Most of these infections may be related instrumentation of the urinary tract and prolonged catheter use. It is the top 10 causes of morbidity and mortality, being the 8th cause of deaths in Singapore in the last few years (Health Facts, Singapore 2012).

Signs & Symptoms

The risk of acquiring a urinary tract infection depends on the method and duration of catheterization, the quality of catheter care, and host susceptibility. Reported infection rates vary. Adoption of the closed method of urinary drainage has markedly reduced the risk of acquiring a catheter-associated urinary tract infection (CAUTI). Recent studies have shown, over 20% of resident/clients catheterized and maintained on closed drainage may be expected to become infected due to errors in maintaining sterile closed drainage, host factors like advanced age, debilitation, and the postpartum state

CAUTIs are generally assumed to be benign. In otherwise healthy resident/clients, these are often asymptomatic and likely to resolve spontaneously with the removal of the catheter and voiding. Occasionally, infection persists and leads to complications like prostatitis, epididymitis, cystitis, pyelonephritis, and gram-negative bacteremia, a serious condition associated with significant mortality.

Infection Control measures

Standard Precautions apply. Other measures include:

1. Limit use of urinary catheter

One of the most important infection control measures is to limit the use of urinary catheters to carefully selected resident/clients, thereby reducing the size of the

population at risk. Generally, urinary catheter should be inserted only when necessary and removed as soon as possible.

2. Review indications for catheterization. Catheterization should not be used as a means of obtaining urine for culture or certain diagnostic tests when the resident/client can voluntarily void or as a substitute for nursing care in the incontinent resident/client. Other methods of urinary drainage like the condom catheter drainage may be useful for incontinent male resident/clients with an intact voiding reflex. Its use, however, requires meticulous nursing care to prevent local complications such as skin maceration or frequent manipulation by restless resident/clients as this has been associated with an increased risk of urinary tract infection. For certain types of resident/clients with bladder-emptying dysfunction, such as those with spinal cord injuries, intermittent catheterization is commonly employed. The "no-touch" method of intermittent catheterization conducted under aseptic conditions is performed in hospitalised resident/clients. For resident/clients with long-term catheterization, a longer duration silicon catheter should be used. The home nurses should review such resident/clients frequently.
3. Use aseptic technique and sterile sets to insert the urinary catheter with pre-disinfection and sterile draping of the urethra with 0.05% Chlorhexidine solution.
4. Set up and maintain a closed drainage system and maintaining an unobstructive and smooth flow of urine.
5. Clean hands with alcohol hand rub or soap and water after manipulating with the closed urinary catheterization
6. Keep drainage system closed and sterile.

For resident/clients who require indwelling urethral catheterization, adherence to keeping a sterile continuous closed system of urinary drainage is the cornerstone of infection control. Technologies like urine sampling port and pre-connected catheter/collecting tube

system, one way valves to prevent reflux have been introduced to lessen the risk of infections.

Procedure to maintain closed drainage system

- Clean hands immediately before and after any manipulation of the catheter site and closed drainage apparatus.
 - Position the drainage bag above the floor and below the level of the bladder.
 - Ensure that the bag or outlet port does not get contaminated from the floor, clothing or measuring jug.
 - Keep catheter site and collecting tube free from kinks.
 - Perform daily meatal care with soap and water to prevent encrustation. Frequency of meatal should be determined by nursing assessment and examination on personal hygiene rounds.
 - Empty the drainage bag when it is two-thirds full.
 - Before emptying the drainage bag, swab the drainage port with a 70% alcohol swab before opening it, prior to closing it and after closing the drainage port. Drain urine into a sterile urinal.
7. Change catheter if there is poor function or obstruction, damage or leakage of parts in the closed system, accumulation of sediments or the bag becomes odorous. Re-insert under strict aseptic conditions.
 8. Avoid irrigation. When obstruction occurs, remove catheter and re-insert if resident/client fails to void after catheter removal
 9. Collect of urine specimen under septic condition.
 10. Staff Education

- Educate all staff on the risk factors, pathogenesis and infection control procedures of preventing and managing CAUTI.

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(I) Varicella zoster virus

Varicella zoster virus (VZV) is one of eight herpes viruses known to infect humans (and other vertebrates). It commonly causes chicken-pox and both shingles and post-herpetic neuralgia in adults. Chickenpox is a common illness that causes an itchy rash and red spots or blisters (pox) all over the body. It is most common in children, but most people will get chickenpox at some point in their lives if they have not had the chickenpox vaccine.

Signs and symptoms

The first symptoms of chickenpox often are a fever, a headache, and a sore throat. The chickenpox rash usually appears about 1 or 2 days after the first symptoms start. A rash may appear without fever or other early symptoms.

Incubation period

The incubation period is usually 10 to 21 days after one is exposed to another person infected with chickenpox. After a chickenpox red spot appears, it usually takes about 1 or 2 days for the spot to go through all its stages. This includes blistering, bursting, drying, and crusting over. New red spots will appear every day for up to 5 to 7 days.

Route of transmission

Chickenpox is transmitted via airborne route or contact with fluid from a chickenpox blister. A person who has chickenpox can spread the virus even before he or she has any symptoms. Chickenpox is most easily spread from 2 to 3 days before the rash appears until all the blisters have crusted over.

Prevention

Chickenpox can be prevented through vaccination. The chickenpox vaccine is safe and effective in protecting those who have never had chickenpox. Although it is not compulsory in Singapore to vaccinate children against chickenpox, it is best that children have the vaccination between 12 to 18 months. Children below the age of 13 receive only 1

dose of the chickenpox vaccine. However, those who are 13 years and above will need 2 doses, 4-8 weeks apart.

Adults, such as non-immune healthcare workers, and those who live or work in conditions where transmission can easily occur, such as foreign workers and college students, are advised to have the chickenpox vaccination. In the latter case, outbreaks can result very quickly among non-immune adults who are more susceptible to severe chickenpox. Non-pregnant women of childbearing age who are not immune, should also be vaccinated.

Infection Control measures

Air borne Infection Precautions are to be adopted:

1. Isolate resident/client.
2. Wear protective personal equipment i.e. N95 mask
3. Designate an immune staff in care of resident/client.
4. Hand hygiene and general hygiene measure.

Administer immune globulin (VZIG) if a contact becomes ill within the incubation period of the disease (e.g. up to 21 days after the last exposure) with even a trivial cold or fever, then they should not.

Non-immune staff should not nurse these resident/clients, but if in contact with these diseases must not transfer to other wards or nurse immunosuppressed resident/clients during the incubation period.

Adequate general hygiene measures are important. Bathing, astringent soaks, and closely cropped fingernails to avoid scratching of the pruritic lesions. Vaccination of healthy, elderly, susceptible residents/clients may reduce the incidence of zoster and subsequent complications in these residents/clients.

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(J) Herpes zoster

Shingles (herpes zoster) is a viral infection of the nerve roots. It causes pain and often causes a rash on one side of the body, the left or right. The rash appears in a band, a strip, or a small area. Shingles is most common in older adults and people who have weak immune systems because of stress, injury, certain medicines, or other reasons. Shingles occurs following a latent infection of *varicella zoster*. In some people, it stays dormant forever.

Signs and symptoms

Shingles symptoms happen in stages. Headache or photophobia may be an early symptom. Itching, tingling, or pain in a certain area may next occur to progress on to a band, strip, or small area of rash a few days later. The rash turns into clusters of blisters. The blisters fill with fluid and then crust over. It takes 2 to 4 weeks for the blisters to heal, and they may leave scars. Some people only get a mild rash, and some do not get a rash at all.

Treatment

Antiviral medicines, sometimes given with steroid medicines, may be given to alleviate pain. Medicines to help alleviate long-term pain include antidepressants, pain medicines, and skin creams.

Incubation period

Incubation period is usually 14-16 days; some cases occur as early as 10 or as late as 21 days after exposure. An individual is most contagious 1-2 days before the onset of the rash.

Route of transmission

The zoster virus is transmitted by the airborne route and from person-to-person by direct contact with skin lesions.

Infection Control measures

It is best to isolate the resident/client using Airborne Precautions. Contact Precautions also apply until all lesions have dried and are crusted over.

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(K) *Clostridium difficile*

Clostridium difficile infection (CDI) is the most common cause of diarrhoea-associated with antimicrobial therapy. Clinical disease ranges from toxin-mediated symptoms associated with mild diarrhea, which can resolve without treatment, to severe cases such as pseudomembranous colitis, toxic megacolon and peritonitis that can lead to death. In mild disease, diarrhoea is usually the only symptom; where diarrhea is defined as the passage of 3 or more loose or liquid stools per day, or as more frequently than is normal for the individual (WHO). A single case of severe CDI or a single death due to CDI should always prompt further investigations.

Symptomatic CDI resident/clients shed hardy spores of *C. difficile* via their stools into the environment. The spread of hardy spores of *C. difficile* via contact plays an important role in the transmission of CDI in healthcare facilities. Isolation of symptomatic CDI resident/clients is a key step in preventing the transmission of *C. difficile* within healthcare facilities.

Infection Control measures in management of symptomatic CDI residents

1. Resident placement

Symptomatic residents with CDI should preferably be nursed in a single-bedded room with hand washing facilities, en-suite toilet, dedicated care equipment and the door kept closed. Personal protective equipment should be put on before entering the isolation room (or area) with symptomatic CDI residents/clients. If isolation in single rooms is not possible, isolation in cohorts should be undertaken. Cohorted residents/clients should be managed by designated staff, where possible, to minimize the risk of infection to other resident/clients (or staff). Isolation precautions may be discontinued when the resident/client has been symptom-free for 48 hours and bowel movements have returned to normal. If the resident/client has recurrent CDI, consideration may be given to leaving the resident/client in

a single room accommodation even after resolution of symptoms to minimize the risk of transmission.

2. Hand hygiene

The spread of *C. difficile* spores via direct and indirect contact is the major route of transmission of CDI in healthcare facilities. Meticulous hand hygiene with soap and water or antiseptics is recommended for all staff if hands are visibly soiled where the physical removal of spores is achieved with rinsing.

3. Equipment and environment

Care equipment (such as commodes, blood pressure cuffs and stethoscopes) should be dedicated to a single resident/client. All care equipment should be carefully cleaned and disinfected using a sporicidal agent (e.g. 1000 ppm hypochlorite) immediately after use on a CDI resident/client. Rectal thermometers should not be shared, and use of electronic thermometers with disposable sheaths should be avoided. Single-use items (including thermometers and other care equipment) should be used when possible.

For environmental cleaning, healthcare facilities should refer to the MOH Environmental Cleaning Guidelines for Healthcare Settings (June 2013).

Infection Control measures in management of residents with *C difficile* at ILTCs

Asymptomatic persons with *C difficile* should be not declined admission to an ILTC. Standard Precautions are to be applied during their management.

Early diagnosis is essential for preventing and controlling CDI in the community. The possibility of developing CDI should be considered when persons with diarrhoea also have one or more of the following risk factors:

- a. Current or recent (within at least the past 12 weeks) use of antimicrobials
- b. Increased age
- c. Prolonged current or recent hospital stay

- d. Serious underlying diseases or poor physical health
- e. Surgical procedures
- f. Immunocompromising conditions
- g. Use of proton pump inhibitors (gastric acid reducing agents)

When residents in the ILTCs have severe diarrhoea (and fever or other symptoms) and any of the risk factors listed above, admission to hospital should be considered as early as possible.

Staff in ILTCs should wear disposable gloves and disposable aprons for all contact with persons with diarrhoea. After contact, staff should dispose of the gloves and aprons, and practise hand hygiene (soap and water or alcohol-based hand rub agent). If possible, persons with diarrhoea and/or confirmed CDI should be nursed in single rooms; otherwise they may be cohorted. Precautions may be discontinued when resident/clients have been symptom-free for at least 48 hours and bowel movements have returned to normal. Precautions may need to be continued in resident/clients with recurrent CDI.

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(L) Conjunctivitis

Conjunctivitis (red eye) is an inflammation or infection of the transparent membrane (conjunctiva) that lines the eyeball that causes the eye to be swollen and makes small blood vessels in the eye become more prominent resulting in red eye. The red eye could be due to an infection (bacterial/viral), allergy or an eye injury. As red eye caused by infection is contagious and occurs often as an epidemic, early diagnosis, treatment and hand washing can help limit its spread.

