TE MARAE ORA
COOK ISLANDS Ministry of Health

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INFECTION PREVENTION AND CONTROL GUIDELINES 2023

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ABBREVIATIONS

ABHR	Alcohol-based hand rub
ACH	Air changes per hour
AFD	Acid-fast bacilli
AGP	Aerosol generating procedure
AMR	Anti-microbial resistance
ARV	Antiretroviral
BCG	Bacille Calmette-Guerin
BI	Biological indicator
BVM	Bag-valve-mask
CAUTI	Catheter associated urinary tract infection
CDC	Centers for Disease Control and Prevention
COVID-19	SARS-CoV-2
CPR	Cardiopulmonary resuscitation
CSSD	Central sterile supply department
ECG	Electrocardiogram
HAI	Health-care associated infection
HAP	Health-care associated pneumonia
HBsAB	Hepatitis B surface antibody
HBsAg	Hepatitis B surface antigen
HBeAg	Hepatitis B (e) antigen
HBIG	Hepatitis B immunoglobulin
HBV	Hepatitis B virus
HCF	Health-care facility
HCV	Hepatitis C virus
HCW	Health-care worker
HEPA	High-efficiency particulate air
HIV	Human immunodeficiency virus
HLD	High-level disinfection
ICU	Intensive care unit
IPC	Infection prevention and control
IV	Intravenous
MDR-TB	Multi drug resistance tuberculosis
MERS CoV	Middle eastern respiratory syndrome virus

MHMS	Ministry of Health and Medical Services
MROs	Multi resistant organisms
MRSA	Multi resistant staphylococcus aureus
MS	Medical Superintendent
NICU	Neonatal intensive care unit
OT	Operating theatre
P2/KN95/FFP2 mask	Particulate respirator that filters more than 94% of airborne particles
PEP	Post-exposure prophylaxis
PICU	Pediatric intensive care unit
PH	Measure of the acidity or basicity of aqueous or other liquid solutions
PPD	Purified protein derivative
PPE	Personal protective equipment
PPHSN	Pacific Public Health Surveillance Network
SARS	Severe acute respiratory syndrome
SARS-CoV-2	COVID-19 virus
SOP	Standard operating procedure
SPC	Pacific Community
SSI	Surgical site infection
TB	Tuberculosis
TBP	Transmission-based precautions
TST	Tuberculin skin tests
VAP	Ventilator associated pneumonia
VRE	Vancomycin resistant enterococcus
WASH	Water, sanitation and hygiene
WHO	World Health Organization

GLOSSARY

Airborne transmission

Refers to the presence of microbes within droplet nuclei, which are generally considered to be particles <5µm in diameter. Can remain in the air for long periods of time and be transmitted to others over distances greater than 1 m.

Alcohol hand rub

A waterless alcohol-based product appropriate for rapid hand decontamination between patient contacts. It is recommended for use when hands are not visibly soiled or contaminated with blood and body fluids.

Contact transmission

Contact transmission occurs through:

- **Direct contact** (involving direct body surface to body surface).
- **Indirect contact** (contact of a susceptible host with an intermediate object, usually inanimate, such as contaminated instruments, needles or dressings, or contaminated gloves that are not changed between patients.

COVID-19

Disease caused by SARS-CoV 2, a novel coronavirus first detected in Wuhan City, Hubei Province, China in December 2019.

Decontamination

Cleaning an object by either chemical or physical means to reduce the number of micro-organisms on it.

Droplet transmission

Droplet transmission occurs when droplets (>5 microns in size), are produced by sneezing, coughing, or even talking. The droplets remain in the air briefly and can travel about 1 meter (3 feet) or less.

Disinfection

Uses chemicals to kill germs on surfaces that have been cleaned. This process does not necessarily clean dirty surfaces or remove germs, but kills germs remaining on a surface after cleaning, further reducing the risk of spreading infection.

Five moments for hand hygiene

Developed by the WHO - describes the opportunities or situations when hand hygiene should be performed by health care workers in acute and primary health care settings.

Hand hygiene

Refers to hand washing with soap and water or the use of an alcohol-based hand rub and antiseptic solutions.

Health-care associated infection (HAI)

Is defined as a localised or systemic infection that results from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) for which there is no evidence of infection on admission. An infection is frequently considered a HAI if it appears ≥48 hours after admission is defined.

Health-care associated infection (HAI) surveillance	HAI surveillance is a key function of IPC activities and includes the collection, compilation, analysis, interpretation, and distribution of information about HAIs.
Infection prevention and control	WHO definition - a scientific approach and practical solution designed to prevent harm caused by infection to patients and health workers. It is grounded in infectious diseases, epidemiology, social science and health system strengthening.
P2/KN95/FFP2 mask	A disposable respirator mask designed specifically to protect the wearer from exposure to airborne (small particle) infectious diseases such as TB by sealing tightly to the face. The N95 respirator has a filter efficiency level of 95% or more against particulate aerosols free of oil, when tested against 0.3 µm particles. The "N" denotes that the respirator is not resistant to oil, and the "95" refers to a 95% filter efficiency. The FFP2 respirator has a filter efficiency level of 94% or more against 0.4 µm solid particles, and is tested against both an oil and a non-oil aerosol.
Occupational exposure	An incident that occurs during the course of a person's employment and involves contact with blood or body substances.
Sterilisation	A process that destroys all forms of microbial life, including bacteria, viruses, spores and fungi. This method is used for all items that contact normally sterile areas of the body. Items must be cleaned first of organic matter to be successfully sterilised.
Standard precautions	Standard precautions refer to a set of basic work practices that should be used at all times in the care of all patients regardless of their diagnosis or presumed infection status. Standard precautions involve safe work practices and include, but are not limited to the following: hand hygiene, respiratory hygiene/cough etiquette, personal protective equipment, appropriate handling of laundry and appropriate handling of used patient equipment.
Transmission-based precautions	Precautions that are designed for use on patients who are known or colonized with infectious agents that require additional control measures of contact, airborne or droplet routes or a combination of these.

ACKNOWLEDGMENTS

Te Marae Ora Cook Islands Ministry of Health would like to acknowledge the main author, Margaret Leong, Infection Prevention and Control Advisor of the Pacific Community in Suva, Fiji, for her commitment and endurance in spearheading the drafting of the Cook Islands Ministry of Health **National Infection Prevention and Control Guidelines (First edition).** Sincere acknowledgement also to the Pacific Community (SPC) and World Health Organisation (WHO) for the technical assistance of Margaret Leong and financial support.

TMO would also like to acknowledge Dr Yin Yin May's leadership of the guideline drafting initiative in early 2023 and determination to complete the final version of the guidelines by the end of April 2023. Thank you, Dr May.

Further acknowledgements are extended to TMO health-care workers and the co-authors of this document: Dr Yin Yin May, Director of Hospital Health Services; Dr Teariki Faireka, Director of Primary Health Care; Dr Koko Lwin, Chief Medical Officer; Ngatamariki Manea, Chief Nursing Officer; and TMO clinical staff. Meitaki ma'ata to you all.

FOREWORD

The **National Infection Prevention and Control Guidelines 2023** is the first edition for Te Marae Ora Cook Islands Ministry of Health The guidelines are the result of the collective efforts of the 2023 IPC Committee under the leadership of Dr Yin Yin May, Director of Hospital Services.

The IPC Guidelines are based on ***patient safety and best practice*** mirrored by two well-known quotes; 'Prevention is better than cure' by Desiderius Erasmus, and 'An ounce of prevention is worth a pound of cure' by Benjamin Franklin.

The National IPC Guidelines have been adapted from the 2021 Pacific Public Health Surveillance Network (PPHSN) Infection Prevention and Control Guidelines, supported by several other sources and literature from WHO and academics.

The guidelines provide advice on the application of basic IPC precautions, standard precautions, and the importance of maintaining appropriate IPC measures in routine circumstances, including to strengthen TMO's health-care service capacity during outbreaks.

The guidelines are intended for implementation and application by all TMO health-care workers. Effective IPC is essential to achieving and delivering high-quality health-care and fulfilling TMO's mission: ***All people in the Cook Islands living healthier lives and achieving their aspirations.***

While the IPC guidelines provide recommendations, best practices and principles for TMO health-care workers to implement effective measures in maintaining IPC during an outbreak, it is importance that all TMO health-care workers receive appropriate training and skills development in this area on a regular basis.

As Cook Islands' primary health-care provider, TMO is committed to providing guidance for the prevention and control of health-care associated infections, in all circumstances, to uphold public health safety while at the same time maintaining the delivery of high-quality health services to all.

The IPC guidelines are an important tool for all TMO Directorates, and all clinical and non-clinical staff, ensuring that everyone is up to date with standards and applications. The guidelines will be reviewed regularly given the potential for the emergence of new diseases, as seen with COVID-19 in 2020 and its global impact on millions of lives. IPC – **'Best practice for patient safety'.**

CHAPTER 1

INTRODUCTION

CHAPTER 01

INTRODUCTION

1.1 Purpose

The Te Marae Ora (TMO) Cook Islands National Infection Prevention and Control (IPC) Guidelines provide guidance to all health-care workers on IPC standards to reduce healthcare associated infections (HAI) and antimicrobial resistance (AMR). The guidelines also provide a framework for monitoring and evaluation and IPC education of all health-care workers.

1.2 Guideline Use

The TMO Cook Islands National IPC Guidelines have been adapted from the 2021 Pacific Public Health Surveillance Network (PPHSN) Infection Prevention and Control Guidelines. The national guidelines should be used as a standard to develop standard operating procedures (SOPs) at health-care facility level throughout the Cook Islands, as a prerequisite for rolling out IPC education and training, including IPC monitoring and evaluation to ensure adherence to IPC principles and standards.

To aid implementation of the national guidelines, it is important that Ministry of Health (MOH) leaders facilitate these seven conditions:

1. Strong national commitment to developing and enforcing IPC policy and SOPs.
2. Implementation of the national IPC guidelines and programme recommendations to help foster, develop and reinforce a culture of patient and healthcare worker safety and IPC.
3. Infrastructure/system – ensure availability of human resources for IPC at national and facility level; access to the necessary equipment and supplies including water, sanitation and hygiene (WASH) facilities; and an environment that is designed and planned to enable implementation of the guideline's recommendations.
4. Promote accountability for IPC by incorporating IPC indicators in the MOH's strategic and operational plans.
5. Training and education – mandate a programme of routine training, education, and periodic annual training for ALL personnel responsible for IPC.

6. Monitoring, evaluation and feedback – ensure a programme of regular supervision and feedback is in place in relation to the guideline's recommendations, including a surveillance programme and research.
7. Safety culture – managers and leaders AT EVERY LEVEL of health-care service delivery demonstrate commitment and accountability for implementation of the national IPC guidelines.

To strengthen successful implementation of the IPC programme, MOH supports the adoption of the minimum requirements for IPC recommended by WHO (Table 1.1).

TABLE 1.1: WHO Core Components of Infection Prevention and Control Programmes [1]

Component	Key Requirements
1. IPC Programmes	**NATIONAL IPC PROGRAMME** ■ A functional IPC programme should be in place, including a dedicated budget for implementing IPC strategies/plans. **AT FACILITY LEVEL** ■ A trained IPC focal point with dedicated time (part-time) to carry out IPC activities for each health care facility.
2. IPC Guidelines	**AT NATIONAL LEVEL** Cook Islands Ministry of Health approved national IPC guidelines are translated to SOPs at the facility level and reviewed at least every five years. **AT FACILITY LEVEL** ■ Facility-adapted SOPs are based on the national IPC guidelines. ■ **At a minimum, facility SOPs should include:** • Hand hygiene • Decontamination of medical devices and patient care equipment • Environmental cleaning • Health-care waste management • Injection safety • Health-care worker protection (for example, post-exposure prophylaxis, vaccinations) • Aseptic techniques • Triage of infectious patients • Basic principles of standard and transmission-based precautions • Routine monitoring of the implementation of at least some of the IPC guidelines/SOPs
3. Education and Training	**NATIONAL LEVEL** ■ The national IPC programme supports education and training of the health workforce as one of its core functions.

Component	Key Requirements
3. Education and Training (cont'd)	**FACILITY LEVEL** ■ All front-line clinical and housekeeping staff will receive education and training on the facility IPC guidelines/SOPs upon employment. ■ All IPC liaisons at primary care level (or other administrative level) have access to specific IPC training.
4. Surveillance	**FACILITY LEVEL** **The Rarotonga Hospital IPC committee is committed to:** ■ Carrying out HAI surveillance and IPC monitoring that is multidisciplinary. ■ Ensuring enabling structures and supporting resources are in place (for example, dependable laboratories, medical records, trained staff), directed by an appropriate method of surveillance. ■ Providing timely and regular feedback to clinicians and the hospital administration in order to achieve appropriate actions.
5. Multimodal Strategies	■ Use of multimodal strategies to implement interventions to improve all standard and transmission-based precautions, triage, and measures targeted at the reduction of specific infections (for example, surgical site infections (SSI) or catheter-associated infections) in high-risk areas/patient groups, in line with local priorities.
6. Monitoring, Audit and Feedback	There is a system of regular monitoring/audit of health-care practices and timely feedback. Feedback should be provided to all audited persons and relevant staff. **FACILITY LEVEL** ■ IPC liaisons are responsible for periodic monitoring of selected indicators for process and structure. ■ Hand hygiene is an essential indicator to be monitored. ■ Regular feedback is provided to key departments, particularly to the hospital administration, to achieve appropriate action.
7. Workload, Staffing and Bed Occupancy	**To reduce the risk of HAI and spread of AMR, the following should be addressed:** (i) bed occupancy at health care facility level should not exceed the standard capacity of the facility; (ii) health-care worker staffing levels should be assigned according to patient workload.
8. Built Environment, Materials and Equipment for IPC	At health-care facility level, patient care activities should be undertaken in a clean and/or hygienic environment that facilitates practices related to the prevention and control of HAI, as well as AMR. This includes all elements around WASH infrastructure and services and the ready availability of appropriate IPC materials and equipment to perform hand hygiene at the point of care.

CHAPTER 2

INFECTION PREVENTION AND CONTROL PROGRAMME

CHAPTER 02

INFECTION PREVENTION AND CONTROL PROGRAMME

2.1 Introduction

An IPC programme is a set of organised activities and plans designed for the prevention and control of infectious diseases and HAIs in the health care environment. Functional IPC programmes have proved to be successful in lowering the incidence and spread of infectious diseases, provided the programmes are comprehensive and include HAI surveillance, prevention activities and staff training [4]. It is imperative to establish a governance structure at national level to regulate national standards for IPC and to promote and effectively implement them.