Symptoms

The most common symptoms of conjunctivitis include:

1. Redness and itchiness in one or both eyes
2. A gritty feeling or sandy sensation in one or both eyes
3. A whitish/yellowish discharge in one or both eyes that forms a crust during the night
4. Watering from one or both eyes

Causes

Causes of red eye include:

1. Viruses
2. Bacteria
3. Allergies
4. Chemical or foreign object in the eye

Viral and bacterial conjunctivitis

Viral conjunctivitis usually produces a watery or mucous eye discharge and bacterial conjunctivitis often produces a thicker, yellow-green eye discharge that may be associated with a respiratory infection or with a sore throat.

Allergic conjunctivitis

Allergic conjunctivitis affects both eyes and is a response to an allergy-causing substance such as pollen. In response to allergens, the body releases histamine, which can cause symptoms such as itching, tearing and red or pink eyes.

Conjunctivitis resulting injury

Irritation from a chemicals or foreign object in the eye can cause conjunctivitis.

Diagnosis

Conjunctivitis is diagnosed by clinical examination of the eye. In addition, the doctor may take a sample of eye secretions from the conjunctiva for laboratory analysis to determine the type of infection and treatment. If a young infant has recurrent red eye or persistent tearing, the child may have a blocked tear duct.

Treatment

For bacterial conjunctivitis, antibiotic eye drops are used to treat the eye infection and the infection should clear within several days. Sometimes an antibiotic eye ointment may be prescribed for treating bacterial red eye in children.

Viral conjunctivitis does not respond to treatment with antibiotic eye drops or ointment. It is self-limiting and may take up to two to three weeks for the infection to clear.

Allergic conjunctivitis is treated with eye drops containing antihistamines, decongestants, mast cell stabilizers, steroids or anti-inflammatory drops. It is best to avoid rubbing the eyes.

Prevention

The best way to control the spread of red eye caused by infection is by practicing good hygiene. If you have a red eye, the following measures will help:

1. Wash your hands thoroughly with soap frequently and do not touch your eyes with your hands.
2. Change your towel, pillowcase and bed sheets often and do not share them with others.
3. Discard eye cosmetics particularly mascara which you have used.
4. Do not use someone else eye cosmetics or personal eye-care items.
5. Follow instructions for proper contact lens care.
6. If a child is infected, avoid close contact with other children.

Infection Control measures

It is best to isolate the resident/client using Standard & Contact Precautions for the duration of the illness.

Reference:

1. Conjunctivitis (Red Eye). Health Promotion Board, Singapore.
<http://www.hpb.gov.sg/HOPPortal/article?id=470>. Accessed on 1 June 2014.

Infectious Disease Outbreak

An infectious disease outbreak can be defined as “two or more linked cases of the same illness or when the number of cases of the same illness unaccountably exceeds the expected number.”

Outbreaks of infectious disease may occur in ILTCs. Their importance depends on several factors: -

- a. severity of the disease
- b. number of residents affected
- c. mode of mode of spread
- d. amount of anxiety they generate in parents and staff
- e. if any specific action is necessary to stop further cases (e.g. immunisation, improving food-handling practises).

Prevention

Prevention may be considered in three areas, aiming at:

- a. The outbreak source
- b. Contaminated vehicles of infection mode of spread
- c. Susceptible human

Choice of control measure within these three areas is dictated by factors such as whether the outbreak source is known, whether a suspected vehicle has been identified, and whether a vaccine or prophylactic treatment is available for susceptible humans.

Infectious disease prevention includes:

1. Requiring certain immunizations

ILTCs should keep an updated staff and resident's immunisation record. Some infections, however, cannot be prevented by immunisation and limiting their spread in the community is dependent on a combination of isolating the infectious source as well as improving personal hygiene practises, where appropriate.

2. Identifying residents who have communicable diseases

If an outbreak is suspected, the Ministry of Health should be notified. It is helpful for the initial assessment of the situation if the following can be established:

- a. What are the symptoms?
- b. When did each resident fall ill i.e. when did symptoms first start?
- c. How residents are ill?
- d. Which group of residents i.e. are the residents from the same ward?
- e. What type of food did the residents eat?
- f. Did they eat the same type of food? (for situations when the residents develop food poisoning symptoms such as diarrhoea and/or vomiting)

Prevention of spread

- a. It is the responsibility of the supervisor of the ILTCs to ensure that if any staff or person engaged in food preparation or rendering services to the ILTC is suffering from an infectious disease, he/she should be excluded from the centre until well and displaying no symptoms.
- b. Disseminate messages about preventive hygiene - including effective hand washing and the importance of covering the mouth during coughs and sneezes - by using posters and educational talks to outline recommended procedures for staff, residents and visitors.
- c. ILTCs should clean and sanitize frequently-touched surfaces (e.g. door knobs, switches, computer keyboards,) routinely and if they become visibly soiled.
- d. Conduct training for staff and food service staff about infectious diseases, their symptoms and treatments, and how to prevent and control outbreaks

Surveillance

1. Establish processes and procedures (a “surveillance system”) e.g. monitoring absentee rates for staff.
2. Early recognition of disease outbreaks is necessary to implement effective control methods. Clusters of illness (such as two or more people ill with similar symptoms closely grouped in terms of time and place) should be reported.

Notification

If an outbreak of two or more cases of infectious diseases occurs, the Ministry of Health is to be immediately notified under the Infectious Diseases Act (Cap 137). Please refer to the MOH website for instructions on notification (<http://www.moh.gov.sg/>).

Recommendations

1. ***All health care facilities must have the ability to identify clusters or outbreaks of infectious diseases. Where help is needed for management, the Ministry of Health is to be consulted immediately for advice.***
2. ***The Ministry of Health is to be notified of any outbreak of infectious diseases.***
3. ***Outbreaks in health care facilities should be managed by a multidisciplinary team that includes the Infection Control professional (ICP)***
4. ***The ICP should have the authority to implement outbreak management measures up to, and including, closure of the affected unit.***

Cleaning and Disinfection

Introduction

Routine cleaning and disinfection are necessary to maintain a standard of cleanliness, reduce microbial contamination and control or minimize the spread of infectious agents from infected resident/clients to other resident/clients or hospital personnel. Medical equipment also requires decontamination for safe resident/client care.

Cleaning is defined as the physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms) from objects and surfaces. Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents and mechanical action. Cleaning must be performed before disinfection or sterilization.

Decontamination refers to the process of cleaning that removes pathogenic microorganisms from objects so that they are safe to handle, use, or discard.

Disinfectants are chemical agents that kill most disease-producing microorganisms, but not necessarily bacterial spores. Words with suffix “cide” (e.g. virucide, fungicide, bactericide, sporicide, and tuberculocide) can kill the type of microorganism identified by the prefix. For example, a bactericide is an agent that kills bacterial. Disinfectants are applied only to inanimate objects. Some products combine a cleaner with a disinfectant.

Disinfection refers to a process that kills most disease-producing microorganisms. Disinfection does not destroy all bacterial spores. Disinfection is usually accomplished by the use of liquid chemicals or wet pasteurization in healthcare setting. Medical devices must be cleaned thoroughly before effective disinfection can take place. Efficiency of this process is dependent on:

- Efficient prior cleaning
- Appropriate disinfectant for the micro-organisms present
- Appropriate strength of the disinfectant
- Compatibility of the equipment
- Appropriate contact time

Spaulding Classification

Over 40 years ago, Earle H. Spaulding devised a rational approach to disinfection and sterilization of resident/client-care items or equipment. This classification scheme is so clear and logical that it has been retained, refined, and successfully used by ICPs and others when planning methods for disinfection or sterilization. Spaulding believed that the nature of disinfection could be understood more readily if instruments and items for resident/client care were divided into three categories based on the degree of risk of infection involved in the use of the items. The 3 categories he described were critical, semi critical, and noncritical. This terminology is employed by the Centers for Disease Control and Prevention's (CDC) "Guidelines for Environmental Infection Control in Healthcare Facilities" and the CDC's "Guideline for Disinfection and Sterilization in Healthcare Facilities".

The level of terminal reprocessing required by medical devices is based on the classification system developed by Spaulding. It divides medical devices into 3 categories, based on the resident's/client's risk of infection due contact with various types of devices.

Table 1: Spaulding's Classification of Medical Devices and Required Level of Processing/Reprocessing Classification

	Definition	Level of Processing/Reprocessing	Examples
Critical Device	Device that enters sterile tissues, including the vascular system	Cleaning followed by Sterilization	Surgical instruments <ul style="list-style-type: none"> • Biopsy instruments • Foot care equipment • Cystoscopes
Semi-critical Device	Device that comes in contact with non-intact skin or mucous membranes but do not penetrate them	Cleaning followed by High- Level Disinfection (as a minimum) Sterilization is preferred	<ul style="list-style-type: none"> • Respiratory therapy equipment • Anaesthesia equipment • Tonometer • Cystoscopes
Noncritical Device	Device that touches only intact skin and not mucous membranes, or does not directly touch the client/resident/client/resident	Cleaning followed by Low- Level Disinfection (in some cases, cleaning alone is acceptable)	<ul style="list-style-type: none"> • ECG machines • Oximeters • Bedpans, urinals, commodes

Non critical items

They are items that come in contact with intact skin but not mucous membranes. Intact skin acts as an effective barrier to most microorganisms; therefore the sterility of items coming in contact with intact skin is “not critical.” Examples of non-critical items are bedpans, blood pressure cuffs, crutches, bed rails, bedside tables, resident/client furniture, and floors.

Most noncritical reusable items may be decontaminated where they are used and do not need to be transported to central processing area. Mops (microfiber and cotton string), reusable cleaning cloths, and disposable wipes are regularly used to achieve low-level disinfection. Microfiber mops have demonstrated superior microbial removal compared to cotton string mops when used with detergent cleaner (95% versus 68%, respectively). However, use of a disinfectant did significant improve removal when a cotton string mop was used (95% versus 95%, respectively). It is important to change the water-disinfectant regularly. It is recommended to launder cotton string mops daily.

Semi critical items

Semi critical items are those that come in contact with mucous membranes or non-intact skin. Respiratory therapy, laryngoscope, endocavitary probes, diaphragm fitting rings are included in this category. These medical devices should be free of all microorganisms, although small number of bacterial spores may be present. Intact mucous membranes, such as those of the lungs or the gastrointestinal tract, generally are resistant to infection by common bacterial spores but susceptible to other organisms such as bacteria, mycobacteria, and viruses. When a disinfectant is selected for use with certain resident/client-care items, the chemical compatibility after extended use with the items with the items to be disinfected must be considered.

Some items may come in contact with non-intact skin for a brief period of time (i.e., hydrotherapy tanks, bedside rails) are usually considered noncritical surfaces and are disinfected with low-or intermediate-level disinfectants (i.e., phenolic, iodophor, alcohol, chlorine). Hydrotherapy tanks have been associated with spread of infection and some facilities have disinfected them with recommended levels of chlorine.

Critical items

Critical items are objects that enter sterile tissue or the vascular system. These must be sterile because microbial contamination could result in disease transmission. This category includes surgical instruments, urinary catheters, injection needles, intravenous cannula. Most of the items can be purchased as sterile or be sterilized by steam sterilization if possible. Heat sensitive object may be treated with hydrogen peroxide gas plasma, ozone, or by liquid chemical sterilants.

Detergents and Cleaning Agents

“Detergents” or “soaps” are cleaning agents that make no antimicrobial claims. Their cleaning activity can be attributed to their detergent properties, which result in removal of dirt, soil and various organic substances. However, the use of a detergent solution improves

the quality of cleaning. Microorganisms may present as "visible dirt" which requires routine cleaning to elimination.

Disinfection of Healthcare Equipment

A great number of disinfectants are used alone or in combination (e.g. hydrogen peroxide and peracetic acid) in the healthcare setting. These include alcohols, chlorine and chlorine compounds, glutaraldehyde, ortho-phthalaldehyde, hydrogen peroxide, iodophors, peracetic acid, phenolics and Quaternary ammonium compounds (QUATs). In most instance, a given product is selected for the intended use and applied in an efficient manner. Caution must be exercised on electronic medical equipment.

Choosing a Disinfectant

Environmental surfaces usually only require cleansing followed by low to intermediate level disinfection. Low - level disinfectants are often labelled "hospital disinfectant" without a tuberculocidal claim, because they lack the potency to inactivate mycobacterial. The following factors influence the choice of disinfectant.