The purposes of an IPC programme in health care are:

- To prevent the transmission of HAIs and AMR and to promote patient safety through implementation of IPC practices;
- To enable health care facilities to detect early outbreaks of HAIs, respond promptly and effectively manage such situations;
- To be prepared to manage and respond to epidemics of emerging infectious diseases in community and health-care facilities;
- To work with community health colleagues to maximise coordination and response to large-scale epidemics.

2.2 Responsibility and Authority for Infection Prevention and Control [3] [1] [4] [5]

The TMO Cook Island MOH supports the development and implementation of the IPC programme to ensure the safety of health-care workers and protection of patients and the community from HAIs and public health disease threats. The MOH will:

- Develop a national IPC programme with clear objectives, functions and activities;
- Ensure facility level implementation of IPC policy and guidelines;
- Ensure that IPC education and training is part of every health-care facility orientation programme for new

employees and that there is an ongoing education programme for all existing staff, regardless of level and position;

- Ensure that HAI and AMR surveillance is standardised and performed to guide IPC interventions and detect outbreaks, with timely feedback of results to health-care workers through local networks and the IPC committee;
- Ensure that regular monitoring and audits of IPC practices, with feedback, are performed to provide data to improve the quality of services and reduce the spread of HAIs and AMR;
- Ensure that IPC liaisons are adequately resourced through appropriate provision of a work- space, computer and internet access;
- Ensure that there is microbiology laboratory support for early detection of HAIs;
- Ensure that there is a multidisciplinary functional IPC committee, supported by senior medical practitioners' participation in the IPC programme and IPC committee meetings (Annex 1: terms of reference for IPC committee);
- Ensure that responsibility for IPC key performing indicators is incorporated in the job descriptions of all health-care workers and in the business plans of health-care facilities;
- Incorporate IPC key performing indicators in the 2023 National Health Strategic Plan.

2.3 Monitoring and Evaluating an IPC Programme

Routine monitoring and evaluation of the IPC programme is important for measuring the programme's effectiveness. Monitoring should address the following issues:

- Providing monitoring (audit) feedback to staff and recommendations for improvement are critical for improving IPC compliance and ensuring patient safety. Feedback should follow the ***positive-negative-positive*** rule: provide positive aspects first, followed by identified deficits, and lastly recommendations for improvement, underpinned by the importance of adherence to IPC standards and guidelines. Staff must be active participants and contribute to identifying solutions and recommendations that will work in their local context, supported by the local IPC committee and hospital management.
- Monitoring and evaluation should be performed regularly via internal audits and reviews of antibiotic resistance reports, reports of HAI, and other reports. Report findings should be presented to IPC committees and relevant departments.

2.4 IPC Committee

- IPC committee – Rarotonga Hospital. Aitutaki Hospital, due to its size, may combine IPC activities with another committee.
- The IPC committee is responsible for the planning, implementation, prioritisation, and resource allocation of all matters relating to IPC.

- The IPC committee membership should comprise representatives from clinical departments, including the laboratory and pharmacy, and those in charge of waste and/or cleaning services. Other members may be co-opted when the need arises (Annex 1 provides draft TOR for a hospital IPC committee).
- The IPC committee reports directly to the Secretary of Health Services and should meet on a regular basis (at least every two months) to discuss IPC activities and to solve any problems. In the event of a critical incident or outbreak situation, the committee should be able to convene promptly.

2.5 IPC Officer / Liaison

The IPC team includes IPC link officers and IPC lead personnel with allocated or dedicated time (part-time or 20 hours/week at least at Rarotonga Hospital) to undertake the role of IPC for the purpose of preventing HAIs and combating AMR through good IPC practices.

Each of the other health-care facilities should have a designated IPC link liaison to ensure implementation of IPC SOPs and activities, and development of methods for reviewing practices to minimise the incidence of infection.

Major responsibilities (that could be incorporated in the job description) of an IPC officer/link liaison with part-time responsibility for IPC are:

- To develop and implement an IPC annual work plan;
- To coordinate and conduct training activities relevant to IPC;
- To carry out HAI surveillance activities and audits;
- To develop and disseminate IPC standards and procedures;
- To observe IPC practices and make suggestions for improvement;
- To help identify problems and assist in problem-solving;
- To report to the IPC committee at every meeting; and
- To support and participate in research.

2.6 IPC Education and Training

The MOH supports:

- IPC education and training (in-service) on the IPC guidelines/SOPs for all health-care workers including cleaners and other support staff upon employment and at least annually;
- A national schedule of monitoring and evaluation to check on the effectiveness of IPC training and education (at least annually);
- Specific IPC training for all IPC liaisons;

- Patient and family education to ensure everyone is aware of IPC measures to minimise transmission of infections. Time should be taken to educate family members on hand hygiene, respiratory hygiene, and other transmission-based precautions that the patient may require.

Steps to a Successful IPC Training Programme:

All health-care workers have a responsibility in preventing HAIs and AMR in the health-care facility. They should:

- Understand infection transmission in the health-care facility;
- Know the important role each staff member plays in preventing infection; and
- Be able to describe or demonstrate various methods of preventing the spread of microorganisms, such as hand hygiene and correct aseptic techniques.

CHAPTER 3

INTRODUCTION TO HEALTH-CARE ASSOCIATED INFECTIONS AND IPC

CHAPTER 03

INTRODUCTION TO HEALTH-CARE ASSOCIATED INFECTIONS AND IPC

3.1 Chain of Infection

Health care associated infections begin when an infectious agent is present and is able to survive in a host and an environment. It is important to understand the process of the chain of infection for implementation of effective IPC measures.

In order for an infectious agent to successfully spread from one host to another, several conditions must be met. This is referred to as the chain of infection. If this chain is broken at any stage, the infection cannot spread and becomes contained. Here, human influenza (flu) is used as an example to explain the chain of infection.

The chain of infection consists of the following components: infectious agent, reservoir, portal of exit, mode of transmission, portal of entry and susceptible host (Fig. 3.1) [6].

Chain of Infection

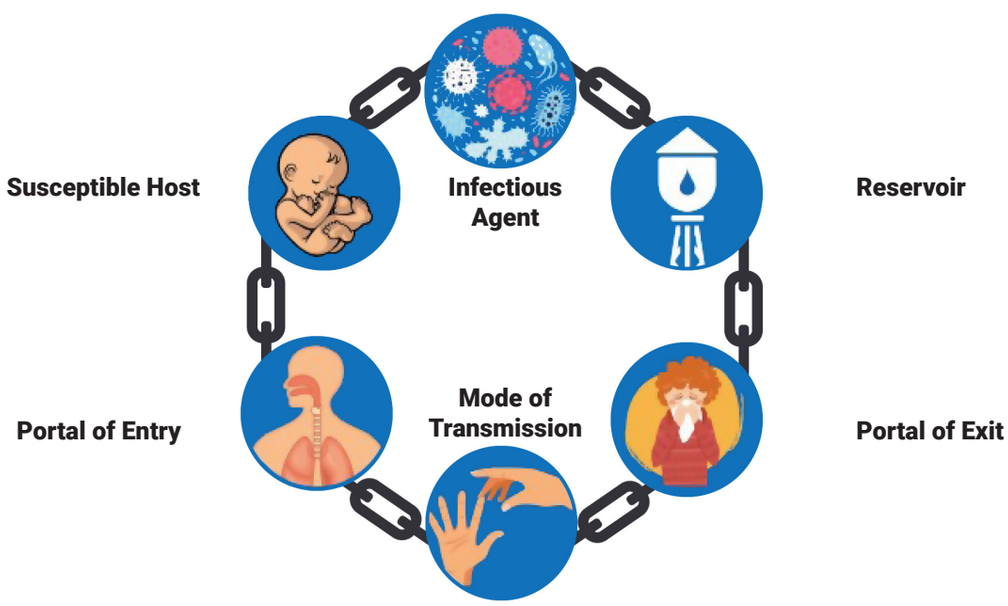


FIGURE 3.1: Chain of Infection

Infectious agent – A pathogen that causes infection. It is the first link in the chain. The ability of a pathogen to cause an infection depends on its virulence, pathogenicity, infectious dose, and infectivity [6]. For example, flu is caused by an influenza virus.

Reservoir – A place where the infectious agent can survive and is sustained. It may be an animal, or it may be something in the environment, such as water, food or soil. Common reservoirs in health-care facilities are persons with infectious diseases, and contaminated medical devices or equipment (usually called vehicles). There are three types of human reservoirs:

i. Persons who are ill (have signs and symptoms of disease).
ii. Colonised persons (harbour an infectious agent but do not have an infection).
iii. Carriers (infected but do not show any signs or symptoms; they can transmit the infection to others) [6].

Portal of exit – The route that the infectious agent takes to leave the reservoir. Infected humans with influenza shed the virus through respiratory droplets, particularly through sneezing and coughing. Portals of exit may be the respiratory tract, genitourinary tract, gastrointestinal tract, skin/mucous membrane, blood, or transmission of disease from a mother to her child during pregnancy (transplacental) [6].

Mode of transmission – Following its exit from the reservoir, the infectious agent must be able to survive the journey from the reservoir to the host. The influenza virus, for example, can survive in bodily fluids for a limited time, and typically is transmitted via contact, especially inhalation. After sneezing or coughing, infected respiratory fluids can either be directly inhaled by a nearby person (inhalation), or land on surfaces that are touched by a person and then come into contact with the person's eyes, nose or mouth.

Portal of entry – Infectious agents enter the host via the respiratory tract, genitourinary tract, gastrointestinal tract, skin/mucous membrane, or parenteral or transplacental processes.

Susceptible host – The last link in the chain. A susceptible host is a person lacking effective resistance to a particular pathogen. In health-care facilities, many patients are susceptible to infections because they are seriously ill.

Modes of Transmission of HAIs

The modes of transmission of HAIs are as follows [6]:

Contact Transmission (Direct and Indirect)

Contact is the most important and frequent mode of HAI transmission; it is divided into three subgroups: direct-contact, indirect-contact, and droplet transmission.

Direct-contact transmission – Skin-to-skin contact with contaminated bodily fluids can lead to transmission and subsequent infection, and physical transfer of microorganisms between a susceptible host and an infected or colonised person.

Indirect-contact transmission – Contact of a susceptible host with an intermediate object, usually inanimate, such as contaminated instruments, needles, or dressings, or contaminated gloves that are not changed between patients.

Droplet transmission occurs when droplets are generated from a human reservoir, mainly during coughing, sneezing or talking, and during the performance of certain procedures such as bronchoscopy. Transmission occurs when droplets containing pathogens from the infected person are propelled a short distance (<1 metre) through the air and deposited on the host's body.

Airborne Transmission

Airborne transmission occurs by dissemination of either airborne droplet nuclei (small-particles, <5 μm in size) of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time, or dust particles containing the infectious agent. Droplet nuclei, dust particles, or skin squames containing micro-organisms are transmitted by air currents and may be inhaled by a susceptible patient in the same room, or a longer distance from the source patient, depending on environmental factors. Special ventilation is required to prevent airborne transmission. Microorganisms transmitted in this manner include *Mycobacterium tuberculosis*, rubeola (measles), and varicella (chickenpox) viruses.

Vector-Borne Transmission

Vector-borne transmission occurs when vectors such as mosquitoes, flies, rats, and other vermin transmit microorganisms. Transmission occurs through simple contamination by animal or arthropod vectors or their actual penetration of the skin or mucous membranes. This mode of transmission plays a minor role in transmission of HAIs.

3.2 IPC Principles to Break the Links in the Chain of Infection

IPC programmes within health care are designed to break the links in the chain of infection. These interventions are often targeted at specific links of the transmission chain.

Standard precautions are the basic set of IPC strategies that should be practised consistently by all staff in all health-care facilities in Cook Islands. These evidence-based practices are designed to protect health-care workers and also reduce the risk of transmission of infectious agents among patients and visitors.

Standard precautions include IPC measures for hand hygiene, use of PPE, practice of appropriate respiratory hygiene, injection safety and safe disposal of sharps, appropriate decontamination of medical equipment, safe handling and cleaning of soiled linen, and environmental cleaning and waste management.

Transmission-based precautions are an additional set of IPC interventions for patients with certain infectious diseases, e.g. those considered highly transmissible and/or caused by epidemiologically important pathogens. Precautions against contact, droplet and airborne transmission usually involve isolation of patients in single rooms.

Transmission-based precautions are always implemented in addition to standard precautions to prevent the spread of infectious diseases. These interventions are specific to the mode of transmission of the disease.

Contact precautions are implemented to prevent transmission of diseases that are spread via contact with infectious material.

Droplet precautions are used to prevent transmission of diseases that are spread via contaminated respiratory droplets.

Airborne precautions are implemented to prevent transmission of diseases that can spread through aerosolised particles.

Note: Standard and transmission-based precautionary measures are discussed in Chapter 4.

3.3 Common HAI

When patients at risk of infections and those with infections are admitted to hospital, they then become potential sources of infections for other patients and staff. In addition, patients who become infected with a HAI are a further source of infection for other patients and staff [7].

The health-care environment includes people, instruments, equipment and surfaces such as floors and furniture. The environment also includes waste disposal and water supply. Cleanliness of this environment can help to make the health-care facility a safe and comfortable place for the patient. Hence, the basic IPC measures of standard precautions, when practiced consistently by all staff, reduce the risk of transmission of HAI.

A HAI is an infection that the patient did not have when they were admitted to the health-care service. It is defined as a localised or systemic infection that results from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) for which there is no evidence of infection on admission to a health-care facility.

An infection is frequently considered an HAI if it appears ≥48 hours after admission [7]. For example, a patient may come to the hospital to have an operation. After the operation, the patient's surgical wound begins to produce pus or other signs and symptoms of infection. This infection is an HAI because there was no infection before the operation. Other types of HAI may arise from urinary tract infection, pneumonia, bloodstream infection (septicaemia), gastrointestinal and skin infections.

Preventing HAIs is important because they:

- Result in pain, discomfort and even death;
- Increase the time the patient has to stay in hospital;
- Keep the patient from working, and are expensive because money is required for medicines and equipment.