- a) The nature of item to be disinfected
- b) The innate resistance of expected microorganisms to inactivating effects of the disinfectant
- c) The amount of organic soil present
- d) The type of and concentration of disinfectant used
- e) Duration of contact time required for efficacy at the usual room temperature of the health care setting
- f) Compatibility with medical equipment
- g) Occupation health considerations
 - i. Surface disinfectants contain quaternary ammonium compounds (QUATs), phenolics, hydrogen peroxide or sodium hypochlorite, which can cause skin and respiratory irritation.

- ii. Disinfectants are one of the leading allergens affecting healthcare providers
- iii. Staff will be more likely to use products that are non-toxic and not irritating
- h) Environmental protection
 - i. Consider products that are biodegradable and safe for the environment
 - ii. Many disinfectants (e.g. QUATs) may be hazardous both during manufacture and when they are discharged into the waste stream, as they are not readily biodegradable

Recommended disinfectants for environmental use in healthcare setting include:

- Chlorine: Sodium hypochlorite (bleach)
- Phenolics
- Quaternary Ammonium Compounds (QUATs)
- Iodophors
- Hydrogen Peroxide (AHP)
- Ethyl alcohol or isopropyl alcohol in concentrations of (60% -90%) used to disinfect small surfaces.

Using Disinfectants

When using a disinfectant,

- a) It is important that an item or surface be free from visible soil and other organic items before applying disinfectant. Their presence may reduce or eliminate the effectiveness of disinfectants.
- b) Use the disinfectant according to manufacturer's instructions on dilution and contact time.
- c) An environmental disinfectant may be used for equipment that only touches intact skin; examples include intravenous pumps and poles, blood pressure cuffs.
- d) Minimize contamination levels of disinfectant solution and equipment used for cleaning by proper dilution of disinfectant, frequent changing of disinfectant solution.
- e) Wear appropriate personal protective equipment.

Chemical Disinfectant

Alcohol

Alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they are also tuberculocidal fungicidal, and virucidal (enveloped viruses; alcohol has poor activity against some non-enveloped viruses such as parvovirus) but do not destroy bacterial spores.

Their cidal activity drops sharply when diluted below 50% concentration and the optimum bactericidal concentration is in the range of 60-90% solutions in water (volume/volume).

Alcohols are not recommended for sterilizing medical and surgical materials principally because of their lack of sporicidal action and their inability to penetrate protein-rich materials. Alcohols have been used effectively to disinfect oral and rectal thermometers, scissors, cardio-pulmonary manikins, external surfaces of equipment and stethoscopes. Alcohol towelettes have been used for years to disinfect small surfaces such as rubber stoppers of multiple dose medication vials or vaccine bottles.

Alcohol is flammable and consequently must be stored in a cool, well-ventilated area. They also evaporate rapidly and this makes extended exposure time difficult to achieve unless the items are immersed.

Chlorine and Chlorine Compounds

Hypochlorites are the most widely used of the chlorine disinfectants and are available in a liquid (e.g. sodium hypochlorite) or solid (e.g. calcium hypochlorite) form. The most prevalent chlorine products are aqueous solution of 5.25% to 6.15% sodium hypochlorite, which usually are called household bleach. They have broad spectrum of antimicrobial activity, do not leave toxic residues, unaffected by water hardness, inexpensive and fast acting, remove dried or fixed organisms and biofilms from surfaces, and have low incidence of serious toxicity.

Disadvantages of hypochlorites include corrosiveness to metals in high concentrations (>500 ppm), inactivation by organic matter, discolouring or “bleaching” of fabrics, release of toxic chlorine gas when mixed with ammonia or acid (e.g. household cleaning agents) and relative stability.

Hypochlorites are widely used in healthcare facilities in a variety of setting. Inorganic chlorine solution is used for spot disinfection of counter tops and floors. A 1:10 to 1: 100 dilution of 5.25% - 6.15%.

Sodium hypochlorite (i.e. household bleach. For small spills of blood (i.e. drops of blood) on noncritical surfaces, the area is to be flooded with 1:100 dilution of 5.25%-6.15% sodium hypochlorite. Disinfection with a 1:10 dilution of concentrated sodium hypochlorite (e.g.. bleach) has been shown to be effective in reducing environmental contamination in resident/client rooms and in reducing *C. difficile* infection rates or in an outbreak setting.

Sodium Dichloriosocyanurate (NaDCC) is a broad-spectrum anti-microbial agent which is effective against bacteria (including MRSA, *E. coli* and *Pseudomonas*), fungi, viruses (including HIV and Hepatitis). It is more stable and therefore more effective than liquid forms of Sodium Hypochlorite. Tablets have a longer shelf life and are more convenient to use and correctly prepared give an accurate strength. Once made, preparations will lose their activity over time, therefore all solutions must be discarded after 24 hours.

Glutaraldehyde

Glutaraldehyde is a saturated dialdehyde that has gained wide acceptance as a high level disinfectant and chemical sterilant. Aqueous solutions of glutaraldehyde are acidic and generally in this state are not sporicidal. Only when the solution is activated (made alkaline) does the solution become sporicidal. Once activated, the solution has a shelf life of minimally 14 days. The antimicrobial activity is dependent on a number of use conditions such as dilution and organic stress.

Glutaraldehyde is used most commonly as a high-level disinfectant for medical equipment such as endoscopes, dialyzers, laparoscopic disposable plastic trocars. Glutaraldehyde is noncorrosive to metal and does not damage lensed instruments, rubber, or plastics.

It should not be used for cleaning non critical surfaces as it is too toxic and expensive. Glutaraldehyde exposure should be monitored to ensure a safe work environment. In the absence of an OSHA permissible exposure, if the glutaraldehyde level is higher than the American Conference of industrial Hygienists ceiling limit of 0.005 ppm. It would be prudent to take corrective action and repeat monitoring.

Hydrogen Peroxide

Hydrogen peroxide is delivered by a computer-controlled distribution system that ensures even distribution throughout the room while monitoring gas concentration, temperature and relative humidity. These may come in the form of aerosolized (35% hydrogen peroxide) or mist (5% hydrogen peroxide).

Advantages:

- a) It is relatively safe and decomposes to water and oxygen. Once decontamination is completed, an aeration unit in the room converts the hydrogen peroxide into water and oxygen. The time required for the mist decontamination is dependent on room volume and technology used.
- b) It is effective for decontaminating complex furniture and equipment that is difficult to clean manually.
- c) It may be used to decontaminate entire units/wards during outbreaks.
- d) It is effective against a wide range of microorganisms, including bacteria, viruses and spores, particularly *C. difficile*.

Disadvantages:

- a) Time taken to complete decontamination process.

- b) Biological soiling reduces the efficacy of vaporized hydrogen peroxide.
- c) Air ducts from the room must be sealed prior to decontamination.
- d) Additional cost

Iodophors

Iodine solutions or tinctures have been used primarily as antiseptics on skin or tissue. Iodophors have been used both as antiseptics and disinfectants. Povidine iodine is the most commonly used iodophor. They retain germicidal efficacy of iodine but unlike iodine are generally non-staining and are relatively free of toxicity and irritancy.

Besides their use as an antiseptic, iodophors have been used for the disinfection of blood culture bottles and medical equipment. Antiseptic are not suitable for use as hard surface disinfectants because of concentration differences. Iodine or iodine-based antiseptics should not be used on silicone catheters as the silicone tubing may be adversely affected.

Table 2 Types of Chemical Disinfectants

Disinfectants	Recommended Use	Precautions
<p>Alcohol e.g. Isopropyl, Ethyl alcohol, methylated spirit.</p>	<ul style="list-style-type: none"> • Rapidly bactericidal, tuberculocidal, fungicidal, and virucidal but do not destroy bacterial spores. • Smooth metal surfaces, table tops and other surfaces on which bleach cannot be used. • Effectively to disinfect non-critical items such as oral and rectal thermometers, hospital mobiles, BP cuffs and stethoscopes etc. 	<ul style="list-style-type: none"> • Flammable, toxic, to be used in cool and well-ventilated area, avoid inhalation. • To be kept away from heat sources. electrical equipment, flames, hot surfaces.
<p>Quaternary Ammonium Compounds e.g. Alkyl dimethyl benzyl ammonium chloride, Alkyl dimethyl ethylbenzyl ammonium chloride</p>	<ul style="list-style-type: none"> • Commonly used in general environmental cleaning of noncritical surfaces, such as floors, furniture, and walls 	<ul style="list-style-type: none"> • Relatively non toxic and less corrosive • Dilutions in use may get contaminated and grow Gram negative bacteria
<p>Phenolics e.g. Benzyl-4-chlorophenol, Amylphenol, Phenylphenol</p>	<ul style="list-style-type: none"> • Effective and good for general use on vegetative bacteria, lipid containing viruses and <i>Mycobacterium tuberculosis</i>. • Have limited or no efficacy for use against spores or non-lipid viruses. • Use on environmental surfaces (e.g. locker, bedrails) and on noncritical medical 	<ul style="list-style-type: none"> • Phenolics should not be used to clean infant bassinets and incubators as hyperbilirubinemia in infants were reported. • If phenolics are used for terminal cleaning of infant bassinets and incubators, the surfaces should be rinsed thoroughly with water and dried before reuse of infant bassinets and incubators.
<p>Sodium hypochlorite [e.g. Sodium dichloroisocyanurate (NaDCC)]</p>	<ul style="list-style-type: none"> • Kills fast and has broad spectrum actions against a wide range of Gram negative and Gram positive bacteria and spores. 	<ul style="list-style-type: none"> • PPE are required while handling and using undiluted • Corrosiveness to metals • Flammable, toxic, to be used in cool and well-ventilated area, avoid inhalation.

Microfibres

Microfibers (MF) systems are designed as microfiber mops and ultramicrofibre cloths

a) Microfiber Mops

Microfiber (MF) are densely constructed polyester and polyamide (nylon fibers). A microfiber mop consists of a synthetic pad fit on a plastic handle. The pads provide a cleaning surface 40 times greater than conventional string mops and increased absorbency. In a 2007 study, The MF system demonstrated superior microbial removal compared to cotton string mops used with a detergent cleaner. Microfibers may be damaged by fabric softeners, oil and grease, highly alkaline products such as bleach, some surfactants and high heat (washing temperature cannot exceed 93°C and drying temperature cannot exceed 60°C).

Microfiber and Ultramicrofiber Cloths

Ultramicrofibers (UMF) are thinner than regular MF and are woven from a continuous strand. They are use with low volume of water containing neither detergent nor biocidal additives. Microfiber cloths may be used either dry for dusting or wet for generally. MF cloths do not perform better than other types of materials at reducing bioburden or organic material but may be better for dusting due to its electrostatic properties.

When wet, MF cloths remove significantly more soiled than general –purpose cloths. UMF cloths conform better to surfaces containing small abrasions invisible ot the naked eye in which bacteria might lodge and remain after passage of conventional cotton or wet loop cloths. Some UMF cloths are designed to be used without disinfectant. Recent study demonstrated that UMF cloths were considerably more effective than wet loop cloths at removing MRSA, *Acinetobacter*, *K. oxytoca* and *C.difficile* spores when moistened with water alone. UMF cloths were also significantly more effective in the presence of organic matter seeded onto surfaces prior to cleaning.

Ortho-phtalaldehyde (OPA)

OPA is a high-level disinfectant. It contains at least 0.55% OPA. OPA solution is a clear, pale-blue liquid with a pH of 7. Studies have demonstrated excellent microbicide. activity in in vitro studies including superior mycobactericidal activity. OPA has several

potential advantages compared to glutaraldehyde. It has excellent stability over a wide pH range (pH 3-9), is not known, irritant to the eyes and nasal passages, does not require exposure monitoring, has a barely perceptible odour and requires no activation. It has excellent material compatibility. A potential disadvantage is that it stains protein grey (including unprotected skin) and thus must be handled carefully. Equipment must be thoroughly rinsed to prevent discoloration of a resident's/client's skin or mucous membrane. The minimum effective concentration of OPA is 0.3% and concentration is monitored by test strips.

Peracetic Acid

Peracetic acid is characterized by a very rapid action against all microorganisms. Special advantages of peracetic acid are its lack of harmful decomposition products. It enhances removal of organic material and leaves no residue. It remains effective in the presence of organic material. Peracetic acid will inactivate Gram-positive and Gram-negative bacteria, fungi and yeasts in less than 5 minutes at less than 100 ppm. In the presence of organic matter, 200 to 500 ppm is required. For virus the range is wide (12-2250 ppm). Although this product is rapidly effective against a broad range of microorganisms, it tarnishes the metal of endoscopes and is unstable, resulting in only a 24- hour use life.

Phenolics

Phenolics antimicrobial efficacy has shown to be bactericidal, fungicidal, virucidal and tuberculocidal. It is used on environmental surfaces (e.g. bedside tables, bedrails, laboratory surfaces) and noncritical devices. The use of phenolics in nurseries has been questioned because of the occurrence of hyperbilirubinemia in infants placed in bassinets where phenolic detergents were used. Phenolics (and other disinfectants) should not be used to clean infant bassinets and incubators while occupied. If phenolics are used to terminally clean infant bassinets and incubators, the surfaces should be rinsed thoroughly with water and dried before reuse.

Quaternary Ammonium Compounds

The quaternary ammonium compounds are widely used as surface disinfectants. Gram negative bacteria have been found to survive or grow in them. Results from manufacturers' data sheets and from published scientific literature indicate that the quaternaries sold as hospital disinfectants are fungicidal, bactericidal, and virucidal against lipophilic (enveloped) viruses. They are not sporicidal and generally not tuberculocidal or virucidal against hydrophilic (non-enveloped) viruses. Best et al and Rutala et al. demonstrated the poor mycobactericidal activities of quaternary ammonium compounds.

The quaternaries are commonly used in ordinary environmental sanitation of non-critical surfaces such as floors, furniture, and walls. Quaternary ammonium compounds are appropriate for disinfecting medical equipment that come into contact with intact skin (e.g. blood pressure cuffs).

Antimicrobial – impregnated Supplies and Equipment

For environment in healthcare, linens and surfaces around residents/clients are developed that incorporate antibacterial or antimicrobial chemicals into them which can eliminate or retard bacterial growth (e.g., antimicrobial linen, stainless steel coated with titanium dioxide, glass coated with xerogel, surfaces brushed or sprayed with surfacine). Product 'antibacterial' claims on efficacy and safety should be carefully evaluated before replacing existing items. Treated surfaces and equipment have not been well studied in clinical settings to prove whether they will prevent transmission of pathogens.

Pasteurization

Thermal Disinfection (e.g., Pasteurization)

Thermal disinfection is a process of hot water disinfection (75°C for 30 minutes), which is accomplished through the use of automated pasteurizers or washer disinfectors with a validated thermal disinfection cycle. The exposure time and temperature will vary with the type of thermal disinfection process. Semi-critical medical devices suitable for thermal

disinfection include equipment for respiratory therapy. Equipment/devices require thorough cleaning and rinsing prior to pasteurization.

New technologies in room decontamination

Ultraviolet Irradiation (UV)

The use of ultraviolet irradiation (UV) in the healthcare setting is limited to destruction of airborne organisms or inactivation of microorganisms on surfaces. UVI inactivates microorganisms at wavelengths of 240-280 nm (UVC). Bacterial and viruses are more easily killed by UVI than are bacterial spores. Germicidal effectiveness of UVI is influenced by the following:

- a) Amount and type of organic matter present
- b) B) wavelength of ultraviolet light
- c) Air mixing and air velocity
- d) Temperature and relative humidity
- e) Type of microorganisms present and
- f) Ultraviolet light intensity, which is affected by distance and cleanliness of lamp tubes.

Portable devices are available to assist in reducing environmental contamination. If UVI is used, in a healthcare setting, warning signs should be posted in the affected area to alert staff, resident/clients/residents and visitors of the hazard. A schedule for replacing ultraviolet lamps should be developed according to manufacturer's recommendations.

Resources for Environmental Cleaning

Adequate resources are needed to help achieve the prime objective of optimal cleanliness in the facility.

These include:

- a. Assigned individual who is competent to oversee the housekeeping

- b. Written policies and procedures for cleaning and disinfection of resident/client/resident areas and equipment that include:
- c. Adequate manpower to allow thorough and timely cleaning and disinfection;
- d. Education and continuing education of cleaning staff;
- e. Regular monitoring of environmental cleanliness

Frequency of Routine Cleaning

The frequency of cleaning and disinfecting individual items or surfaces depends on:

- a. Whether surfaces are high-touch or low-touch
- b. Type of activity taking place in the area and the risk of infection associated with it (e.g., isolation room vs. meeting room),
- c. Vulnerability of clients/resident housed in the area,
- d. Probability of contamination based on the amount of body fluid contaminating surfaces in the area.

Frequency of Contact with Surfaces

All surfaces in health care setting have the potential to harbor pathogenic microorganisms. The potential for exposure to pathogens is based on the frequency of contact with a contaminated surface and the type of activity involved. For example, a conference room table would have less potential for exposure to pathogens than the doorknob in a resident/client/room. It is cost-effective to concentrate cleaning resources on high risk, high-touch surfaces which require more frequent cleaning regimen.

a. High-touch Surfaces

High-touch surfaces require more frequent cleaning and disinfection than minimal contact surfaces. Examples include doorknobs, call bells, bedrails, light switches, computer keyboards. Cleaning and disinfection is usually done at least daily and more frequently if the risk of environmental contamination is higher.

b. Low-touch Surfaces

Low-touch surfaces are those that have minimal contact with hands. Examples include floors, walls, ceilings, mirrors and windowsills. Low-touch surfaces require cleaning on a regular (but not necessarily daily) basis, when soiling or spills occur, and when a resident/client is discharged from the health care setting. Many low touch surfaces may be cleaned on a periodic basis rather than a daily basis if they are also cleaned when visibly soiled. Refer to manufacturer's recommendations for equipment cleaning.

High-Touch Surfaces for Disinfection

- Tray table
- Beside table
- Door Knobs/Handles
- Door Surface
- Bed Rails
- Call Bell
- Phone
- Light Switches
- Resident/client Chair
- All Other Horizontal Surfaces
- Bedside Commode / Toilet Seat
- Medical Equipment

Room Cleaning Checklist

- At Start, Perform Hand Hygiene!
- Put on Personal Protective Equipment if required
- Disinfect High-Touch Surfaces
- Disinfect Bathroom:

- ♦ Toilet Door /Door Knob
- ♦ Toilet Seat/handle
- ♦ Bathroom Handrails
- ♦ Sink/Faucet
- ♦ Tub/Shower
- ♦ Mirror
- Damp Dust:
 - ♦ Overhead Light (if bed is empty)
 - ♦ TV & Stand
 - ♦ Clean Floor
- Replace as needed:
 - ♦ Hand sanitizer
 - ♦ Paper towels
 - ♦ Soiled curtains
- For terminal cleaning:
 - ♦ Disinfect bed frame/mattress
 - ♦ Remake bed with clean linen
 - ♦ Replace as needed: pillows, mattresses, pillow covers, mattress covers
- Other: empty trash and replace liner
- Discard dust cloths
- Change mop heads/disinfect after cleaning each isolation room

Focus cleaning resources on high risk high touch surfaces, as frequently touched surfaces are more likely to harbour and transmit microbial pathogens.

Webber, Rutala, Miller et al (2010) emphasized the role of surface contamination in the transmission of health care associated pathogen is an important issue because transmission can be interrupted by appropriate hand hygiene and cleaning /disinfection of the environmental surfaces.

Vulnerability of the Resident/Client Population

Different populations of residents/clients have different vulnerabilities based on their susceptibility to infection. The frequency of cleaning may be higher in areas with vulnerable resident/client populations.

Factors that will impact on environmental cleaning:

1. Probability of contamination with pathogens

The probability that a surface, piece of equipment or care area will be contaminated is based on the activity in the area, the type of pathogens involved and the microbial load. Areas that are heavily soiled with blood or other body fluids will require more frequent cleaning and disinfection than areas that are minimally soiled or not soiled, (e.g. lounges, offices). The frequency of cleaning can be determined according to the level of contamination: heavy, moderate or light contamination.

2. Colour Coding for Cleaning

Adopting a colour coding of the cleaning of the environment and cleaning equipment is based on best practice. All cleaning items, for example, cloths (re-usable and disposable), mops, buckets, aprons and gloves, should be colour coded to reflect the different areas within the establishment.

Routine Cleaning and Disinfection Methods

Table 3 Frequency of Routine Cleaning

SN	CLEANING METHOD	HIGHT TOUCH	LOW-TOUCH	MINIMUM CLEANING FREQUENCY
1	Routine Cleaning	Bed Rail		At least once daily
		Control Panel		
		Call Bell		
		Cardiac Table		
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
2	Routine Bed Cleaning	Bed Rails		At least once daily
	(On Contact Precautions)	Control Panel Call Bell		
		Cardiac Table		
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
		Main door Knob		
		Tap Head		
3	Discharged Bed Cleaning	Bed Rails	Bed Frame	Upon bed discharge
		Control Panel	Mattress	
		Call Bell	Wall	
		Cardiac Table		
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
4.	Discharged Bed Cleaning	Bed Rails	Bed Frame	Upon bed discharge
	(Contact Precautions)	Control Panel	Mattress	

Table 4 Method of cleaning

Equipment / Condition	Action	Comments
Airways	Disposable single use.	
Face masks, "rebreathing" bags, connectors and catheter mounts, etc.		Process re-usable equipment in anaesthetic washing machine (80 ⁰ C for 1 minute) where available. Store dry and covered. Where washing machine unavailable follow local policy. Autoclave after use on HIV, HBV, TB and other infected residents/clients.
Rebreathing circuits	Disposable single use.	May be used throughout an operating list providing appropriate filters are in place
Auroscope speculum	<ul style="list-style-type: none"> • Decontaminate and autoclave in CSSD/TSSU. • Disposable single use. 	These should be disposable tips or processed properly in CSSD.
BATHS		
Baths (after bathing resident/clients colonised with MRSA, etc.)	<ul style="list-style-type: none"> • Facility approved disinfectant. 	After bathing residents/clients colonised with MRSA, etc.
BEDS		
Frames	Wash with fresh general purpose detergent solution and dry	On resident/client discharge or when soiled. After infected resident/client, disinfectant (phenolic or chlorine releasing agent).
Mattress	Water impermeable cover, wash with detergent solution and dry.	Do not routinely use disinfectants regularly because of deterioration in mattress cover.
Mattress (after cases of MRSA, VRE, or Group A Streptococcus)	Facility approved disinfectant after washing with general-purpose detergent. OR 70% alcohol solution or wipes.	After cases of MRSA, VRE or Group A <i>Streptococcus</i> .
Bed linen	Laundry: Heat disinfection: - 65 ⁰ C for 10 min - -71 ⁰ C for 3 min	Heat sensitive fabrics, low temperature wash and chemical disinfection with chlorine releasing agent Normally, clear plastic bag If soiled, red/pink plastic bag, then transparent plastic bag Incinerate from resident/clients with serious infections (e.g. viral haemorrhagic fever).
Bedpans and urinals	Washer-disinfector.	Process in bedpan washer. Check machine reaches 80 ⁰ C for 1 minute OR,

Equipment / Condition	Action	Comments
		process disposable in a macerator.
Support for disposable bedpans	Wash in fresh general-purpose detergent solution.	Wipe straight after use with fresh general purpose disinfectant (GPD) and a disposable cloth.
Racks and holders	Wash in fresh general-purpose detergent solution.	Keep clean. Wipe with GPD between resident's/client's use.
Blood pressure cuffs	<ul style="list-style-type: none"> Wash in fresh general-purpose detergent solution. Disposable single use. 	<p>Wash and dry after use on infected resident/clients.</p> <p>Single use cuffs may be available and should be dedicated to one resident/client.</p>
BOWLS		
Surgical bowls	Disposable single use.	
Resident/client washing bowls	Wash in fresh general-purpose detergent solution and dry.	All resident/clients should have their own bowls. Wash and dry thoroughly daily and before returning to general use. Do not stack if wet.
Carpets		Vacuum clean. Washing should be by hot water extraction using the approved detergent. Check disinfectant use after discharge of infected resident/client or after spillage of body fluid or mobile dry clean.
Commodes	<ul style="list-style-type: none"> Wash in fresh general-purpose detergent solution. Phenolic solution after washing with general-purpose detergent. Chlorine releasing granules / solution. 	Use disinfectant (phenolic solution or chlorine releasing agent) only after cleaning with general-purpose detergent.
Crockery and cutlery	Wash in fresh general-purpose detergent solution.	If available, use centralised disinfecting dishwasher service. Otherwise, handwash in hot water with GPD and air-dry if central service not provided.
Curtains	<p>Laundry</p> <p>Heat disinfection:</p> <ul style="list-style-type: none"> - 65° C for 10 min - 71° C for 3 min 	<p>Change 3-monthly or when soiled.</p> <p>Change following occupation of bed or room by resident/client with MRSA, VRE or Group A <i>Streptococcus</i> infection.</p> <p>Wipe curtain pulls with an alcohol wipe between resident/clients.</p>
Denture pots	Disposable shingle use.	
Drains (waste)	Clean regularly	Do not use disinfectants. These are of no value if drains smell because they are blocked. Contact works department.