Adherence to IPC practices is important because ongoing transmission can result in certain types of microorganisms becoming established (resident) in the health-care facility with the potential for antimicrobial resistance to occur.

There are four major types of HAI, all related to invasive or surgical procedures [6]:

- Catheter-associated urinary tract infection (CAUTI)
- Health-care associated pneumonia (HAP)
- Catheter-related bloodstream infection (CBSI)
- Surgical site infection (SSI)

The following section provides background information and measures that can be implemented and practised in health-care facilities to prevent these four major types of HAIs.

3.3.1 Catheter-Associated Urinary Tract Infection (CAUTI) [8]

CAUTI is one of the most common HAIs, accounting for up to 40% of all HAIs. Preventing CAUTI is a major factor in decreasing the overall incidence of HAIs in health-care facilities. Health-care associated CAUTIs are related to urinary catheterisation and are more resistant to antibiotics. This is because hospitalised patients can become colonised with resistant microorganisms, a process encouraged by an increased length of stay and exposure to antibiotics. ***E. coli*** is the most frequent cause of CAUTI. However, increasingly, CAUTIs are caused by more resistant gram-negative species, including ***Klebsiella and Pseudomonas,*** as well as resistant ***E. coli.*** These resistant microorganisms may also be acquired by transfer from other patients, most commonly via contaminated staff hands, but sometimes from environmental sources.

To reduce health care associated UTI:

- Limit the duration of catheterisation as much as possible and introduce an indwelling urinary catheter only when necessary and when no other options are effective.
- Follow appropriate procedures for inserting and removing urinary catheters to reduce the risk of UTI.
- Consider other methods for managing urinary tract problems that do not require the use of an indwelling catheter.
- Ensure that only properly trained persons insert and maintain catheters.

Strategies to Prevent Urinary Tract Infections

A care bundle is a package of interventions that, when implemented together for all patients with urinary catheters, has resulted in substantial and sustained reductions in CAUTIs.

INSERTION CARE BUNDLE

- **Avoid unnecessary catheterisation**
- **Chose catheters of appropriate size**
- **Use sterile items/equipment**
- **Insert catheter using strict aseptic non-touch technique**
- **Use closed drainage system**

Urinary catheterisation should always be performed using sterile or high-level disinfected equipment and aseptic techniques.

Insertion Procedure for Urinary Catheter

- Explain the procedure to the patient and get their consent.
- Use aseptic non-touch technique for insertion.
- It is recommended that during the procedure an assistant is available.
- Before inserting a urinary catheter, all of the following materials should be available at the point of care: a sterile indwelling urinary catheter, a sterile drape, a sterile syringe filled with sterile water for blowing up the balloon, clean examination gloves, sterile gloves, antiseptic solution and a sterile gauze or sponge-holding forceps.
- Lubricant is not necessary, but in case you use it, be sure it is single use.
- Perform hand hygiene and wear clean examination gloves.
- To prevent bacteria being carried into the bladder during insertion of the catheter, clean the urethral area and external genitals with soap and water and rinse carefully and thoroughly.
- Separate and hold the labia apart, or hold the head of the penis with the non-dominant hand, and prepare the urethral area with the antiseptic solution, using a sterile gauze or sponge forceps with sterile gauze.
- Remove examination gloves, perform hand hygiene and put on a pair of sterile gloves.
- Grasp the catheter about 5 cm from the catheter tip with the dominant hand and connect the other end to the urine collection bag.
- Gently insert the catheter until urine flows, then for a further 5 cm. Inflate the balloon. Record the volume required to inflate the balloon – the same volume should be removed when the balloon is deflated for removal.
- Do not use undue force. In the event of pain, blood or resistance during insertion, stop the procedure.
- If the catheter is indwelling, pull it out gently to feel resistance, and secure the indwelling catheter properly to the thigh.
- For intermittent catheterisation, allow the urine to slowly drain into the collection bag, then gently remove the catheter.
- Dispose of waste appropriately.
- Remove gloves and practise hand hygiene.

MAINTENANCE CARE BUNDLE

- **Review the need for the catheter on a daily basis and remove catheter promptly when no longer necessary.**
- **Use aseptic techniques for daily catheter care (e.g. hand hygiene, sterile items/equipment).**
- **Don't break the closed drainage system. If a urine specimen is required, take the specimen aseptically via the sampling port.**

Catheter Maintenance

- Clean the peri-urethral area daily.
- Do not rest the bag on the floor.
- Check the urine flow through the catheter several times a day to ensure that the catheter is not blocked (no dependent loops or kinking of the catheter tubing).
- Avoid raising the collection bag above the level of the bladder. If it becomes necessary to do so during

transfer of the patient to a bed or stretcher, clamp the tubing.

- Before the patient stands up, drain all the urine from the tubing into the bag.
- Remove the urine after performing hand hygiene and while wearing clean examination gloves.
- To avoid contamination, empty the collection bag in a clean, fresh vessel; do not permit the tip to touch the urine vessel.
- For sample collection, aspirate the urine from the needleless sampling port with a sterile needle.
- Unless obstruction is anticipated, bladder irrigation is not recommended.
- The closed catheter collection system should always remain closed.
- In an open system, replace bags when needed.
- Clamping catheters prior to removal is not necessary.
- Do a daily review of urinary catheter necessity and remove as soon as indicated.
    - For long-term duration of an indwelling urinary catheter (IDC), consider changing it every 4–6 weeks.
    - For post-operative patients with an IDC, consider removal 2 days post-operative.
- Change IDC as clinically indicated.

Removal Procedure for Urinary Catheter

- IDC should be removed as soon as possible to reduce the risk of CAUTI.
- Before removing the catheter, ensure that a new pair of clean examination gloves and a syringe are at the point of care.
- Practise hand hygiene.
- Put on clean examination gloves.
- Empty the catheter balloon using a syringe; compare the volume removed to that inserted – it should be the same.
- Swab the urethra two times with an antiseptic solution using sponge forceps with sterile gauze.
- Gently remove the catheter.
- Dispose of all waste appropriately.
- Remove gloves and perform hand hygiene.

3.3.2 Surgical Site Infection (SSI) [9]

SSI is often the result of contamination during a surgical procedure or contamination of the surgical wound after the procedure. They are very common HAIs. Although sterilisation of instruments, aseptic technique, clean air, and antimicrobial prophylaxis have been shown to reduce the incidence of SSI, it remains an important cause of morbidity and mortality worldwide [9].

The following factors predispose a patient to development of an SSI:

- Obesity
- Infection at another body site at the time of surgery
- Poor nutritional status

- Chronic diseases such as diabetes and malignancy
- Smoking
- Length of pre-operative stay
- Colonisation with microorganisms

Reducing Operative Risk Factors for SSI

- Avoid prolonged pre-operative hospitalisation and recommend ambulatory surgery as often as possible.
- Avoid pre-operative hair removal. If hair must be removed, clip it with scissors or electric clippers just before the surgery. Do not shave using a razor blade (shaving may cause microscopic cuts in the skin that later serve as foci for bacterial multiplication).
- In the surgical room, prepare a wide area around the proposed incision site with antiseptic solution (alcoholic povidone-iodine).
- Practice good surgical techniques that minimise tissue trauma, control bleeding, eliminate dead space, use minimal sutures, and maintain adequate blood supply and oxygenation.
- Keep the duration of surgical procedures as short as possible. The rate of infection doubles with each hour of surgery.
- Discharge patients when clinically indicated after surgery.

Antimicrobial Prophylaxis to Reduce Risk of SSI

- The administration of systemic antimicrobial agents immediately before surgery can reduce the incidence of SSI after certain operations. The benefits, however, must be weighed against the risks of toxic and allergic reactions, the emergence of resistant bacteria, drug interactions, super infection, and cost. In general, antimicrobial prophylaxis is recommended for procedures with significant risk of infection (e.g. surgery that involves entering the colon). The prophylactic antimicrobial drug(s) should be directed against the most likely infecting organisms.
- **To help reduce the development of antimicrobial resistance to drugs used for surgical prophylaxis, it is recommended that:**
  - Antimicrobial agents with a moderately long half-life be used;
  - Antimicrobial agents with an appropriate spectrum of activity be used;
  - The antimicrobial agent(s) used prophylactically differ from any agents used for a period of time just before surgery, as antimicrobial-resistant bacteria may have developed;
- **Follow the Antibiotic guidelines – Cook Islands (2023) on antibiotic prophylaxis in surgery:**
  - In most instances, a single intravenous (IV) dose of an antimicrobial administered 60 minutes or less before the skin incision provides adequate levels of antimicrobial within the tissues throughout the operation. If surgery is prolonged (more than 4 hours), if major blood loss occurs, or if an antimicrobial with a short half-life is used, one or more additional doses should be given during the procedure.
  - Use the WHO Surgical Safety Checklist [10] (Annex 2).

3.3.3 Health-Care Associated Pneumonia [11] [12]

Health care associated pneumonia (HAP) is a common HAI with a significant risk of a fatal outcome. The risk of HAP is common among elderly patients who are bedridden with co-morbidities. Most of these infections occur by aspiration of bacteria growing in the back of the throat or in the stomach. Pneumonia associated with mechanical ventilation may be referred to as ventilator-associated pneumonia (VAP).

Intubation and mechanical ventilation greatly increase the risk of pneumonia in the following ways:

- They block the normal body defence mechanisms – coughing, sneezing, and the gag reflex.
- They prevent the washing action of the cilia and mucus-secreting cells that line the upper respiratory system.
- They provide a direct pathway for microorganisms to get into the lungs.

Other procedures that could increase the risk of pneumonia include oxygen therapy, intermittent positive pressure ventilation (IPPV) treatment, and endotracheal suctioning. The combination of severe illness, the presence of multiple invasive devices (intravenous catheters, urinary catheters, and mechanical ventilators), and frequent contact with the hands of health-care workers often leads to cross-contamination and patient infection.

Risk Factors for HAP

- Old age
- Chronic lung disease
- Severe head injuries with loss of consciousness
- Severe medical conditions, such as end-stage renal disease and liver cirrhosis
- Cigarette smoking
- Alcoholism
- Obesity
- Major cardiovascular or pulmonary surgery
- Endotracheal intubation and mechanical ventilation
- Prolonged confinement to bed
- Immune deficiency states
- Diabetes

Reducing the Risk of HAP – Pre-Operative Pulmonary Care

- Limit the use of narcotics, although not to a degree that will compromise appropriate pain relief.
- Adhere to standard precautions to maximise prevention of cross-transmission of microorganisms.
- **Additionally, patients should be educated about the following post-operative practices that can prevent development of HAP:**
  - Deep breathing

- Moving in bed
- Frequent coughing.

- Early ambulation

Reducing the Risk of HAP – Prevention of Complications from Equipment / Devices

To reduce the risk of contamination and possible infection from mechanical respirators and other equipment, follow these guidelines:

- Use mechanical ventilation only when necessary.
- Implement comprehensive oropharyngeal cleaning. This includes suctioning to avoid draining past the tube. Also consider a decontamination programme for all patients at high risk of VAP.
- If reusable breathing circuits are used for more than one patient, they must be cleaned and appropriately sterilised between patients, according to the manufacturer's guidance. Disposable (single patient use) breathing circuits eliminate this risk of cross-transmission and are preferred.
- Breathing circuits intended for single patient use are not suitable for cleaning, decontamination and reuse.
- Respiratory equipment, such as oxygen tubing, nasal prongs, nebulisers and masks, are intended for single patient use and are not suitable for cleaning, decontamination and reuse.
- Disinfect or sterilise resuscitation devices, such as bag valve masks, promptly according to the manufacturer's guidelines.

To minimise cross-contamination when suctioning patients on ventilators, follow these guidelines:

- A closed suction system is recommended to lessen the risk of cross-contamination.
- Practise hand hygiene.
- Wear sterile examination gloves, a mask, and protective eyewear.
- Use only sterile fluid to clear a catheter that you are using to suction secretions from the patient's lower respiratory tract if you are planning to reinsert it into the endotracheal tube.
- Discard waste appropriately.
- Remove gloves immediately after therapy and practise hand hygiene.

Reducing the Risk of HAP – Preventing Gastric Reflux

To reduce the risk of gastric reflux, which can lead to HAP, follow these practices:

- Avoid prolonged use of nasal gastric tubes for feeding.
- Feed small, frequent amounts rather than large amounts at one time.
- Elevate the head (30–45 degrees), if not contraindicated, so that the patient is in a semi-sitting position.
- Ensure that patients stop taking solid foods 4–6 hours prior to a general anaesthetic.

Reducing the Risk of HAP – Post-Operative Management

Surgical units should have effective plans for post-operative management that include the following guidelines:

- Provide adequate pain control for patient comfort and to facilitate movement.
- Move and exercise patients daily to prevent skin breakdown and pressure sores.
- Encourage deep breathing/coughing in the immediate post-operative period and for the next few days.
- Encourage early mobilisation of patients.
- Ensure adequate nutrition.

3.3.4 Infections Related to Use of Intravascular Devices [13]

Intravascular device-related infection may be localised skin and soft tissue infection at the site of the intravascular device (exit site infection, phlebitis). Localised infection is typically associated with ***Staphylococcus aureus.*** The infection may extend to cause extensive skin and soft tissue infection of the limb and can progress to bloodstream infection. Intravascular devices may also be associated with bloodstream infection with little or no evidence of infection at the catheter site. ***Staphylococcus aureus*** is again the most commonly associated organism.

For these reasons, intravascular catheter-related infection should be considered in any patient who develops a new-onset blood stream infection with an intravascular device in situ, particularly if there is no other obvious site of infection (e.g. pneumonia). Where possible, a sample for blood culture should be taken, using appropriate precautions, to aid in diagnosis of patients with suspected severe intravascular catheter-related infection. One of the most important principles of safe management of intravascular catheter-related infection is early removal of the catheter. Antimicrobial treatment is unlikely to be effective if the catheter remains in place.

Risk Factors Associated with Infections Related to the Use of Intravascular Catheters [14]

- Inadequate hand hygiene during insertion and care of the device.
- Immunosuppression.
- Cracks in infusion bottles and punctures in plastic containers, allowing for contamination of the substance being infused.
- Contaminated infusion fluid or additives.
- Leaky intravenous administration sets with multiple connections.
- Non-sterile preparation of intravenous infusion fluid.
- Inadequate preparation of skin before inserting the device.
- Multiple changes of intravenous fluid containers while using the same IV administration set.
- Multiple injections and irrigations of the system.
- Central venous pressure measurement apparatus.