Equipment / Condition	Action	Comments
Electrical and monitoring e.g. ECG monitors	Engineers	This type of equipment must be kept dust free. Seek advice from electrical service unit about how to do this. Return to this unit for servicing and decontamination. Permit to work label required. Control panels should, where possible be covered. Wipe control panels with an alcohol wipe at the beginning of a shift.
Electrode leads	<ul style="list-style-type: none"> • Disposable single use. • Wash in fresh general-purpose detergent solution. • 70% alcohol solution or wipes. 	Normally dispose of these. Clean with GPD and wipe with alcohol between resident/clients if they are not disposable.
Face masks	Washer-disinfector.	
FLOORS		
a. damp clean	Wash in fresh general-purpose detergent solution.	Damp mop with GP detergent in hot water, air dry, daily in clinical areas, consider using microfiber (MF) or ultramicrofiber (UMF) Known contaminated spillage and special areas, chemical disinfection with facility approved disinfectant
b. dry clean		Vacuum with filter or use dust-attracting mop. Do not use broom in resident/client areas.
Flower vases	Wash in fresh general-purpose detergent solution.	
Furniture	<ul style="list-style-type: none"> • Wash in fresh general-purpose detergent solution. • Wipe surfaces with phenolic solution or chlorine releasing agent after discharge of infected resident/client. 	Damp dust with general-purpose detergent. Wipe surfaces with phenolic solution or chlorine releasing agent after discharge of infected resident/client.
Hairbrushes and combs	Wash in fresh general-purpose detergent solution.	Allocate to a resident/client and discard on discharge.
Headphones	<ul style="list-style-type: none"> • Wash in fresh general-purpose detergent solution. • 70% alcohol solution or wipes. 	
Hoists	<ul style="list-style-type: none"> • Wash in fresh general-purpose detergent solution. • Wipe surfaces with phenolic solution after use 	Use disinfectant only after use by an infected resident/client.

Equipment / Condition	Action	Comments
	by an infected resident/client.	
Slings		Launder between resident/clients.
Horizontal Surfaces eg ledges, tops of curtain rails, equipment rails.	Wash in fresh general-purpose detergent solution.	Wipe according to domestic policy.
HUMIDIFIERS		
General	Wash in fresh general-purpose detergent solution.	During use empty and clean reservoir daily. Dry thoroughly. Refill with sterile water.
b. Aquapaks, etc.	Disposable single use.	Disposable systems such as "Aquapak" or equivalent must not be reused on more than one resident/client. Change when nozzle overtly dirty.
Infusion, enteral feed pumps	Wash in fresh general-purpose detergent solution.	Clean daily according to local policy. Wipe with a damp cloth with GPD. Ensure surfaces completely free of feed and infusion residues. Then decontaminate with alcohol wipe if contaminated with blood.
Infusion stands	Wash in fresh general-purpose detergent solution.	Wash when soiled and on completion of resident/client use.
Surgical instruments (used)	Decontaminate and autoclave in CSSD.	Bag as instructed. Contaminated instruments should be cleaned before sterilization
Intravenous infusions		ALL LINES MUST BE DATED.
INTRAVENOUS LINES		
Administration set	Disposable Single use.	Change every 48 or 72 hours (label with date/time of set up).
a. Peripheral cannulae	Disposable Single use.	Inspect frequently. Resite 48 hourly if practicable or at first sign of inflammation (pain swelling, blockage). Resite as soon as possible after emergency insertion.
c. TPN catheter	Disposable single use.	See Total Parenteral Nutrition and and tunneled Hickman Broviac/Groschong lines line policies in the Nursing Practise Manual.
Laryngoscopes	Decontaminate and autoclave in CSSD	After use remove bulb and wash bulb. Send blade to CSSD or use single use blades or sheath. Wipe over hand piece. Store dry. For tonsillectomy, use single use blades or a blade sheath.
Blades	Disposable single use / sheath.	Risk of vCJD transmission from tonsillar tissue reduced.

Equipment / Condition	Action	Comments
Library books		No special treatment required. Wipe outside plastic covers with general-purpose detergent if used by a resident/client with infection.
Lights and shades	Wash in fresh general-purpose detergent solution.	Damp dust according to cleaning schedule.
MATTRESSES		
a. normal	Wash in fresh general-purpose detergent solution. Use phenolic solution or chlorine releasing agent or 70% alcohol solution or wipes after discharge of infected resident/client.	Clean covers between resident/client use and when soiled. Use phenolic solution or chlorine releasing agent or 70% alcohol solution or wipes after resident/clients with MRSA or Group A <i>Strep</i> .
b. ripple, etc.	i) Wash in fresh general-purpose detergent solution. ii) Decontaminate after resident/client use.	Wipe hard surfaces with general-purpose detergent daily. Decontaminate after resident/client use.
Pillows	i) Wash in fresh general-purpose detergent solution.	Protect with waterproof covers. Clean between resident/client use and when soiled.
Any foam support		Protect with waterproof cover if possible. Dispose if soiled or used on a resident/client with infection. Store dry in plastic bags.
Medicine glasses	Disposable single use.	Discard after single use.
MOP HEADS		
a. dust control	Disposable single use.	Discard after use.
b. damp mopping		Launder after use or discard.
Nebulisers	Wash in fresh general-purpose detergent solution. Disposable single use.	Named for individual resident/client. Change complete unit weekly or when soiled. Store dry.
Oxygen masks	i) Disposable Single use.	Change daily or when soiled.
Oxygen tubing		Change between resident/client use.
Pressure relieving equipment	i) Wash in fresh general-purpose detergent solution.	Wipable material should be cleaned. Otherwise dispose of when soiled or resident/client discharged.

Equipment / Condition	Action	Comments
	OR ii) 70% alcohol solution. OR iii) Disposable single use.	
RAZORS		
a. safety razors	i) Disposable single use.	
b. electrical razors	70% alcohol solution or wipes.	Between resident/clients detach head, dust off and immerse in 70% alcohol for 3 minutes. Allow to dry. Do NOT use on HIV, HBV, MRSA positive resident/clients and anyone with a skin disease or facial lesion.
c. clippers	Disposable single use.	Use Disposable clipper heads.
Rooms (terminal cleaning or disinfection)	Non-infected resident/clients: wash surfaces in detergent solution and allow to dry	Infected residents/clients: wash with detergent solution and allow to dry. Use facility-approved disinfectants if disinfection is required.
Shaving brush		Do NOT use. Use gauze to apply cream or foam.
SKIN		
a. Hands		Use liquid soap and water, dry thoroughly. Removes transient microorganisms and cleans soil.
(Hands) antiseptic hand hygiene		Use alcohol gel (or alcoholic chlorhexidine). Wash with chlorhexidine
b. IM Injection sites		Nil or wipe with 70% alcohol swab (optional) and allow the skin to dry.
c. Intravenous infusion and long line sites	70% alcohol solution or wipes.	Prepare the site by swabbing with for at least 1 minute. Allow the skin to dry.
e. Before urethral catheterisation		Use soap and water or individual sachets of chlorhexidine 0.015% with cetrimide 0.15%.
f. Wounds		Use individual sachets
Surgical wounds		Clean around drain site with sterile normal saline or sterile water, as necessary.
Surgical drains		Dress separately from incision.
Open surgical wounds		Clean with sterile water or sterile normal saline or as directed

Equipment / Condition	Action	Comments
Non-surgical wounds (e.g. pressure sores, ulcers)		Clean with sterile water or sterile normal saline or as directed
Infected wounds		Clean with sterile normal saline, sterile water or as directed
Slings (orthopaedic supports)	i) Disposable single use.	
Slings (resident/client hoist)	i) Decontaminate and autoclave	Send for proper decontamination when the resident/client leaves.
SPECULA		
a. aural	i) Wash in fresh general-purpose detergent solution. ii) Decontaminate and autoclave	Use disposable tips and if not disposable, send for proper decontamination.
b. vaginal	Single use	
c. proctoscopes	ii) Disposable single use.	
SPILLAGES		
a. Body fluids	i) Wash in fresh general purpose detergent solution.	See Spillage Policy. Put on disposable plastic apron and "Marigold"-type gloves. Mop up as much as possible with Incopads. Discard in yellow plastic sack. Clean with GPD in hot water and wipe up with paper towels. When the spillage has been removed, wipe or wash the area with GPD, changing gloves if necessary. Discard protective clothing into the yellow bag, tie and send for incineration.
Body fluids in carpeted areas		If carpeted area, clean up as much as possible with disposable towels\incopads then arrange formal cleaning procedures.
b. Blood, blood-stained body fluids, tissue, CSF, amniotic fluid also body fluids from HIV, HCV and HBV positive and risk resident/clients	i) Chlorine releasing granules/solution.	ALL BLOOD SHOULD BE TREATED AS A POTENTIAL HAZARD Put on disposable "Marigold"-type gloves and plastic apron and visor or goggles. Mop up as much as possible with disposable paper towels or incontinence pads, discard into a yellow bag. Make sure the area is well ventilated and move staff and resident/clients away from the spillage. Flood the area with fresh CRA solution giving 10,000 ppm available chlorine, or cover with chlorine releasing granules. Leave for 5 minutes and mop up. When the spillage has been removed wipe or wash the area with GP

Equipment / Condition	Action	Comments
		detergent, changing gloves if necessary. Discard everything into a yellow sack (marked "hazard"), tie and send for incineration. Steam clean/disinfect carpets according to hospital policy
Sputum pots and sputum traps	i) Disposable Single use.	
Stethoscopes	i) Wash in fresh general purpose detergent solution. ii) 70% alcohol solution or wipes.	Clean daily and between resident/clients. This may be done with an alcohol impregnated wipe. Dedicate one stethoscope per resident/client for resident/client requiring isolation. Wipe with alcohol wipe at the beginning of each shift and clean after discharge of resident/client.
Suction Apparatus		
If the machine becomes contaminated, a <u>Permit to Work</u> is required to ensure the engineers are aware of any risk.		
Catheters plastic, PVC red rubber	i) Disposable Single use.	
Jars	i) Decontaminate and autoclave in CSSD / TSSU. ii) Disposable Single use.	Empty and clean daily, send to CSSD after completion of resident/client use according to local policy. Disposable units to be discarded in rigid containers for incineration.
Telephone handsets	i) Wash in fresh general purpose detergent solution. ii) 70% alcohol solution or wipes.	
THERMOMETERS		
General	i) Disposable Single use.	Use (a) disposable system (eg "TempaDot") or electronic thermometers with appropriate disposable tips or sheaths.
Mercury		Mercury thermometers should be phased out. Caution for mercury spillages.
Oral	i) Wash in fresh general purpose detergent solution. ii) 70% alcohol solution or wipes.	Clean in tepid water. Wipe with 70% alcohol and store dry.
Aural	i) Disposable Single use.	
Rectal	i) Wash in fresh general	Use a sheath. Clean in tepid water.