Reducing the Risk of HAI Due to Intravascular Catheters

The following practices help reduce the risk of infection:

- Avoid intravascular catheterisation when possible.
- Perform hand hygiene and put on clean sterile gloves when inserting and handling intravenous catheters.
- If the site for inserting the catheter is dirty, wash it with soap and clean water and dry it before applying the skin antiseptic.
- Disinfect the clean skin site with 70% alcohol (isopropanol). Apply with rubbing for 30 seconds and allow to dry completely before inserting the IV cannula.
- Insert cannula into vein, preferably in an upper limb, without touching the skin.
- If re-palpation is necessary after skin prep, wear sterile gloves or perform a new application of antiseptic.
- Fix the device in place by attachment to the skin. Ideally, use transparent adherent dressings to allow easy inspection (if available) of the site later.
- Dressings can be left in place for up to 72 hours if they are kept dry. Change the dressing immediately if it becomes wet, soiled, or loose.
- If dressings are removed to inspect the site, discard the removed dressing appropriately and use a new dressing.
- If there is resistance to withdrawal of blood or injection of drugs through an intravascular catheter, do not use force. The catheter is likely to need replacement.
- Check at least daily if the patient has pain or discomfort at the site of the intravenous line. If palpating the cannula site daily for tenderness, be careful to practise hand hygiene, wear sterile gloves and avoid touching the puncture site. Inspect the insertion site if the patient develops tenderness or fever.
- For peripheral IV lines, avoid using the lower limbs if possible as these are more likely to become infected.
- A routine change of intravascular catheters at 72 hours is necessary.

Inserting Central Venous Catheters

- Avoid the use of a central venous catheter unless it is essential.
- Avoid using the femoral or jugular sites for adults (if possible).
- Central venous catheters should be inserted only by those with substantial experience in the procedure or by those in training under direct supervision of a person with substantial experience. Infection is more likely if an inexperienced health-care worker inserts the catheter.
- If the IV site area has too much hair – use a clipper to clip the hair instead of shaving.
- Wash the catheter insertion site with soap and clean water and dry it before applying the skin antiseptic.
- Prepare the skin using alcoholic 10% povidone iodine, or 60% to 90% alcohol, and allow to dry.
- Perform hand hygiene and use the aseptic technique/maximum sterile barrier precautions (i.e. surgical mask, cap, gown, sterile gloves) and sterile full body drape on the patient.
- Put on sterile gloves, face shield and gown before inserting the central venous catheter.
- Handle and maintain central lines appropriately. Comply with hand hygiene requirements.
- Wipe the access port or hub immediately prior to each use with an appropriate antiseptic (e.g. alcoholic

chlorhexidine, povidone iodine, or 70% alcohol).

- Access catheters only with sterile devices.
- Perform dressing changes under aseptic technique, using clean or sterile gloves.
- Change transparent dressings regularly, at least once a week or more frequently if the dressing is soiled, loose, or damp.
- Gauze dressings should be changed every two days.
- When changing the dressing, disinfect the site with alcohol, or 70% isopropyl alcohol.
- Replace administration sets not used for blood, blood products, or lipids at intervals no more frequently than 72 hours.

Changing Fluids and Infusion Sets

Follow these guidelines for changing fluids and infusion sets:

- Change infusion bottles or plastic bags with parenteral solutions every 24 hours.
- Change infusion bottles or plastic bags with lipid emulsion given alone within 12 hours.
- Change infusion sets whenever they are damaged/contaminated and after 96 hours routinely.
- If the tubing becomes disconnected, wipe the hub of the cannula with 60% to 90% alcohol and connect a new infusion set.
- Replace tubing that is used to administer blood products within 24 hours.

Inserting and Maintaining Peripheral IV Lines [15]

Follow these practices to reduce the risk of infection when inserting and maintaining peripheral intravascular catheters:

- Ensure that a peripheral venous catheter is indicated. Remove the catheter when no longer necessary or indicated.
- Prepare clean skin with an antiseptic (70% alcohol or alcohol-based povidone iodine) using a circular motion outward from the insertion site before catheter insertion.
- Wear clean, non-sterile gloves and apply an aseptic procedure (with non-touch technique) for catheter insertion, removal, and blood sampling.
- Consider scheduled catheter change every 96 hours or as clinically indicated.
- Change tubing used to administer blood, blood products and fat emulsions within 24 hours of infusion start.
- Consider changing all other tubing when clinically indicated.
- Monitoring: Record time and date of catheter insertion, removal and dressing change, and condition (visual appearance) of catheter site every day.

Removal of Peripheral IV Lines [13]

Follow these practices to reduce the risk of infection when removing peripheral IV lines:

- Perform hand hygiene.
- Put on examination gloves.
- Check the patient's hand or wrist for phlebitis or evidence of infection. If phlebitis is associated with other signs of infection, such as fever or pus coming from the exit site, this is classified as a clinical exit-site infection.
- Carefully remove the needle or the plastic catheter with one hand and, with the other hand, cover the insertion site with sterile gauze.
- Press the insertion site firmly for about a minute and cover it with a sterile bandage.
- Dispose of waste appropriately, remove gloves, and practise hand hygiene.
- If clinical exit-site infection is present, assess whether it requires antimicrobial treatment.
- Document clinical observations of the IV site (e.g. intact without signs/symptoms of infection, warm, erythema, pus, etc.) in the patient's record.

3.4 Common Pathogens Responsible for HAI

3.4.1 Health-Care Associated Diarrhoea [16]

Diarrhoea is generally defined as passage of three or more liquid stools in 24 hours. In some cases, however, the abrupt onset of illness with passage of a single liquid stool leaves little doubt that the patient will meet the definition of diarrhoea soon afterwards and it is sensible to consider that the patient has diarrhoea. New-onset passage of loose stool in patients admitted to a health-care facility is common. It is not always caused by infection, although this should be considered as likely in most cases.

Food- and water-borne infectious diarrhoea (rotavirus, campylobacter, salmonella) can be introduced into a health-care facility by patients and staff, if the water supply is not safe; if food is not properly prepared, stored and served; if infected staff come to work while they have diarrhoea; or if infected people visit relatives. Once introduced to the hospital or health service, diarrhoeal infection may spread through person-to-person transmission.

Factors that put Patients at Particular Risk of Health-Care Associated Diarrhoea

- Antimicrobial administration (especially for C. difficile-associated diarrhoea).
- Sharing space with a patient who has infectious diarrhoea.
- Occupying space previously occupied by a patient with infectious diarrhoea.
- Immunosuppression.
- Decreased gastric acidity (for example in patients taking drugs to suppress gastric acid).
- Unhygienic shared toilet facilities.
- Inadequate hand hygiene by patients and staff.

Prevention of Health-Care Associated Diarrhoea

- Ensure compliance with the five moments for hand hygiene (section 4, Fig. 4.1).
- Implement contact precautions with single room isolation/keeping cohorts in a separate space. Keeping distance between patients should be practised for all patients with diarrhoea, even if the diarrhoea is considered to be non-infectious. This is because patients with diarrhoea are highly likely to contaminate their environment with their colonic bacteria. These bacteria may include antimicrobial resistant bacteria that could cause infection in other vulnerable patients.
- Ensure that all patients admitted with diarrhoea, or who develop diarrhoea in the health-care facility, are kept in a separate space and use separate washing and toilet facilities if possible (i.e. isolation).
- If a separate space is not possible, consider how to help patients with diarrhoea to keep some distance from other patients.
- Immediately clean and then disinfect all soiled articles and environment.
- Ensure that bedpans and bathroom equipment that are regularly handled by patients and staff are clean at all times and disinfected when appropriate.
- Wear utility or heavy-duty gloves before sorting out linen, and bundle soiled linen to prevent leakage.
- Ensure that staff with diarrhoea are not engaged in patient care or food preparation and serving until at least 24 hours after the diarrhoea has been resolved.

3.4.2 Bloodborne Pathogens

Bloodborne transmission of viral infection is a recognised risk to both health-care workers and patients in their care. In health care, transmission of bloodborne viruses may occur by injection, infusion, transplantation, unsterile equipment, or other accidental injury/penetration. The risk of transmission of infections can be reduced by eliminating hazards, providing and using engineering controls, avoiding unsafe practices, using personal protective equipment, immunisation, and post-exposure prophylaxis.

Hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV are important bloodborne pathogens that can be transmitted in the health-care setting through administration of blood and blood products, the use of contaminated needles/surgical equipment or sharps injuries.

Risks of bloodborne pathogens to health-care workers are discussed further in Chapter 6.

CHAPTER 4

STANDARD PRECAUTIONS AND TRANSMISSION-BASED PRECAUTIONS

CHAPTER 04

STANDARD PRECAUTIONS AND TRANSMISSION-BASED PRECAUTIONS

IPC precautions are divided into two distinct groups: standard precautions and transmission-based precautions. This chapter covers each of the elements of standard precautions and transmission-based precautions.

4.1 Standard Precautions [17] [18]

What are standard precautions?

Standard precautions refer to the minimum IPC measures designed to protect patients and health-care workers from contact with infectious agents and to reduce HAI in all settings.

Standard precautions are implemented through the following safe work practices and include these elements:

- Hand hygiene.
- Respiratory hygiene/cough etiquette.
- PPE according to the risk.
- Safe injection practices, sharps management and injury prevention.
- Routine environmental cleaning.
- Safe handling and cleaning of soiled linen.
- Safe re-processing of medical equipment and instruments.
- Safe handling of waste management.

When and why should standard precautions be applied?

It is essential that all health-care workers always apply standard precautions because:

- People may be infectious before they show signs and symptoms, or receive laboratory test confirmation;
- There is an increased risk of transmission of infection with specific procedures;
- People are at risk of acquiring infectious agents present in the surrounding environment including surfaces and equipment.

Always apply standard precautions to protect yourself when in contact with:

- Blood

- Body fluids
- Non-intact skin
- Mucous membranes of others regardless of diagnosis, or the known or suspected infectious status of individuals.

4.1.1 Hand Hygiene

Hand hygiene is mandatory and is the single most important measure to prevent and minimise the spread of HAIs in health-care environments and in the community. The main purpose of hand hygiene is to mitigate the spread of infection by removing visible soil and microorganisms (transient microorganisms) carried on the hands of both staff and patients.

The **five moments for hand hygiene** (Fig. 4.1) developed by WHO [19] describe the opportunities or situations when hand hygiene should be performed by health-care workers in acute and primary health-care settings. The five moments are designed to protect patients from the risk of microbial transmission from the hands of health-care workers, and also to prevent microbial transmission to health-care workers and patient surroundings from the patient.

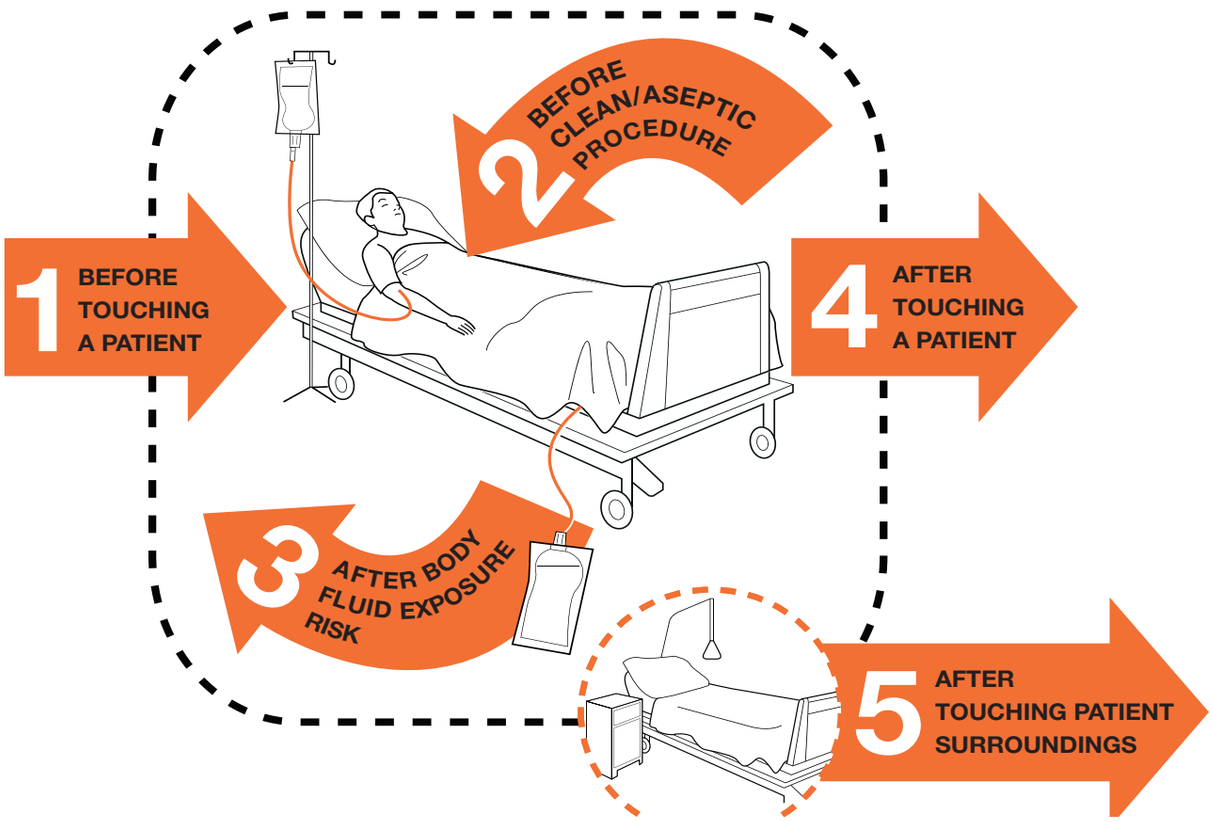


FIGURE 4.1: The Five Moments for Hand Hygiene Developed by WHO

Additional Situations of When to Perform Hand Hygiene

- Before and after eating or preparing to serve or handle food.
- When hands become visibly soiled.
- After using the toilet.
- Before putting on gloves and after removing gloves.
- Before starting work and leaving work.
- Before and after using computer keyboards, especially in the clinical environment.
- After wiping mouth and nose secretions.
- When entering and leaving the patient environment, especially during an outbreak of an infectious agent.
- After handling laundry, waste and equipment.

Access to hand hygiene must be provided to immobile inpatients after toileting and before meals. Patients and visitors must be encouraged to perform hand hygiene.

Hand Hygiene Products

Hand hygiene includes both hand washing with liquid soap and water, and the use of alcohol-based hand rub products (gels, rinses, foams) that do not require the use of water. Water alone is not suitable for cleaning soiled hands; soap must be used with water for effective hand washing.

Hand drying is an essential part of hand washing. Ideally, hands should be dried with a single-use paper towel or single-use cloth towel. The reuse of cloth hand towels should be avoided because of the risk of cross-contamination (cloth towels must be washed and dried before reuse).

Plain Soaps

Soaps are commonly available in the form of bar soap and liquid preparations. Plain soaps aid in the removal of dirt, soil and various organisms, such as ***C. difficile*** and non-enveloped viruses, e.g. norovirus. Plain soaps have minimal, if any, antimicrobial activity, although hand washing with plain soap can remove loosely adherent transient flora.

The use of bar soaps in clinical settings is **not recommended** due to the risk of soap being left sitting in water, thus allowing transient organisms to grow. If bar soaps are used, it is important to ensure that the bar soap is placed on a well-drained holder and is not immersed in liquid. It is preferable to use liquid soap preparations. Soap and water can still be used, even where there is no piped water. If piped water is not available, one of the following methods can be used:

- A bucket with a tap at the base.
- A pitcher or a jug to pour water over the hands with the help of an assistant.

Alcohol-Based Hand Rubs

According to WHO, alcohol-based hand rub preparations contain either ethanol, isopropanol or a combination of these products (60% v/v n-propanol is approximately equivalent to 70% v/v isopropanol and to 80% v/v ethanol) [19]. Most studies have indicated that an alcohol-based hand rub preparation of at least 70% isopropanol, 0.5% chlorohexidine and a skin emollient is effective against gram-negative and gram-positive bacteria including methicillin-resistant *Staphylococcus aureus* (MRSA).

Alcohol-based hand rub is highly effective and inactivates a wide range of harmful microorganisms on the hands. It is effective at removing vegetative forms of *C. difficile* but is not effective at removing spores [19].

The efficacy of an alcohol-based hand rub depends on appropriate usage. This includes the following:

- Type of alcohol used.
- Concentration of alcohol.
- Volume of alcohol used – the ideal volume is unknown, but if hands dry less than 20 seconds after being rubbed, it is likely that insufficient alcohol was used.
- Hands are dry before the use of alcohol-based hand rub (dry wet hands before using hand rub).
- If hands are visibly soiled, they should be washed first with soap and water.

Hand Hygiene Technique

The steps below should be followed when performing hand hygiene with either soap and water or an alcohol-based hand rub to ensure that all surfaces of the hands are covered (Figs 4.2 and 4.3). Ensure that jewellery has been removed and arms are bare below the elbows.

1. **Lather the hands with liquid soap and water or, if using alcohol-based hand rub, rub as follows:**
    - Rub hands palm to palm;
    - Right palm over back of left hand with fingers interlaced and vice versa;
    - Palm to palm with fingers interlaced;
    - Backs of fingers to opposing palms with fingers interlocked;
    - Rotational rubbing of left thumb clasped in right palm and vice versa; and
    - Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.
2. Rinse under running water if hand washing.
3. Do not touch taps with clean hands – if elbow or foot controls are not available, use paper towel to turn off taps.
4. Pat hands dry using paper towel or single-use hand towel.

FIGURE 4.2: Steps for Hand Washing (Source: SPC 2008.)

There are three types of hand hygiene:

a) Social or routine hand hygiene
b) Aseptic or clinical hygiene
c) Surgical hand antisepsis

A Social or Routine Hand Hygiene

Using Soap and Water

Note: Hands must be washed with liquid soap and water when:

- They are visibly dirty or soiled with blood and bodily fluids; or
- Exposure to potential spore-forming pathogens is strongly suspected or proven, including outbreaks of ***C. difficile.***

Use the five moments for hand hygiene and follow the steps in Figure 4.2 for hand washing. Hands and wrists should be washed for 40–60 seconds with plain liquid soap to remove dirt, soil and other organic substances. The hands are then dried with a paper towel or, if these are not available, a single-use hand towel. This type of hand hygiene is suitable for all routine procedures.

Using Alcohol-Based Hand Rub

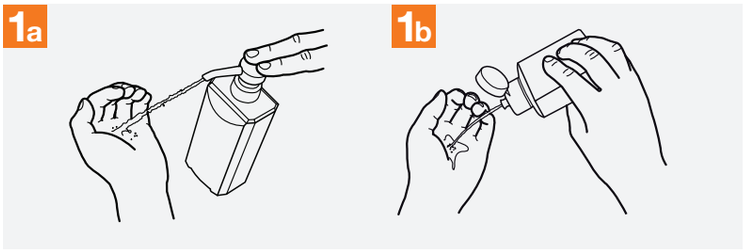
Many studies have stated that alcohol-based hand rub is more effective than hand washing with soap and water. Studies have shown that alcohol-based hand rub has excellent in-vitro germicidal activity against gram-positive and gram-negative vegetative bacteria (including multidrug-resistant pathogens such as MRSA and vancomycin-resistant *Enterococcus* (VRE), *M. tuberculosis,* and a variety of fungi. However, hand hygiene must be performed with soap and water when there is suspected or confirmed contamination of spore-forming organisms such as *C. difficile* or when norovirus is suspected or known to be present [20] [21].

How to use alcohol-based hand rub – follow the steps in Figure 4.3.

How to Handrub?

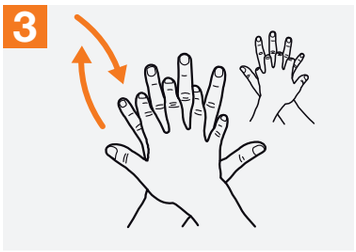
RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

Duration of the entire procedure: 20-30 seconds



Apply a palmful of the product in a cupped hand, covering all surfaces;

Rub hands palm to palm;

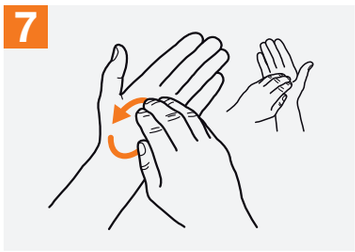


Right palm over left dorsum with interlaced fingers and vice versa;

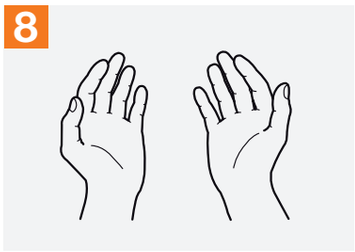
Palm to palm with fingers interlaced;

Backs of fingers to opposing palms with fingers interlocked;

Rotational rubbing of left thumb clasped in right palm and vice versa;



Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Once dry, your hands are safe.

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

May 2009

FIGURE 4.3: Steps for Using Alcohol-based Handrub (Source: WHO 2009.)

When to Use Alcohol-Based Hand Rub

- Use alcohol-based hand rub on clean dry hands.
- Apply about 3 ml of the product to the palm of one hand and rub hands together, covering all surfaces of the hands and fingers until the hands are dry. This should take about 20–30 seconds; if the hands are dry in 10–15 seconds, not enough hand rub was used.
- Hand hygiene with alcohol-based hand rub can be used according to the indications for the 5 moments for hand hygiene.

B Aseptic Clinical Hand Hygiene

Aseptic clinical hand hygiene is undertaken to remove or destroy transient microorganisms and inhibit the growth of resident microorganisms. It should be carried out prior to any procedures that involve contact with the mucous membrane, non-intact skin or invasive medical device, e.g. insertion of a central venous line.

The hand hygiene procedure can be carried out in one of two ways:

- By washing hands and forearms with antimicrobial soap and water, for 40–60 seconds and drying with a hand towel (follow the steps for hand washing in Figure 4.2); or
- By using alcohol-based hand rub for 20–30 seconds. This is appropriate for hands that are not soiled with protein matter or fat or visibly dirty (follow the steps for hand washing shown in Figure 4.3).

Note: Immersing hands in bowls of antiseptic is not recommended.

C Surgical Hand Antisepsis

Surgical hand antisepsis is important in preventing the development of SSI. The aim of surgical handwashing is to remove or destroy transient microorganisms and reduce the presence of resident flora on the skin of hands and arms. This ultimately prevents SSI [22] [23].

Principle 2 of the *Pacific perioperative practice bundle: Infection prevention* recommends that the antimicrobial solution used for scrubbing should:

- Be used according to the manufacturer's instructions;
- Be broad spectrum;
- Be fast acting and persistent;
- Have a residual and cumulative effect, and
- Be non-irritating and have minimal detrimental effects on the skin.

Five-Minute Surgical Scrub Technique (For First Scrub)

1. Open and prepare nail cleaner and scrub sponge for use later in the scrub.

2. Turn on the water to a comfortable temperature and even flow.
3. Complete pre-scrub wash, using antiseptic solution to loosen debris on the skin.
4. Apply antiseptic solution to hands. Wash hands before proceeding to wash arms using a circular hand motion, working in one direction from hands to 2.5 cm above the elbow.
5. Leave the solution in contact with the skin while cleaning nails using the nail cleaner – dispose of the nail cleaner in a safe manner.
6. Rinse hands and arms, keeping hands higher than elbows to allow water to run in one direction only.
7. Avoid splashing water onto perioperative attire as this will cause 'strike through' when donning a sterile gown, rendering it unsterile.
8. Apply antiseptic solution to scrub sponge (unless it is already impregnated).
9. Wash all surfaces of the hands and fingers, then wash the forearms to elbow level – discard the scrub sponge safely.
10. Rinse hands and arms thoroughly.
11. Apply antiseptic solution to hands and repeat previous step, but stop at mid forearm.
12. Rinse thoroughly.
13. Apply antiseptic solution to hands and wash hands only.
14. Rinse for the final time – if taps are elbow operated, turn taps off using elbows to avoid contamination of the hands.

Note:

- **If scrub sponge and nail cleaners are unavailable, pay greater attention to the first hand wash of the procedure to ensure nail beds are thoroughly cleaned by dipping fingertips of each hand into the solution.**
- **If brushes are used, the selection of reusable or disposable brushes or sponges for scrubbing should be based on realistic considerations of effectiveness and economy.**
- **If a reusable brush is desired, it should be easy to clean and maintain and should be durable enough to withstand repeated sterilisation , without the bristles becoming soft or brittle.**

Three-Minute Surgical Scrub Technique for Subsequent Scrubs

1. Turn on the water to a comfortable temperature and even flow.
2. Apply antiseptic solution to hands. Wash hands before proceeding to wash arms using a circular hand motion, working in one direction from hands to 2.5 cm above the elbow.
3. Leave the solution in contact with the skin.
4. Without rinsing, apply additional solution and wash all surfaces of the hands and then proceed from forearms using a circular motion to the level of the elbow.
5. Rinse hands and arms thoroughly.
6. Apply solution and wash hands and forearms, stopping at mid forearm.
7. Rinse hands and arms thoroughly.
8. Apply solution and wash hands only.
9. Rinse for the final time.

Steps Before Starting Surgical Hand Preparation

- Keep fingernails short.
- Do not wear nail polish or artificial nails.
- Remove all jewellery.
- Wash hands with non-medicated soap before entering the operating room.
- Clean subungual areas with the nail file.

4.1.2 Respiratory Hygiene and Cough Etiquette

Respiratory hygiene and cough etiquette are elements of standard precautions and should be practised at all times by all patients (and staff and visitors) with respiratory symptoms (e.g. coughing, sneezing). The application of respiratory hygiene and cough etiquette procedures is designed to reduce the spread of respiratory infections such as COVID-19 and other influenza-like symptoms [17].

People with respiratory infections/symptoms should be educated to:

- Cover their mouth and nose with a tissue when coughing, sneezing or blowing their nose, and to dispose of used tissue in waste or garbage containers. If no tissues are available, cough or sneeze into the inner elbow rather than the hands, and perform hand hygiene immediately;
- Spit into a tissue if spitting is necessary, and dispose of the tissue in a waste or garbage container, and perform hand hygiene;
- Perform hand hygiene (use alcohol-based hand rub or wash hands with soap and water) each time after contact with respiratory secretions;
- Wear a medical/surgical mask (if available) if you are coughing in order to protect other people in the surrounding area;
- Keep contaminated hands away from the mucous membranes of the eyes, nose and mouth.

Health-care facilities should promote respiratory hygiene and cough etiquette by:

- Ensuring patients with fever and cough are seated away from others in common waiting areas (ideally at least three feet/1 metre from others);
- Ensuring that patients have access to appropriate materials to adhere to respiratory hygiene and cough etiquette;
- Promoting the use of disposable tissues (if available) as opposed to using handkerchiefs;
- Making medical/surgical masks available in waiting areas to reduce the risk of infection transmission;
- Making hand hygiene resources available in waiting areas during an influenza outbreak (e.g. alcohol-based hand rub dispensers), with instructions on how to use them;
- Educating patients, family members, and visitors on the importance of covering their mouths and noses with a tissue to help prevent the transmission of influenza and other respiratory viruses;
- Making appropriate garbage containers (pedal operated) or open bins available in waiting areas for disposal of used tissues;
- Posting signs requesting that patients and family members with acute febrile respiratory illness use respiratory hygiene and cough etiquette.

4.1.3 Personal Protective Equipment (PPE) [25] [26]

PPE is an important component in the prevention and control of infectious diseases. It is used to protect the mucous membranes (eyes, nose mouth), airway, skin and clothing from exposure to infectious agents.

Depending on the circumstances, PPE is part of standard precautions and includes medical/surgical masks or NIOSH-certified N95 particulate respirator masks, gloves, eye shields or eye goggles, waterproof gowns and coveralls.

PPE on its own is insufficient. It must be used together with standard and additional precautions. It is important to use PPE effectively and correctly. All health care workers must be trained to use PPE correctly and in the appropriate situations and settings.