Equipment / Condition	Action	Comments
	purpose detergent solution. ii) 70% alcohol solution or wipes.	Wipe with 70% alcohol and store dry.
Tympanic membrane	i) Disposable Single use.	Use disposable tips.
Holder	i) Wash in fresh general purpose detergent solution.	Wash weekly and after each resident/client and allow to dry.
Temperature probes: nose, mouth and rectal.		Use disposable sheaths or wash clean in GPD. Rinse and store dry.
Toilet seats	i) Wash in fresh general purpose detergent solution. ii) Phenolic solution after washing with general purpose detergent.	Clean last of all in sequence. Use phenolic or Chlorine Releasing Agent on communal toilet seats daily.
Toys	i) Wash in fresh general purpose detergent solution.	If soiled, wash with GPD. Soft toys cannot be adequately decontaminated so if used by a child with infection should be sent home with the child or destroyed. The optimal method for decontamination is low-temperature steam/formaldehyde, but this is not generally available.
TROLLEYS		
a. dressing	i) Wash in fresh general purpose detergent solution and wipe dry	Clean thoroughly daily. Before and after procedures wipe with 70% alcohol. Must be dry before placing sterile packs on surface.
b. resident/client	i) Wash in fresh general purpose detergent solution.	
Urinals	Washer disinfectant	
Urine measuring jugs	i) Washer-disinfectant.	Heat disinfect in bedpan washer between every use.
Urine bag stands	i) Wash in fresh general purpose detergent solution.	
Urine drainage bags		Change bag weekly. And at catheter change unless a protective valve system is used. The "closed system" must be maintained to reduce the risk of introducing micro-organisms into the system.
Wheelchairs and Trolleys	i) Wash in fresh general purpose detergent solution. ii) Chlorine releasing granules/solution.	Keep clean. Wipe with chlorine releasing agent after use by resident/clients in Source Isolation
X-Ray equipment	i) Wash in fresh general	Keep equipment clean by damp

Equipment / Condition	Action	Comments
	purpose detergent solution. ii) 70% alcohol solution or wipes.	dusting. Use ALC after GPD if overtly contaminated.

Recommendations

1. ***Health care settings should have policies and procedures addressing infection prevention and control for environmental services, reprocessing of medical equipment, and facility design and construction.***
2. ***There must be adequate numbers of staff with appropriate training to provide a clean and safe environment, including extra environmental cleaning capacity during outbreaks.***
3. ***Cleaning practises in the health care setting must be monitored and results reported back appropriately to become a part of the employee's performance review.***
4. ***The ICP must have input at all stages of construction and renovation, from design to commissioning, and have the authority to halt projects if there is a risk to client/resident or staff safety.***

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Waste management

Handling and Disposing of Infectious Waste

Appropriate handling and disposal of potentially infectious waste is important in preventing or minimising the spread of infection, illness and disease. When cleaning and disposing of potentially infectious waste such as blood or body fluids, or items contaminated with blood-stained items or soiled clothing, the following steps should be taken:

- Wear disposable gloves, and a plastic apron if necessary.
- For blood and body fluid spills, absorb the bulk of the spill with disposable materials such as paper towels. Special care should be taken if waste contains sharp material such as broken glass. Sharp material should be picked up with sturdy tongs, and put into a puncture-resistant rigid-walled container such as a sharps container.
- Clean the spill with water and detergent.
- After cleaning, disinfect the area with a freshly prepared solution of 10,000 ppm sodium hypochlorite and leave to dry. For small spills (e.g. spots of blood) an alcohol wipe may be sufficient
- Clean cleaning equipment such as mops and buckets with warm water and detergent and store dry.
- Remove and dispose of gloves and other waste such as paper towels into a sealable plastic bag (see Appendix C). Clean hands with alcohol hand rub or wash hands thoroughly with soap, water and dry with paper towels (see Appendix A).
- If the spill is on carpet, clean with a neutral detergent and arrange for the carpet to be cleaned with an industrial cleaner as soon as possible.
- Granular formulations that produce high available chlorine concentrations can be used to contain the spill and prevent airborne contaminants. Cleaning supervisors may assist in recommending products that are available from chemical suppliers.

- Sharps should be disposed off immediately after use into sharps disposal boxes. No attempt should be made to recap, break or bend the needle as this is a common cause of injury.
- If a needle-stick or other injury involving exposure to blood or body fluids occurs during handling and disposal of potentially infectious waste, the person should be medically assessed as soon as possible.

Recommendations

1. ***Health care settings should have policies and procedures addressing infection prevention and control for handling of waste.***

Kitchen

1. National Environment Agency (NEA) Regulatory Requirements for Food Handlers

- 1.1. Attended and passed Work Development Agency's Food Hygiene Course
- 1.2. Registered with NEA

2. NEA definition of Food Handler

- 2.1. A food handler refers to any person who handles and prepares food and beverage.
Chefs, sous chefs, cooks and kitchen assistants are considered as food handlers as they are primarily involved in food preparation.
- 2.2. Waiters, dishwashers, cleaners and other service staff are generally not considered as food handlers as they are primarily involved in the serving of food and beverage. However, they will be considered as food handlers if they are also involved in the handling and preparation of food and beverage. This may include the washing and cutting of raw fruit, vegetable and meat, processing of ready to eat food (in raw or cooked form), preparation of sauces, spices and condiments, mixing of beverage drinks and any other forms of food and beverage handling and preparation.

3. Personal hygiene

- 3.1. Wash hands thoroughly with soap and water:
 - 3.1.1. before handling any food items or utensils
 - 3.1.2. before and after preparing food, especially raw meat, poultry and seafood
 - 3.1.3. before handling cooked or ready to eat food
 - 3.1.4. after using the toilet
 - 3.1.5. after touching rubbish bins
- 3.2. Staff with infection
 - 3.2.1 Staff who are suffering from sickness, diarrhoea, influenza, discharges from ears, eyes, nose and septic skin conditions should not be allowed to work with food.

3.2.1 Staff must be symptom free for 48 hours before returning to work.

4. Avoid Cross-Contamination

4.1. During Storage

- 4.1.1. Store raw food separately from ready-to-eat food
- 4.1.2. Place packages of raw meat, poultry or fish in plates before refrigerating and place at the bottom shelf of the fridge so that the juices would not drip onto other food. Do not use plates that are used to hold raw meat, fish or poultry to place cooked food.
- 4.1.3. Store fresh fruit and vegetable in clean plastic bags when not in use and away from raw meat or seafood products in the fridge.
- 4.1.4. Keep food covered and elevated from the floor during storage and handling.
- 4.1.5. Place food that are likely to spill in suitably covered trays or containers and place them in the lower part of the fridge

4.2. During Food Preparation

- 4.2.1. Pay attention to personal hygiene during food preparation
 - a) Keep hands clean by washing hands thoroughly with soap including finger tips before, during intervals and after food preparation, changing tasks and returning from breaks
 - b) It is essential that jewellery worn in hands such as rings be removed before preparation of food as they may harbour food poisoning organisms
 - c) Avoid touching face, skin and hair or wiping hands on cleaning cloth
 - d) Cuts should be covered with waterproof bandages
 - e) Food handlers who are sick or have a skin infection should not be allowed to prepare food for others
- 4.2.2. Use separate utensils for preparing raw food and cooked/read-to-eat food

- a) Use different plates for raw food and cooked/ready-to-eat food. Never use the same plate without washing it thoroughly before use. Do not put raw vegetables on a plate that has previously held raw meat, poultry or seafood until it has been thoroughly washed.
 - b) Use separate cutting boards and knives for cutting raw meat/seafood and for slicing cooked or ready-to-eat food. Replace cutting boards that have become excessively worn out or developed hard-to-clean grooves
- 4.2.3. Wash and sanitise all equipment and utensils that come into contact with food with water and soap between tasks and handling raw and read-to-eat food.
- a) After preparing raw food in a food processor, clean the parts of the equipment thoroughly.
 - b) Keep all work surfaces clean between each task to remove all food scraps, crumbs spillage or spots that serve as potential reservoir of bacteria
 - c) Discard food that has dropped on the tabletop or on the floor
 - d) Regularly change, wash and sanitise cloths used for wiping tables or equipment. Never use cloths for cleaning dirty areas to clean anything that may come into contact with food.
 - e) Do not recycle used food packaging and paper bags for storage of food

4.2.4. Cleaning Food

- a) Wash fresh fruit and vegetables thoroughly to remove soil and residue.
- b) Clean raw meat and seafood before cooking or storing to remove dirt and other contaminants.

4.3. When Serving Food

- 4.3.1. Always use different serving containers and serving spoons for raw and cooked food.
- 4.3.2. Use shallow containers and leave sufficient air space around the food to provide rapid and even cooling. Cooked food stored in large, deep containers

remains warm for a longer time. Dangerous bacteria may grow in the warm spots which can lead to food poisoning if consumed.

4.3.3. Never place cooked food in a container that has been used to hold raw food

4.3.4. Cooked food intended for consumption later should be separated from food to be served as soon as it is cooked.

4.4. When Storing Leftovers

4.4.1. Refrigerate or freeze leftovers within 2 hours in clean, shouldow, covered containers to prevent harmful bacteria from multiplying. When in doubt, discard leftovers

4.4.2. Do not keep cooked food for more than 4 days. Label and date food before storing them. If there is any doubt about the safety of the food, throw it out.

5. Cooking Food

5.1. Cook food thoroughly, especially meat, poultry, eggs and seafood. Cook at high temperatures (above 75°C).

5.2. Ensure that the centres of meat and poultry are well cooked as partially cooked food increases the risk of bacterial growth

5.3. Bring food like stews, soups and curries to boiling temperatures when cooking

6. Keep Food Safe

6.1. When it comes to food, there are two temperatures to keep in mind always – keep hot food above 60°C and cold food below 5°C. As a general guide, keep hot food hot and cold food cold, as bacteria multiply quickly in the temperature danger zone of between 5°C and 60°C.

6.2. Do not serve cooked food standing at room temperature for more than 2 hours

6.3. Reheat stored cooked food at temperatures above 75°C or bring them to boil to kill bacteria.

- 6.4. Portion out excess cooked food immediately after cooking and refrigerate quickly
- 6.5. Keep cold food in refrigerator or on a bed of ice until it is time to serve
- 6.6. Do not thaw food at room temperature. Defrost food overnight in the fridge or use the microwave oven. When defrosting meat in the fridge, place the meat in containers or trays to prevent the meat juices from contaminating other food.
- 6.7. Do not leave chilled or thawed meat at room temperature for more than 2 hours as bacteria will rapidly multiply. Chilled and thawed meat should be placed in the fridge if not cooked immediately.
- 6.8. Do not refreeze meat that has been completely thawed.
- 6.9. Do not marinate food at room temperature on the kitchen counter. Marinate food safely in a covered bowl in the fridge.
- 6.10. Inspect dried and preserved food regularly for insect infestations, mouldiness and other signs of spoilage. Discard where necessary.

7. Food Utensils

- 7.1. Clean all utensils (including cutting boards and knives) and kitchen surfaces and countertops with detergent and hot water and dry them thoroughly.
- 7.2. Cutting boards in particular are prone to harbouring bacteria. Use a brush to scrub off the stubborn food and dirt particles. Sanitise plastic cutting boards with chlorine or bleach solution.
- 7.3. Wash dishcloths and tea towels frequently and dry them thoroughly. Damp dishcloths and tea towels harbour bacteria. Frequently change tea towels or dishcloths that come into contact with plates and utensils. After using them, dry them quickly to prevent germs from breeding.
- 7.4. Wash kitchen sponges thoroughly before putting it away. Change kitchen sponges regularly to prevent bacteria from harboring. Kitchen sponges can harbour millions of bacteria.

7.5. Clean all kitchen surfaces and countertops with detergent and hot water. Do not let food residue dry on kitchen surfaces and utensils.

7.6. Keep cutting boards, utensils, cleaning cloths, sinks and countertops clean and dry to prevent accumulation of dirt and harbouring of bacteria.

8. Kitchen Waste

8.1. Place all kitchen waste in bags or covered bins and dispose of them frequently.

Kitchen waste attracts insects and rodents which can carry microbial flora.

9. Record Keeping

The recommended records include:

- Hazard analysis
- Staff training and health records
- Refrigeration temperatures
- Cleaning schedules
- Pest control records
- Equipment maintenance schedule

Recommendation

1. ***Health care settings should have policies and procedures addressing infection prevention and control for food handling and storage.***

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Laundry Management

Facilities:

Design:

The laundry area must be sited such that soiled articles are not carried through areas where food is stored, prepared, cooked or eaten. The laundry area should have a flow of 'dirty to clean' design where clean laundry is stored differently from the area where dirty laundry is handled. The laundry floor and wall must be of easily cleanable material. The floor should be non-slip.