Selection of PPE is Based on the Assessment of:

- The risk of transmission of the infectious agent/microorganism to the patient and health-care worker;
- The risk of contamination of the health-care worker's skin and clothing by the patient's blood and body substances, considering the type of patient interaction and procedure;
- Type of known or possible infectious agent;
- Risk of exposure and extent of contact with blood, body fluids, respiratory droplets and aerosols or open skin;
- Likely modes of transmission of the infectious agent.

The use of comprehensive PPE is mandatory when direct, close contact with patients suffering from highly pathogenic airborne and droplet viruses is anticipated [27], e.g. COVID-19, filoviruses (Ebola virus and Marburg virus), MERS-CoV, avian influenza A (H5N1) in humans, and SARS.

Careful removal of PPE is also very important and health-care workers must receive training and supervision on how to put on and safely remove PPE (follow the steps shown in Figs 4.6 and 4.7).

Where to Wear PPE

PPE should be worn in a protected environment (e.g. isolation room, operating room, etc.) and should not be worn outside that area. PPE must be removed before leaving the protected area.

Gloves [28]

Gloves are worn to protect staff and patients from infectious agents, such as multidrug-resistant organisms, and are an essential component of standard and contact precautions. Gloves are used to protect health-care workers' hands against contamination and should be worn by all health-care workers when in contact with blood, body substances, secretions, excretions and contaminated equipment or surfaces. Hand hygiene should be performed before putting gloves on and after removing them. The use of gloves does not replace the need for hand hygiene by using alcohol-based hand rub or hand washing with soap and water.

Gloves should be changed:

- Between care/treatment of patients (to prevent cross-transmission of infection);
- When performing separate procedures on the same patient;
- As soon as gloves are torn or punctured; and
- Before touching non-contaminated items and surfaces in the surrounding environment.

Gloves must be worn according to **STANDARD** and **CONTACT PRECAUTIONS.** The pyramid in Figure 4.4 details some clinical examples and indications for the type of gloves to use in these situations [28].

FIGURE 4.4: Indications for Glove Use (Source: WHO 2006.)

Masks and Eye Protection (Face Shields / Eye Goggles)

Masks, eye protection and face shields are worn to protect the mucous membranes of the eyes, nose and mouth, which are portals of entry for infectious agents during procedures and patient-care activities likely to generate splashes or sprays of blood, body fluids, secretions or excretions.

Face and eye protection are essential components of precautions against airborne and droplet transmission.

TABLE 4.1: Types of Mask and Indications

Medical/Surgical Mask Indications	Respirator Mask N95, N99 or FFP2 or FFP3 Indications
■ Worn for droplet precautions ■ Procedures that generate large droplets of secretions and excretions ■ Procedures that require aseptic techniques to protect the patient from infectious agents ■ Infections that are transmitted via droplets, e.g. influenza virus	■ Worn for airborne precautions for infections transmitted by airborne transmission, e.g. TB ■ Procedures that generate aerosols of particles of known or suspected infectious agents **Note: Not all particulate respirator masks are fluid resistant**

Note: Medical/surgical masks should be provided to patients who are coughing to prevent transmission of infectious agents.

When a mask is worn, ensure that:

- It is changed when it becomes wet (it is no longer effective when wet);
- It is not reused once it is removed;
- It does not hang round the neck;
- It is not touched while in use; and
- The wearer performs hand hygiene after removal of a used mask.

Note: The front of the mask is considered contaminated.

How to Perform a User Seal Check When Wearing a Respirator Mask (N95 or P2) [18]

A user seal check should be performed by the wearer each time a respirator mask is put on. This check determines if the respirator mask is worn properly or needs to be adjusted. The user seal check can be a positive pressure or negative pressure check. Before checking, cover the front of the respirator mask with both hands, being careful not to disturb the position of the respirator.

Positive seal check

- Exhale sharply. Positive pressure inside the respirator means there is no leakage. If there is leakage, adjust the position and/or tension straps.

Negative seal check

- Inhale deeply. If there is no leakage, negative pressure will make the respirator cling to your face.
- Leakage will result in loss of negative pressure in the respirator due to air entering through gaps in the seal.

Figure 4.5 below shows how to perform a particulate respirator mask (N95 or FFP2) seal check [29].

FIGURE 4.5: How to Perform a Respirator Seal Check (Source: WHO 2020.)

Considerations for Eye Protection

- According to WHO, face shields and goggles are considered to be equally effective, so either device can be selected depending on personal preference [27].
- Fogging can affect face shields and goggles but is less of a problem with face shields. In hot and humid climates, fogging can affect visibility and the ability of the health care worker to provide patient care. Therefore, it is advisable to use goggles with some form of ventilation.
- Face shields provide a wider range of view of the patient and enhance interaction with patients.
- Reusable face shields and goggles should be cleaned with detergent and water, or disinfected using the manufacturer's instructions.
- The front of the face shield/goggles is considered contaminated.
- The use of prescribed goggles may be considered for those who wear glasses.

Fluid-Resistant Gowns and Aprons

Fluid-resistant gowns and aprons prevent contamination of clothing and skin by infectious agents during procedures and patient-care activities likely to generate splashes or sprays of blood, body fluids, secretions or excretions.

- A clean, non-sterile gown is adequate to protect clothing during procedures that are likely to generate splashes or sprays of blood or body substances.
- A fluid-resistant long-sleeved gown and apron are strongly recommended to mitigate against the risk of infectious blood and body substances, secretions or excretions that could penetrate the underlying clothes or skin with potential to subsequently, unknowingly, transmit the infectious agent via the hands to the mucous membranes of the eyes, nose or mouth.
- Aprons are usually worn over a gown to protect against splashing of blood, body substances excretions or secretions.
- Disposable plastic aprons can be worn for contact precautions to protect against transmission of multidrug-resistant organisms or other contact infectious agents.
- Removal of gowns/aprons should be done before leaving the patient area to prevent contamination of the environment.

TABLE 4.2: PPE Selection Based on Blood and Body Fluid Exposure

Scenarios	Gloves	Gown	Eye Wear	Mask
If direct contact with blood and body fluids, secretions, excretions, mucous membranes, non-intact skin	✔			
If there is a risk of splashes to the health-care worker's body	✔	✔	✔	
If there is a risk of splashes to the health-care worker's body and face	✔	✔	✔	✔

Head Cover

A head cover is worn in the operating room to minimise hair fall on to the sterile area during surgery. A head cover is also worn in food preparation areas to prevent hair fall on to food.

Sequence for putting on and removing PPE for highly infectious diseases or in the context of COVID-19 disease (Figs 4.6 and 4.7).

Before Putting on PPE

Ensure the following measures before putting on PPE (health-care workers must be trained and competent in procedures for putting on and removing PPE before attending to patients in isolation.

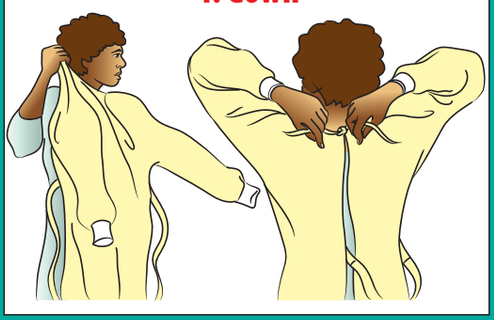
The ***PPE health care worker competency assessment checklist*** (Annex 3) is an effective guide to assessing competency.

- It is essential to have a trained observer or 'buddy' to supervise the procedure of putting on and removing PPE to ensure that the correct steps are followed.
- Before putting on PPE, all jewellery, watch, pens and mobile phone should be removed (including from the pocket).
- PPE posters showing how to put on and remove PPE should be available in the putting on and removing area and should be strictly followed to prevent missing a step.
- There should be appropriate separate places designated for putting on and removing PPE.
- Ensure that there is a mirror available if a buddy or supervisor is not available. This is helpful in adjusting the PPE and checking that it is placed and removed correctly.
- PPE must be put on in the correct order according to the ***sequence for putting on PPE*** (Fig. 4.6).
- The observer or buddy should check the integrity of the PPE to ensure a correct fit.

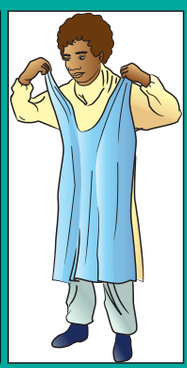
Sequence for putting on personal protective equipment (PPE)

Gather all PPE supplies, check correct size for fit,
Remove all personal items (jewellery, watches, wedding ring, cell/mobile phone)
Ensure you have a Supervisor/buddy or mirror
Perform hand hygiene using soap and water (40-60 seconds) or alcohol based hand rub (20-30 seconds)

1. Gown



- Long sleeves down to wrist
- Length of gown to knees
- Ties at back of neck and waist



- Put on apron if necessary

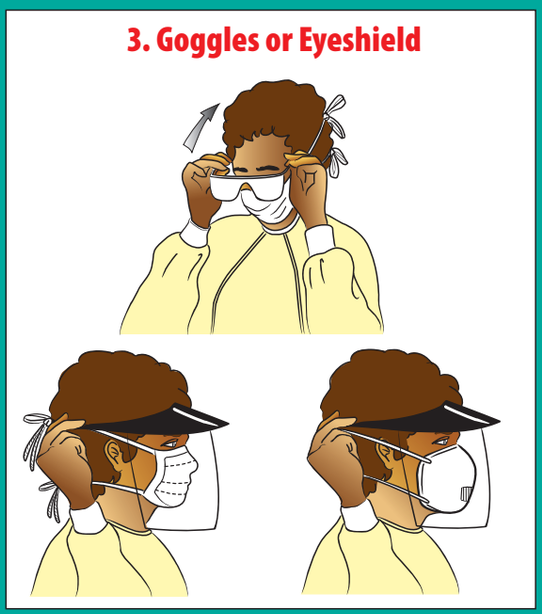
2. Mask

a. If wearing a medical mask
i. Place mask over nose and mouth and below chin

or Respirator

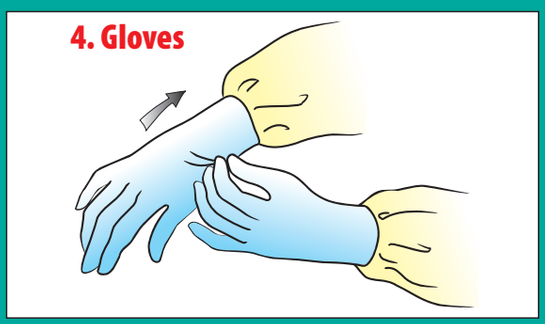
b. If wearing a respirator mask for aerosol generating procedure
i. Place mask over nose and mouth
ii. Pull elastic bands over head – upper band above ear line, lower band below ear line
iii. Fit check by moulding nose strip over bridge of nose with finger tips of both hands to get a snug fit

3. Goggles or Eyeshield



- Put on goggles or eyeshield

4. Gloves



- Put gloves on
- Pull over wrist of isolation gown

Safety precautions

- PPE needs to be the appropriate size for the person
- Avoid adjusting PPE once you enter isolation area
- Avoid touching your face
- Minimise contact with environmental surfaces

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World Health Organization
Representative Office for the South Pacific

Developed based upon infection control guidance from the World Health Organization.

FIGURE 4.6: Sequence for Putting on PPE (Source: SPC 2021.)

When Wearing PPE During Patient Care

- Do not touch the eye protection (face shield/goggle) or mask.
- Keep your hands away from your face. PPE cannot be adjusted during this time.
- Limit touching of surfaces.
- If there is a partial or total breach, e.g. gloves torn, or an insect enters the goggles, leave the patient environment immediately and go to the doffing area and remove PPE under the supervision of the trained observer or buddy.

Removing PPE (Doffing)

- Remove PPE outside of the patient room, in the designated PPE doffing area under the supervision of the observer/buddy.
- A trained buddy or assistant is vital when removing PPE to ensure protection.
- PPE must be removed slowly and deliberately in the correct sequence to reduce the possibility of self-contamination or other exposure to an infectious agent.
- Discard PPE in the designated container.
- Access to hand hygiene must be available.

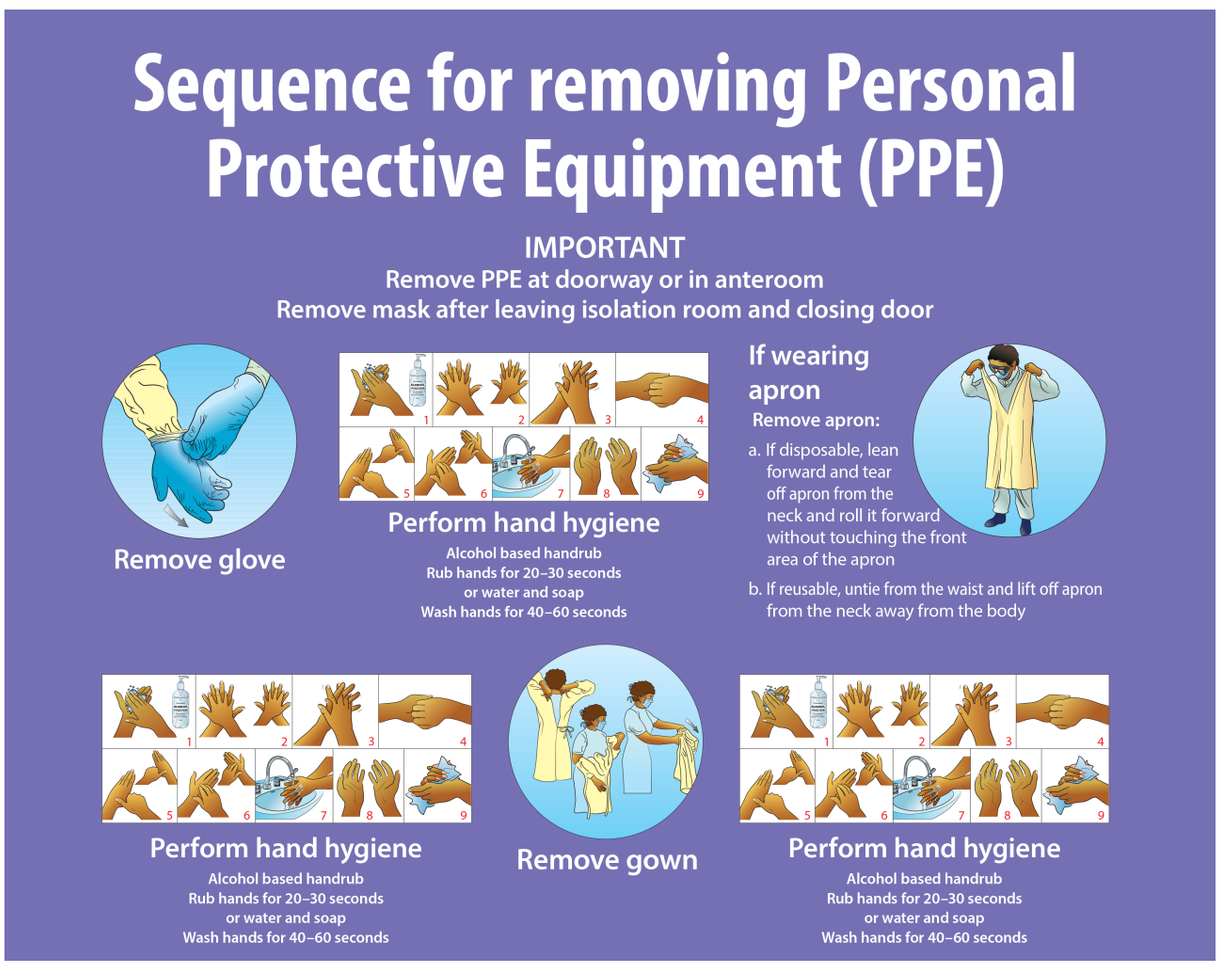


Figure 4.7: Sequence for removing PPE (Source: SPC 2020.)