Wash hand basin:

Non-hand touch taps are recommended. Liquid soap and paper towels must be available. A foot-pedal operated bin for paper towels should be provided

Washing machines/Equipment:

Washing machines with a sluice cycle is recommended. Machines must be regularly maintained and records retained. Washing machines should reach 65 degree Celsius for a minimum of 10 minutes or 71 degree Celcius for 3 minutes in order to achieve disinfection. Washing machine must not be over loaded to ensure that the machine functions adequately. Laundry bags, containers should be cleaned with detergent and water after contained soiled for contaminated linen, or at least weekly. Washing powder/liquid must be kept in a locked storage cupboard

Staff:

Laundry staff should always wear gloves and a disposable apron whilst handling laundry. Hands must be washed after removal of gloves and apron

Practices:

Handling used linen:

Used linen are to be contained in a white (or designated color) plastic bag. Bed linen should not be shaken and must be removed with care to avoid dispersing dust and contaminants. Contaminated or soiled linen with urine or faeces, vomit, sputum is to be washed off into the WC or slop-hopper and excess water drained before putting them into the designated plastic bag which will be sent to the laundry. Note: A dedicated sink or toilet bowl can be used to wash off contaminated or soiled linen if a slop-hopper is not available. Items that are not washable should be dry cleaned or destroyed if necessary. Laundry bag must be strong enough to contain the linen. Bags must not be over-filled and should be securely tied. No extraneous items must be placed in the laundry bags, especially sharp objects. This may contribute to a health & safety risk for the laundry workers and is not acceptable.

Handling infected linen

Infected linen should not be sorted, agitated but placed in a water-soluble bag or double bagged in a green or designated colour bag. Water-soluble bag can be placed into the machine [on a sluice cycle] thereby reducing the risks of body fluid contamination.

Double-bagged laundry should be handled carefully to reduce the risk of fluid contamination when placing the infected linen into the machine.

Used linen and soiled/infected linen should not be laundered together. There must not be contact between clean and soiled linen.

Table 5 Recommended cleaning

Category	Description	Method
Used linen/clothing	Linen that is used but not contaminated with urine, faeces, blood, vomit, sputum or other body fluid	<ul style="list-style-type: none"> • White or designated color laundry bag • Sluice cycle not required
Contaminated or soiled linen/clothing but not infected	Linen that is contaminated with urine, faeces, blood, vomit, sputum but not infectious	<ul style="list-style-type: none"> • Remove solid waste in WC or slop-hopper • Rinse off contaminant • White or designated color laundry bag

Category	Description	Method
		<ul style="list-style-type: none"> • Sluice cycle may be needed
Infected linen/clothing	<p>Linen or clothing contaminated with urine, feces, vomit, sputum, blood or body fluid from a person with a known infectious condition</p> <p>Note: No segregation of linen of colonized MRSA resident/clients unless linen is soiled with body fluid</p>	<ul style="list-style-type: none"> • Remove solid in WC or slop-hopper • Place in a water-soluble bag or double bagged using gloves and apron • Sluice cycle needed

Table 6 Recommended laundry frequency

Item	Frequency
Clothes	Daily
Bed sheets, pillow cases	Weekly or according to organization policy or when stained
Cotton blankets	Monthly or according to organization policy or when stained
Curtain, screens	Quarterly or according to organization policy, or when stained

Recommendation

1. ***Health care settings should have policies and procedures addressing infection prevention and control for handling of laundry.***

Staff Welfare: Immunization and exposure management

The differences between hospitals and most long term care facilities include living conditions which are congregated in most long term care facilities. As such, there would be an increased risk of exposure to residents with certain infectious diseases such as herpes zoster, scabies, conjunctivitis, influenza, TB, and viral gastroenteritis.

A baseline health assessment for all new employees should include immunization status and history of relevant past or present infectious diseases. The past history of infectious disease should address diseases such as protection from chicken pox, hepatitis, skin boils, and bacteria diarrhoea.

An essential part of successful staff health programs is ensuring that healthcare workers are immune to vaccine-preventable diseases. A comprehensive staff immunization program is far more cost-effective than case management and outbreak control. To ensure susceptible staffs are vaccinated, the immunization programs should be mandatory for newly employed staff and existing staff rather than voluntarily.

Chickenpox:

Anyone who is not fully vaccinated, and never had chickenpox, should receive one or two doses of chickenpox vaccine. The timing of these doses depends on the person's age. Chickenpox vaccine may be given at the same time as other vaccines.

Hepatitis

Hepatitis B vaccine should be offered to healthcare workers who have a reasonable expectation of being exposed to blood on the job. This excludes staff who would not be expected to have occupational risk, such as receptionists, billing staff, and general office workers. Substantial evidence suggests that adults who respond to hepatitis B vaccination (anti-HBs of at least 10 mIU/mL) are protected from chronic HBV infection for as long as 23 years, even if there is no detectable anti-HBs currently. Only immunocompromised persons

(e.g., hemodialysis resident/clients, some HIV-positive persons) need to have anti-HBs testing and booster doses of vaccine to maintain their protective anti-HBs concentrations of at least 10 mIU/mL. For persons whose immune status is normal, periodic serologic testing to assess anti-HBs concentrations is not necessary. Persons who perform invasive procedures should be treated no differently from other HCPs with respect to anti-HBs testing. Immunoprophylaxis should be considered if a HCP has an exposure (e.g. needlestick).

Table 7 Post-Exposure Prophylaxis (PEP) against Hepatitis B for HCP Exposed to Blood and / Body Fluids

Immune Status of HCP	Source Resident/client HBsAg (+)	Source Resident/client HBsAg (-)	Source not tested or unknown
Unvaccinated	One dose HBIG and start one series of HB vaccination	Start HB vaccine series	Start HB vaccine series
Previously Vaccinated - Known responder (anti-HBs \geq 10 mIU/ml)	No treatment	No treatment	
Known non-responder	One dose HBIG and start one series of HB vaccine	No treatment	If known high risk source, treat as if source were HBsAg (+)
Antibody response unknown	Check anti-HBs; if \geq 10 mIU/ml, one dose HBIG and vaccine booster	No treatment	Check anti-HBs: if \geq 10mIU/ml, one dose HBIG and vaccine booster

Abbreviation: HBIG – Hepatitis B immunoglobulin HB – Hepatitis B

HCP – Health Care Worker

HBsAg – Hepatitis B surface antigen

Influenza

It is highly recommended that residents be immunized against pneumococcal diseases and annually be vaccinated with the influenza vaccine against seasonal influenza.

Tuberculosis

Tuberculosis (TB) has caused extensive outbreaks in ILTCs, generally traced to a single ambulatory resident. Large numbers of staff and residents may be involved. Screening for Tuberculosis during employment may include annual TB symptom questionnaire, Mantoux Test and / or Chest X-Rays. Exclusion from duty is indicated in personnel with active pulmonary or laryngeal TB until they are non-infectious. There should be documentation to indicate the personnel are not infectious before they are allowed to return to duty. The following evidence should be included in the documentation:

1. Adequate therapy has been received;
2. The cough has resolved;
3. Results of AFB smears collected on different days are negative.

In an ILTC that does not have a negative-pressure room; residents with suspected active TB should be transferred to an appropriate acute-care facility for evaluation. There should be a referral agreement with that facility. The following measures will give some protection for staff from TB infection:

- Provide all staff and volunteers with up-to-date information about the risks of contracting TB and how to protect themselves from infection. They must be aware of all TB symptoms and seek advice from health facilities if symptoms develop;
- Ensure that proper hygiene techniques are in place such as washing hands with appropriate disinfectant or alcohol rub after touching a resident/client. Wear gloves when handling objects contaminated by sputum.

- Ensure that all rooms where people with TB sleep have plenty of sunlight and good ventilation. Ultraviolet radiation kills TB bacteria while ventilation removes the infected particles from the air. Resident/clients should be encouraged to cover their mouths when coughing

General health

As staffs may occasionally be potential source of infection to residents, it is important that staffs be accountable to practise good personal hygiene at all times. All health care settings should establish a clear expectation that staff do not come into work when ill, and support this expectation with appropriate attendance management policies.

Recommendations

- 1. All health care settings must have an immunization program in place appropriate to their resident/clients.**
- 2. Residents of ILTCs must have immunization programs that also include pneumococcal and annual influenza vaccination.**
- 3. Attendance management policies shall discourage health care providers from working while ill with a communicable disease that can be spread in the health care setting.**

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Components of an Infection Control program in ILTC

Structure and Components

Infection control program for ILTCs have evolved over the years, since then the structure and components of an effective program are usually drawn from regulatory requirements, existing practises in the nursing homes, and base on extrapolation from hospital programs. Infection Control programs (Table 1) should include basic surveillance for infections, an epidemic control program, policies and procedures formation and review, education of employees in infection control methods, an employee health program, a nursing residents health program (e.g. immunization), and monitoring of resident care practises. In addition, other aspects of the program should also include quality improvement, resident/client safety, environmental review, antibiotic monitoring, product assay and evaluation, preparedness planning, and reporting of diseases to the Ministry of Health.

The Infection Control Personnel/Nurse (ICN)

An ICN is an essential component of an effective infection control program and is the person designated by the facility to be responsible for infection control (refer Table 1 for structure of IC program). The ICN is usually a staff with nursing background, which will be necessary for assessment and chart review of the residents. He/she is a registered nurse and in most ILTC, owing to the size and staffing limitations, ICN has other duties, such as assistant director of nursing, charge nurse, in-service coordinator, employee health, or performance improvement. The number of ILTC beds justifying a full-time ICN depends on the acuity level of residents and the level of care provided, where possible a ILTC with more than 250 to 300 beds may need a fulltime ICN. The ILTC ICN, like the acute care hospital, requires specific training in infection control; well-defined support from administration; and the ability to interact tactfully with personnel, physicians, and residents. In addition to the professional nursing qualifications, other criteria required for the ICN include:

- Knowledge and experience in areas of resident care practises, microbiology, asepsis, disinfection/sterilization, infectious diseases, communication, program administration, and epidemiology;
- ICN is a registered nurse
- Undergone a basic infection control training course
- Maintains current knowledge and skills in the area of infection prevention, control, and epidemiology for his/her professional development.

Elements and Structure of Infection Control in ILTCs

Refer to Tables 8 and 9.

Table 8 ILTC Infection Control Program

Elements	Examples
Infection control activities- Establish and implement routine infection control policies and procedures	Hand hygiene Standard precautions Organism-specific isolation Employee education
Infection identification	Develop case definitions Establish endemic rates Establish outbreak thresholds
Outbreak Management	Identification, investigation, and control of outbreaks
Organism-specific infection control policies and procedures	Influenza, TB, Scabies, MDROs (eg, MRSA)
Disease reporting	Public health authorities (MOH) ILTCs' senior management and staff
Antibiotic stewardship	Review of antimicrobial use
Monitoring of resident/client care practices	Aspiration precautions Pressure ulcer prevention Invasive device care and use
Facility management issues	General maintenance Plumbing/ventilation Food preparation/storage Laundry collection/cleaning Infectious waste collection/disposal

Elements	Examples
	Environment Housekeeping/cleaning Disinfection/sanitation Equipment cleaning
Product evaluation	Single use devices
Resident health program	TB screening Immunization program (e.g influenza)
Employee health program TB screening	TB screening Immunizations (Hep B, influenza) Occupational exposures
Other program elements: Quality improvement (QI)	Serve on QI committee
Preparedness planning	Develop pandemic influenza preparedness plan

Table 9 ILTC Infection Control Program: Structure

Infection Control Committee (ICC)		
Leadership	Expertise/training	Role(s)
Core members	Administration, Nursing Representative, Medical Director, ICN	Identifies areas of risk
Ad hoc members	Food Service, Maintenance, Housekeeping, Laundry Services, Clinical Services, Resident Activities (Physio, Occupational Health Representative) Employee Health (Human Resource)	Establishes priorities Plans, strategies to achieve goals Implements plans Develops policies/procedures Allocates of resources Assesses program efficiency at least annually
Infection Control Doctor Infection Control Nurse (ICN)	Qualification via education, experience, and local credentials	Surveillance Data collection and analysis Implementation of policies, procedures Education Reporting to ICC Communication to public health Communication to other agencies Communication to other facilities

The Infection Control Committee (ICC)

The committee oversees infection prevention and control issues in the ILTCs, because of the limitation in the physician availability a small working group consisting of the ICN, the administrator, the medical director, and the nursing supervisor or their designee may efficiently make most of the infection control decisions (Table 2). The ICC functions may be combined with the quality improvement or resident/client safety programs, with infection control identified as a distinct program. The group should meet at least six monthly to review infection control data, review policies, and monitor program goals and activities. Documentation and written records of these meetings should be kept and readily available for inspection by the accreditation authorities.