4.1.4 Safe Handling and Disposal of Sharps

Accidental injury with sharp objects is the most common way in which health care workers are at risk of occupational exposure to HIV, hepatitis C and hepatitis B viruses. The potential for transmission of blood-borne diseases is greatest when needles and other sharp instruments or devices are used. Special care should be taken to prevent injuries when cleaning reusable sharp instruments and disposing of sharps.

Responsibility for Sharps

All health care workers who use sharps are responsible for their safe disposal into 'sharps containers'.

Safe practices when handling sharps include the following:

- Sharps should not be passed by hand between a health-care worker and any other person; a puncture-resistant tray or kidney dish must be used to transfer sharps.
- Needles should never be recapped.
- Do not bend needles, lancets or other sharps after use.
- Sharps should never be forced into a sharps container.

Sharps Containers

Standard sharps containers should be ordered well in advance to prevent shortages. Dispose of all sharp objects in puncture-proof containers.

- Sharps containers must be puncture-resistant and must be labelled 'Sharps'.
- The container should have an opening that is wide enough to allow the sharps to be dropped into it.
- The container should never be overfilled and should be replaced when it is three-quarters full. When it is three-quarters full, close the lid or cover with tape.
- Sharps containers should be placed as close as practical to the point of use. For example, containers should be placed on the medicine trolley, and in the treatment or immunisation room.
- Sharps containers should not be placed where they are easily accessible to children.
- Sharps should not be disposed of in a municipal waste facility.

4.1.5 Environmental Cleaning

Infectious agents present in the health-care environment can be transmitted to patients via the hands of staff when they have been in contact with contaminated equipment or the environment. Studies have shown that having an effective system for environmental cleaning minimises the spread of nosocomial infections in health-care settings [30].

Frequent environmental cleaning reduces the number of infectious agents and is a vital component of standard precautions.

Cleaning refers to the use of mechanical action, using water and detergent followed by rinsing and drying, with the aim of removing organic matter and dirt from surfaces.

Routine environmental cleaning prevents infectious agents from multiplying on clean dry surfaces and also enhances the well-being of patients and staff. Housekeeping staff and health-care workers have the responsibility of ensuring that the environment is clean and safe, not just for patients, but also for their colleagues and visitors. Housekeeping staff are an integral part of the health-care system.

The level of cleaning required in certain areas of a health-care facility depends on the risk of contamination with infectious agents. For example, the general areas of the hospital require regular cleaning, while the isolation units and the intensive care units, where there is a risk of AMR transmission, require additional levels of cleaning. Cleaning with neutral detergent followed by a chemical disinfectant can effectively inactivate most infectious agents [31] [32].

The following environmental cleaning activities must be implemented within each facility's IPC programme and not as a stand-alone service.

Training and Education

Training for cleaning staff should be mandatory, structured, targeted, and delivered by the IPC liaison in a suitable manner (e.g. participatory). It must be conducted before staff can work independently within the health-care facility.

Training content should include, at a minimum:

- A general introduction to the principles of IPC, including:
  - Transmission of pathogens.
  - How cleaning staff can protect themselves from pathogens.
  - Detailed review of the specific environmental cleaning tasks they are responsible for, including review of SOPs, checklists, and other job aids.
- When and how to safely prepare and use different detergents, disinfectants, and cleaning solutions.
- Specific training content for cleaning staff who may be responsible for cleaning procedures in specialized patient areas – particularly high-risk areas such as ICUs, operating rooms, and maternity units.

The role of environmental cleaning is to reduce the number of infectious agents that may be present on surfaces and minimise the risk of transfer of microorganisms from one person/object to another, thereby reducing the risk of infection. However, under circumstances when patients are placed on transmission-based precautions, disinfection is necessary to kill the remaining pathogens or infectious agents.

The definitions below will assist all staff to understand cleaning and disinfection practices.

Key Definitions

Cleaning (environmental) refers to the removal of dirt and impurities, including germs, from surfaces with water and detergent. Cleaning alone does not kill germs, but removing the germs decreases their number and therefore reduces the risk of spreading infection.

Disinfection uses chemicals to kill germs on surfaces that have been cleaned. This process does not necessarily clean dirty surfaces or remove germs, but kills germs remaining on a surface after cleaning, further reducing the risk of spreading infection.

Detergents: A detergent is a surfactant that facilitates the removal of dirt and organic matter. Most hard surfaces can be adequately cleaned with warm water and a neutral detergent as per the manufacturer's instructions. Allowing the cleaned surfaces to dry is an important aspect of cleaning.

Disinfectants: A disinfectant is a chemical agent that rapidly kills or deactivates most infectious agents. Disinfectants used within a health care setting are preferably chlorine-based products, such as sodium hypochlorite.

Cleaning Level and Schedule

The level of cleaning required in certain areas of a health care facility depends on the risk of contamination with

infectious agents. For example, the general areas of the hospital require regular cleaning, while isolation units and intensive care units, where there is a risk of AMR transmission, require additional levels of cleaning and disinfection of environmental surfaces.

Cleaning Schedules (Annex 4 contains Recommended Cleaning Schedules)

In health care, the recommended cleaning schedules are determined by the risk of transmission of infection in the environment. The recommended schedules for cleaning include frequency and methods and are divided into two main groups:

1. **Minimal hand contact areas,** e.g. floors, walls, ceilings and non-patient areas.
   - Damp mopping is recommended over dry mopping.

2. **Frequent hand contact areas** or high-risk surface areas in patient areas, e.g. doorknobs, bed rails, bedside tables, wall areas around the toilet and bathroom, etc.
   - These areas require cleaning with detergent solution more frequently than minimal hand contact areas.
   - When multidrug-resistant organisms are suspected or known to be present, or during outbreak situations, these areas are cleaned twice, with the second cleaning to include a disinfectant recommended by the health-care facility, e.g. sodium hypochlorite.
   - Shared clinical equipment in these areas, such as trolleys, knobs on certain machines, etc. should be cleaned frequently with detergent.
   - All health-care facilities should have a cleaning schedule with clear lines of responsibilities for housekeeping staff and health-care workers. The schedule should include:
     - Rosters;
     - Frequency of cleaning required and methods of cleaning for all areas;
     - The products used to clean specific areas, with SOPs for mixing solutions; and
     - Clear SOPs for cleaning mops, buckets and other items.

Cleaning Equipment

- All cleaning equipment used in health-care facilities should be cleaned and stored dry between uses.
- The equipment should be well maintained and used appropriately.
- Cleaning equipment, including mop heads, should be laundered using hot water and completely dried before re-use.
- Cleaning equipment, such as buckets, should be emptied and cleaned with a new batch of sodium hypochlorite solution and allowed to dry completely before re-use.
- Dust control equipment that generates and disperses dust, such as feather dusters and brooms, should not be used in the health-care facility.
- Use of spray bottles or equipment that might generate aerosols during usage should be avoided. Chemicals in aerosols may cause irritation to eyes and mucous membranes. Containers that dispense liquid such as 'squeeze bottles' can be used to apply detergent/disinfectants directly on to surfaces or cleaning cloths with minimal aerosol generation.
- Cleaning cloths should be laundered and dried between use. In outbreak situations, it is recommended that disposable cloths are used.

Cleaning Techniques [31]

Incorrect or inappropriate cleaning techniques may spread microorganisms rather than remove them from surfaces. The following points should form the basis of all SOPs for cleaning in health-care facilities.

- The flow of cleaning should be from areas that are considered relatively clean to areas that are dirty. This means that areas/elements that are low touch or lightly soiled should be cleaned before areas/elements that are considered high touch or heavily soiled. For example, when cleaning a bathroom, the toilet should be cleaned last as it is likely to be the most contaminated element in that area.
- **The flow of cleaning should generally be from high to low reach surfaces. Examples include:**
  - Cleaning bed rails before bed legs;
  - Cleaning environmental surfaces before cleaning floors;
  - Cleaning floors last to allow collection of dirt and microorganisms that may have fallen.

How to Use Cleaning Cloths

When using cloths and a bucket/solution system to clean, **never 'double-dip' used cloths into the bucket containing clean, unused cloths as this can contaminate the clean cloths in the solution and result in spreading microorganisms to surfaces that are wiped.**

Follow these procedures when cleaning surfaces with cloths:

1. Thoroughly wet (soak) a fresh cleaning cloth in the environmental cleaning solution.
2. Fold the cleaning cloth in half until it is about the size of your hand. This will ensure that you can use all of the surface area efficiently (generally, fold them in half, then in half again, to create eight sides).
3. Wipe surfaces from clean to dirty, high to low, in a systematic manner, making sure to use a mechanical action and ensuring that the surface is thoroughly wetted for the required contact time (for disinfection steps).
4. Regularly rotate and unfold the cleaning cloth to use all of the sides.
5. When all sides of the cloth have been used, or when it is no longer saturated with solution, dispose of the cleaning cloth or store it for re-processing.
6. Repeat the process from step 1.

Floors

1. Use a damp mop to clean floors. Avoid using brooms as this disperses dust into the air. Mop from cleaner to dirtier areas. Work in a systematic manner, proceeding from the area farthest from the exit and working towards the exit.
2. Change/wash mop heads/floor cloths and buckets of cleaning and disinfectant solutions as often as needed (e.g. when visibly soiled, after every isolation room, every 1–2 hours) and at the end of each cleaning session.
3. **Use a two-bucket system for routine cleaning and a three-bucket system for floors of isolation units:**
   - First bucket with detergent and water.

- Second bucket with disinfectant.
- Third bucket with clean water for rinsing mops.

Mopping

1. Insert the clean mop into the first bucket, wring it out and mop a portion of the floor using overlapping strokes, turning the mop head regularly (e.g. every 5–6 strokes).
2. After cleaning a small area (e.g. 3 m x 3 m), immerse the mop or floor cloth in the third bucket to rinse it and then wring it out. Repeat the process from step 1 until you are finished mopping.
3. If cleaning an isolation unit, once the floor is dry, mop with disinfectant from the second bucket.

Terminal or Discharge Cleaning of Inpatient Wards

Terminal cleaning of inpatient areas, which is done after a patient is discharged/transferred, includes the patient zone and the wider patient care area and aims to remove organic material and significantly reduce and eliminate microbial contamination to ensure that there is no transfer of microorganisms to the next patient.

Recommended Cleaning for Patients on Transmission-Based Precautions

Isolation or cohort areas with suspected or confirmed cases of infections requiring transmission-based precautions are considered high-risk areas, particularly for multidrug-resistant pathogens, e.g. patients with MRSA or highly transmissible infectious diseases with high morbidity and mortality, e.g. COVID-19.

The cleaning schedule and frequency should be intensified to include a two-step clean, which involves a physical clean using detergent solution followed by use of a chemical disinfectant (e.g. sodium hypochlorite). The intensified cleaning schedule and frequency should include the following:

- **First,** thoroughly clean all hard surfaces and all frequently-touched surfaces (e.g. door handles, furniture, light switches) with a solution of water and neutral detergent. Follow facility procedures for cleaning.
- **Second,** disinfect all hard surfaces and all frequently touched surfaces (e.g. door handles, bed rails, etc.) with sodium hypochlorite (household bleach and water).

Sodium hypochlorite solution is used for disinfection (Annex 5 provides dilution instructions). The minimum concentration of chlorine is 1000–5000 ppm or 0.1%–0.5%. Liaise with your pharmacy department for mixing dilution, or follow the instructions in Annex 5.

- Sodium hypochlorite solutions should be made fresh daily and leftover solution discarded after 24 hours.
- Gloves must be worn when handling and preparing solutions. Protective eyewear must be worn in case of splashing.
- Never mix sodium hypochlorite solution with ammonia or any other cleanser.
- Follow the manufacturer's instructions for application and proper ventilation.

Colour Coding Cleaning Equipment

A standard for colour coding cleaning equipment is the most effective method of restricting equipment to individual areas of health facilities (Fig 4.8). Equipment may include dry mops, wet mops, mop handles, buckets, wringer buckets, gloves and cleaning cloths. All other equipment that may assist in the control of infection should also be colour coded.