Surveillance

Infection surveillance in the ILTCs involves the systematic collection, consolidation, and analysis of data on healthcare associated infections (HAIs). Standardization of surveillance is ideal with the following recommended steps:

- 1) Assess the residential/nursing home population
- 2) Select the outcome or process for surveillance
- 3) Use surveillance definitions (CDC, NHSN)
- 4) Collect surveillance data
- 5) Calculate and analyzing infection rates
- 6) Apply risk stratification methodology
- 7) Report and apply surveillance information

1. Assessing the population

Infection surveillance may either include all residents/resident/clients in a facility (total house surveillance) or be targeted at specific subpopulations. Although facility wide surveillance is useful for calculating baseline rates and detecting outbreaks, however a more focused analysis could include examination of infection rates in residents who are at risk for

specific infections (such as aspiration pneumonia in residents receiving tube feedings or urinary tract infections).

2. Selecting the outcome measures

Generally, surveillance in the ILTC refers to collection of data on outcome measures such as HAIs that occur within the institution (e.g., incidence of UTI or aspiration pneumonia). These surveillance data could be used primarily to guide activities, plan educational programs, and detect epidemics. Additionally process measures (e.g. surveillance of infection control practices) could also be part of the infection control and quality improvement programs in identifying areas for improvement in practise and for monitoring compliance with regulatory aspects of the infection control program. Examples of process measures include observation of hand hygiene compliance, observation of correct catheter care technique, antibiotic utilization studies, and administration of hepatitis B immunization to all new employees.

3. Using surveillance definitions

Surveillance requires objective, valid definitions of infections. Definitions could be based on the National Healthcare Safety Network [NHSN] definitions. In the ILTC, radiology and microbiology data are less available, and written physician notes and nursing assessments in the medical record usually are brief. Timely detection of HAI in the ILTC often depends on recognition of clues to infection by nurses and reporting of the findings.

4. Collecting surveillance data

ILTC surveillance could be incidence or prevalence studies. The surveillance process consists of collecting data on individual cases and determining whether or not a HAI is present by comparing collected data to standard written definitions (criteria) of infections. Surveillance should be done on a timely basis, probably at least weekly. The ICN, during her rounds may use house reports from nursing staff, chart reviews, laboratory or radiology

reports, treatment reviews, antibiotic usage data, and clinical observations as sources of information.

5. Analysis and reporting of surveillance data

Analysis and calculation of infection rates provide the most accurate information. Rates are generally calculated by using 1000 resident- days as the denominator. The data could be done quarterly, and annually to detect trends and steer toward specific interventions such as education and control programs.

Outbreak Management

Outbreak management and control should be considered a high priority for ILTC. The ICN is required to monitor residents and staff for illnesses and clustering of cases of an infectious diseases and initiate control measures. Leading causes and examples are: influenza, or other respiratory viruses, viral gastroenteritis, scabies and conjunctivitis. The ICN may approach to investigate an outbreak by:

- a) Determining that an outbreak has occurred
- b) Developing a case definition
- c) Case finding
- d) Analysing the outbreak
- e) Formulating a hypothesis regarding mechanism of transmission
- f) designating control measures
- g) Evaluating control measures

She may also refer to the available guide to investigation of outbreaks by CDC, SHEA publication. In cases of major outbreaks, there may be a need for an outbreak control team to be appointed in the organization. This may comprise the following representatives:

- Infection Control Doctor, if available
- Infection Control nurse
- Medical Director

- Nursing Administrator / senior nursing personnel
- Representative from Operations

The responsibilities of the outbreak control team are to:

- Agree and coordinate policy decisions in controlling the outbreak
- Review progress in management of outbreak
- Define end of outbreak

Other Aspects of the Program

1. Policies and procedures

An important aspect of infection control programs is the development and updating of infection control policies and procedures, when necessary they should be reviewed on a scheduled basis.

2. Education

Basic training program on key infection control practises like surveillance using infection definitions, calculating infection rates play an important role in enhancing the educational needs of ILTC personnel. In addition education on basic hygiene, barrier precautions and hand hygiene to residents and families should be routinely directed and incorporated in the orientation program. A structured orientation program should be designed for all new employees and regular on going infection control education should include all staff especially those providing direct resident care.

3. Facility management

Environmental control in the facility is an important consideration. Routine environmental cultures are not cost-effective and do not usually generate information relevant to clinical infections. Proper selection of disinfectants and antiseptics with periodic environmental compliance rounds are recommended.

4. Waste management

Proper waste disposal is another important factor in the ILTC (See **Waste Management**).

5. Infectious Disease reporting

Another important function of the infection control program is infectious disease reporting to the public health authorities. The list of reportable diseases will be in accordance to the requirement indicated in Infectious Disease Act of Singapore.

6. Performance/Quality improvement/resident safety

The increased emphasis on quality indicators in health care is becoming evident in ILTC. A quality assessment and assurance committee may be required as many of the techniques used in infection prevention and control are applicable to Quality Improvement (QI), such as data collection, data analysis, and intervention.

7. Preparedness planning

The ICN will play a key role in ILTC preparedness planning. Currently the planning may be focused on pandemic influenza and the ILTC should be prepared for dealing with a variety of disaster scenarios. Issues to be considered include surge capacity, medication availability and rationing, stockpiling, staff shortages during an influenza pandemic, and communication with public health authorities.

Recommendations

- 1. Health care settings must evaluate their IPC needs and then implement an IPC program suited to those needs.***

- 2. Periodic review of the IPC program must be carried out to reassess the organization's needs and to determine which elements are required to continue to meet the goals of the program for that health care setting.**
- 3. Senior administration and the IPC committee must support the implementation and execution of the IPC program by the IPC staff.**
- 4. Each health care facility shall have a multidisciplinary infection prevention and control committee whose responsibilities include annual goal-setting, program evaluation and ensuring that the IPC program meets current legislated standards and requirements as well as the requirements of the facility.**
- 5. Health care settings must monitor targeted IPC processes with regular audits of practises.**
- 6. Health care settings must monitor targeted IPC outcomes using surveillance for health care-associated infections in specific populations.**
- 7. Infection surveillance must include standardized collection of data using written definitions of infections, identification of risk population, methods of measurement, description of data sources and benchmarks used for comparison.**
- 8. Results of process and outcome surveillance must be analyzed and reported back in a timely fashion; a plan for improvements, including organizational accountability, must be developed by the targeted area in conjunction with IPC based on the results of surveillance.**
- 9. Education in infection prevention and control must span the entire health care setting and be directed to all who work in that setting.**
- 10. Orientation programs for staff new to the health care setting must include an IPC component.**
- 11. All health care facilities must have trained infection prevention and control professional(s) (ICP) and resources to implement the IPC program that are proportional to the size, complexity, case mix and estimated risk of the populations served by the health care facility.**

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Appendix A

Hand hygiene

Rub hands palm to palm			Right palm over left dorsum with interlaced fingers and vice versa
Palm to palm with fingers interlaced			Back of fingers to opposing palms with fingers interlocked
Rotational rubbing of right thumb clasped in left palm and vice versa			Rotational rubbing, backwards and forwards with clasped fingers of left hand in right palm and vice versa
Wrap left hand over right wrist using rotational movements up to elbow and vice versa			Use paper towel to turn off faucet

Source: Infection Control, SGH, used with permission

Appendix B

Surgical hand rub

The handrubbing technique for surgical hand preparation must be performed on perfectly clean, dry hands. On arrival in the operating theatre and after having donned theatre clothing (cap/hat/bonnet and mask), hands must be washed with soap and water. After the operation when removing gloves, hands must be rubbed with an alcohol-based formulation or washed with soap and water if any residual talc or biological fluids are present (e.g. the glove is punctured).

Surgical procedures may be carried out one after the other without the need for handwashing, provided that the handrubbing technique for surgical hand preparation is followed (Images 1 to 17).



1

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the dispenser



2

Dip the fingertips of your right hand in the handrub to decontaminate under the nails (5 seconds)



3

Images 3–7: Smear the handrub on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds)



4

See legend for Image 3



5

See legend for Image 3



6

See legend for Image 3



7

See legend for Image 3



8

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your right hand, using the elbow of your other arm to operate the dispenser



9

Dip the fingertips of your left hand in the handrub to decontaminate under the nails (5 seconds)



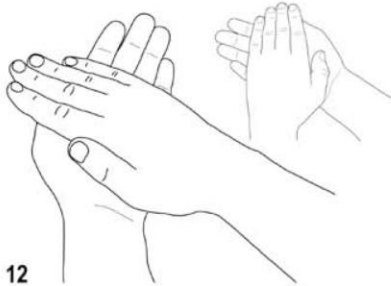
10

Smear the handrub on the left forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds)



11

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the distributor. Rub both hands at the same time up to the wrists, and ensure that all the steps represented in Images 12-17 are followed (20-30 seconds)



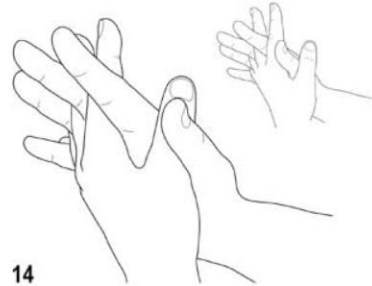
12

Cover the whole surface of the hands up to the wrist with alcohol-based handrub, rubbing palm against palm with a rotating movement



13

Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice-versa



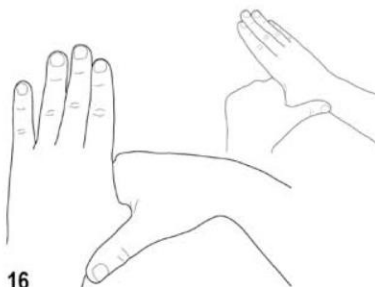
14

Rub palm against palm back and forth with fingers interlinked



15

Rub the back of the fingers by holding them in the palm of the other hand with a sideways back and forth movement



16

Rub the thumb of the left hand by rotating it in the clasped palm of the right hand and vice versa



17

When the hands are dry, sterile surgical clothing and gloves can be donned

Repeat the above-illustrated sequence (average duration, 60 sec) according to the number of times corresponding to the total duration recommended by the manufacturer for surgical hand preparation with an alcohol-based handrub.

Source: WHO Guidelines on Hand Hygiene in Healthcare

Appendix C

Putting on PPE



Removal of PPE



Source: Infection Control, SGH, used with permission

Appendix D

Respiratory Hygiene

Stop the spread of germs that make you and others sick!

Cover your Cough



Cover your mouth and nose with a tissue when you cough or sneeze or cough or sneeze into your upper sleeve, not your hands.



Put your used tissue in the waste basket.



You may be asked to put on a surgical mask to protect others.

**Clean
your
Hands**
after coughing or sneezing.



Wash hands with soap and warm water for 20 seconds or

clean with alcohol-based hand cleaner.



Massachusetts Department of Health
100 North Street
Boston, MA 02111
617-725-6900
www.mass.gov/dhs



Massachusetts
Department of
Public Health

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Acknowledgment

The Working Group appointed by Infection Control Association (Singapore) [ICA(S)] to assist in the preparation of this revised guideline comprises the following experts who contributed in their individual capacity:

Chairperson: Dr Ling Moi Lin, President of ICA(S)

Members: Ms Lang Ren Lee, Lily, Executive Committee Member, ICA(S)
Ms Lee Shu Lay, Honorary Secretary, ICA(S)
Ms Goh Swee Eng, Executive Committee Member, ICA(S) and
Assistant Nursing Director, St Andrew's Nursing Home
Mr Victor Lim, Nurse Manager, SASCO Senior Citizens' Home
Dr Suririnah, Healthcare Consultant, Assistant Head of Home &
Children's Wing Mindsville@Napiri
Ms Tham Heng Yoke, Singapore Cheshire Home

Endorsed by the Infection Control Association (Singapore), Agency for Integrated Care (AIC) and the Service Development and Management Division (SDMD), Ministry of Social and Family Development.