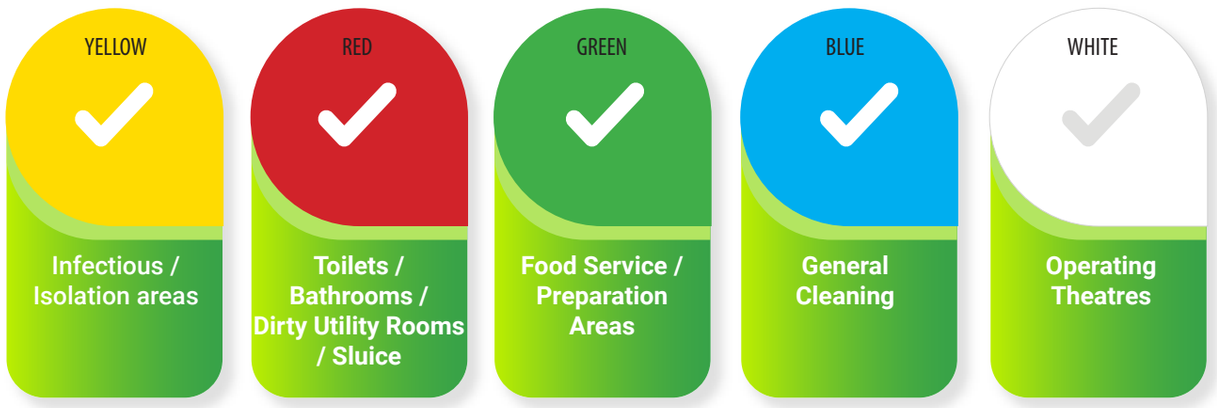


Figure 4.8: Colour Coding for Cleaning Equipment

Housekeeping Audits and Checks

It is recommended that health-care facilities have a system that includes colour coding, checklists and cleaning manuals to ensure that cleaning standards are met, regardless of whether cleaning services are outsourced.

Cleaning should be audited on a regular basis, normally via visual inspection. Feedback, including recommendations for adherence to cleaning and disinfection procedures, should be reported to management and the IPC committee and provided to staff.

Cleaning Spills of Blood and Other Body Fluids

The purpose of cleaning up spills of blood and other body fluids is to destroy harmful microorganisms such as HIV, HCV and HBV.

Items needed for cleaning spills include:

- Neutral detergent
- Cloth or old pieces of linen, paper towel
- Mop.

Procedure for cleaning spills

1. Wear gloves.
2. Wipe up spills with a cloth or paper towel and discard in waste bin.

3. Mop up remainder of the spill using neutral detergent.
4. Apply a two-step clean if an infectious agent is a concern.

4.1.6 Safe Handling of Linen [31]

The objective of the laundry system is to provide a properly designed laundering programme in a safe and sanitary environment and to ensure the supply of clean and hygienic laundry. Laundry managers and staff share the responsibility for achieving this objective.

There should be:

- An appropriate and safe laundry facility, located separately from clinical areas. Healthcare linen must not be washed in domestic washing machines;
- Standard procedures and guidelines for handling, using and laundering clean and contaminated linen;
- Training, educating and instructing staff about potential infectious hazards and techniques to prevent the spread of infection.

Used linen that is soiled with blood, urine, faeces, or other body substances is particularly infectious. Processing soiled linen consists of collecting, transporting, and sorting the linen before it is washed, followed by storage and distribution.

Health-care workers are responsible for ensuring that:

- Standard precautions apply when handling clean and contaminated linen;
- Linen is free of foreign matter, such as sharps and instruments, before it is sent for laundering;
- Soiled and infectious linen is appropriately treated and handled in accordance with SOPs; and
- Used linen is placed in leak-proof bags and bagged at the bedside, and not sorted in patient care areas.

Using Personal Protective Equipment

When collecting, handling, transporting, sorting or washing soiled linen, housekeeping and laundry staff should wear:

- Household utility gloves;
- Closed shoes that protect the feet from sharp items and from blood and body fluid spillages;
- Protective eyewear; and
- A plastic or rubber apron.

Collecting and Transporting Soiled Linen

The following steps should be taken when collecting and transporting soiled linen:

- Place used linen in bags or in linen trolleys with lids. If linen is heavily soiled with blood and/or body fluids,

it should be placed in a leak-proof bag or a container with a lid.

- Handle soiled linen as little as possible and avoid shaking linen to prevent the spread of microorganisms in the environment and to people.
- Linen should not be sorted or washed in patient care areas.
- Transport collected soiled linen in trolley carts with lids, or in covered carts to the laundry processing area, once or twice daily.
- Transport soiled linen and clean linen separately, using separate trolleys labelled accordingly.

Sorting Soiled Linen

Sorting soiled linen is important because, in addition to linen soiled with blood and body fluids, linen from places such as operating theatres, labour wards and other procedural areas may sometimes contain sharp instruments and soiled dressings soaked with blood and body fluids. When sorting linen, heavy utility gloves, protective eyewear and plastic aprons should be worn. Any items found during sorting should be disposed of properly.

Laundering Linen

The following steps should be taken when laundering soiled linen:

- Wash heavily soiled linen separately from non-soiled linen.
- Use the washing machine's time cycle according to the manufacturer's instructions.
- Water temperatures should be above 71°C.
- When the wash cycle is completed, linen should be checked for cleanliness and rewashed if still stained or dirty.

Storing, Transporting and Distributing Clean Linen

The following measures should be taken when storing, transporting and distributing clean linen:

- Store clean linen in clean, dry, closed storage cupboards.
- Use physical barriers to separate the folding and storage room from soiled areas.
- Clean and soiled linen should be transported separately in separate trolleys.
- Clean linen should be covered during transport to avoid contamination.

Laundry Staff

Good staff practices help reduce the risk of cross-contamination and prevent injury. Staff should:

- Receive adequate training in standard precautions, including hand hygiene;
- Understand the risks involved in carrying out other tasks in the laundry facility, such as food preparation or patient care, which should never be done in laundry areas;
- Receive education and training (and supervision, if appropriate) in the safe use of equipment and

machinery, and in safe work practices, including safe manual handling techniques;

- Wear appropriate protective clothing, and gloves when sorting laundry;
- Not eat or smoke in the laundry area;
- Not handle linen if they have exfoliative skin conditions (e.g. conditions where skin flakes off) or unhealed wounds or rashes, unless protective measures are adopted (such as covering wounds with bandages).

Handling of Linen When There is An Outbreak of an Infectious Agent or if a Patient is Placed on Transmission-based Precautions

The following measures should be undertaken when there is an outbreak of an infectious agent such as COVID-19 or when a patient is placed on transmission-based precautions [32] [33]:

- All individuals dealing with soiled bedding, towels and clothes from patients should wear appropriate PPE, including heavy-duty gloves, mask, eye protection (goggles or face shield), long-sleeved gown, and boots or closed shoes.
- Laundry staff must be trained in putting on and removing PPE.
- Staff should perform hand hygiene after exposure to blood or body fluids and after removing PPE.
- Soiled linen should be placed in clearly labelled, leak-proof bags or containers for collection by laundry staff, after carefully removing any solid excrement.
- The laundry area must be cleaned using a two-step clean, which involves a physical clean using detergent solution, followed by use of a chemical disinfectant (e.g. sodium hypochlorite 0.1%). The cleaning schedule and frequency should be intensified to include:
    1. A thorough wash of all hard surfaces and all frequently touched surfaces (e.g. door handles, furniture, light switches) with a solution of water and normal neutral detergent. Allow surfaces to dry and follow with:
    2. A second wash with sodium hypochlorite and water of all hard surfaces and all frequently touched surfaces (e.g. door handles, bedside rails, etc.).

The Effectiveness of the Laundering Process Depends on Many Factors, including:

- Time and temperature
- Mechanical action
- Water quality (pH, hardness)
- Volume of the load
- Extent of soiling
- Model/availability of commercial washers and dryers

Always launder soiled linens from patient care areas in a designated area, which should:

- Be a dedicated space for laundering soiled linen.
- Not contain any food, beverage or personal items.
- Have floors and walls made of durable materials that can withstand exposure to large quantities of water and steam.

4.1.7 Safe Handling of Health-Care Waste

Health-care waste is all waste generated from all health-care facilities, including hospitals, health centres, nursing stations, laboratories and blood banks.

Safe waste disposal helps to:

- Prevent the transmission of infection from health-care workers (who handle the waste) to the local community;
- Protect those who handle waste from accidental injury;
- Prevent open piles of waste that can become breeding ground for flies, other insects and rats, which carry diseases;
- Prevent build-up of waste, which may pose fire hazards;
- Provide a more pleasant atmosphere (uncollected waste causes foul smells and is unsightly).

The key to effectively managing health-care waste is segregation (separation) and identification. Segregation is the responsibility of the waste producer and should take place as close as possible to where the waste is being generated. Health-care waste should be categorised and placed into colour-coded bags or bins.

Categories of Health-Care Waste [34]

General waste

General waste includes waste that does not carry harmful microorganisms. Examples of general waste include kitchen refuse, paper waste, boxes, and bottles and plastic containers that store products used by the hospital or clinic.

Infectious and/or clinical waste

Infectious waste is solid and/or liquid waste, potentially carrying harmful microorganisms likely to cause infection among patients, health-care workers or people in the community. Infectious waste may be solid, liquid or laboratory waste. Examples include used dressings, gauze or other items contaminated with blood, pus, faeces, urine, blood or other body fluids; human tissue; body parts; paper specimen collection cups; and pathology samples.

Pathological waste

Pathological waste refers to human materials removed during surgery, labour or delivery; autopsy; embalming; biopsy, including body parts, tissues and fetuses; products of spontaneous or induced human abortions, regardless of the period of gestation; organs; and bulk blood and body fluids. Pathological waste also includes laboratory specimens of blood and tissue after completion of laboratory examination.

Sharps

Sharps include needles, lancets, hypodermic syringes with attached needles, scalpel blades, razor blades, glass pipettes, broken glassware, intravenous spikes, and any other sharp object with the potential to penetrate intact skin.

Pharmaceutical and cytotoxic wastes

- Pharmaceutical and cytotoxic wastes include expired, unused, spilt and contaminated pharmaceutical products, drugs and vaccines that are no longer required and need to be disposed of appropriately. This category of waste also includes discarded items used in the handling of pharmaceutical supplies, such as bottles and boxes with residues, gloves and masks, connecting tubing and drug vials.
- Unused expired pharmaceuticals are sent to Rarotonga for disposal in the hospital-grade medical incinerator.

Key Technical Steps for the Management of Health-Care Waste

All medical waste produced by health care facilities should be: (i) segregated; (ii) stored; (iii) collected safely in designated containers and bags; and (iv) treated and finally disposed of through a safe waste-disposal system.

1. **Segregation** – Waste must be segregated at source into infectious/clinical waste and general waste. Infectious/clinical waste should be further segregated into at least the following: (i) infectious/clinical waste, such as blood, body parts and body fluids; (ii) sharps and syringes; and (iii) pharmaceutical waste, both liquid and solid, and expired or damaged drugs and medicine.
2. **Storage** – Once segregated, all health-care waste should be temporarily stored or kept in proper colour-coded storage bags, containers or boxes, and labelled to avoid mixing medical waste with general waste. The waste storage area must be fenced and always kept locked. General waste that is mixed with medical waste should be considered as medical waste and should follow the medical waste stream.
3. **Collection and transport** – Waste is stored in bags and placed in clearly labelled rubbish bins and collected by Facilities and Maintenance staff, Monday to Friday at 1 pm. A dedicated vehicle is available for the collection of waste from the various locations at Rarotonga Hospital, Tupapa Primary Care, Oral Health, Community Health, and Planning and Funding offices, and transported to the hospital waste management facility compound.

   General waste is taken to the Arorangi Waste Management Facility. Hospital clinical waste is incinerated from Monday to Friday. Facility and Maintenance staff are rostered during public holidays for the collection of hospital clinical waste and general waste.

   Hospital clinical waste is incinerated during public holidays. However, general waste collected at Rarotonga Hospital, Tupapa Primary Care, Oral Health, Community Health Services, and Planning and Funding, is kept locked within the incinerator compound and taken to the Arorangi Waste Management Facility the next working day. The Arorangi Waste Management Facility is closed during public holidays.
4. **Final disposal** – This is the final journey for waste. On Rarotonga, a containerised medical-grade incinerator is available for incineration of infectious/clinical waste and used sharps, while general waste is taken to the Arorangi Waste Management Facility.
5. **A pit** is also available for the disposal of ash from the incinerator. In the Outer Islands, a hole is dug for the disposal of waste.
6. **Various systems and technologies** are available, including thermal and non-thermal systems. The most common technology for thermal treatment is incineration. Non-thermal technology includes microwaves, autoclaves or controlled or engineered landfill.

Minimum Standard for Segregation, Storage and Transport

The minimum standard for segregating health-care waste is the three-bin system: separate containers are provided for infectious/clinical waste, used sharps, and general waste. The basic features of a minimal level of waste segregation and storage are as follows:

- Waste is segregated at the place of production to reduce health risks from smaller, potentially infectious materials (typically, waste items contaminated with body fluids, and used sharps).
- Infectious/clinical waste, general waste and used sharps waste are stored in separate colour-coded containers and locations within medical areas, and subsequently at a central storage site at the health-care facility.
- Central storage area(s) are fenced, lockable and isolated from patients and the public.
- In a warm climate, the storage times are 48 hours during the cooler season and 24 hours during the hot season.
    - Staff should receive instructions on three-bin waste segregation and safe handling and storage of health-care waste.
    - Staff should be aware of how to protect themselves from injuries and infection from waste.
    - Waste containers and storage areas should be cleaned regularly.

Minimum Standard for Transporting Health-Care Waste

- Waste containers and onsite transport trolleys are closed with lids to isolate wastes from patients and the public.
- When waste is transported offsite for disposal, the vehicle must be able to carry the waste in a closed or covered container, and the driver must know what to do if there is an accident or incident during transportation on a public road.
- Transport staff are vaccinated at least against hepatitis A (if available) and hepatitis B, and tetanus.
- Rubbish bins with lids are used and clearly labelled to isolate wastes from patients and the public.
- Waste is collected Monday to Friday at 1 pm from various locations at Rarotonga Hospital, Tupapa Primary Care, Oral Health, Community Health Services and Planning and Funding. General waste is taken to the Arorangi Waste Management Facility every day from Monday to Friday. All Facilities and Maintenance staff have been trained to operate the medical-grade incinerator.
- Waste containers, trolleys and vehicles are maintained and cleaned daily after every use.

In emergency situations, all waste from patients arriving at a health-care facility could be classified as potentially infectious to minimise the transmission of secondary infection.

Waste Segregation

The key to effectively managing health-care waste is segregation (separation) and identification. Segregation is the responsibility of waste producers and should take place as close as possible to where the waste is generated. Health-care waste should be categorised and placed in colour-coded bags or bins as follows:

- **Sharps:** Dispose of in puncture-proof containers so they do not cause injury and infection. These items can potentially spread viruses such as HIV, HBV or COVID-19. Sharps containers should be colour-coded red or yellow or, at a minimum, have an INFECTIOUS SHARPS sticker placed on the container.
- **Pharmaceutical waste:** Collect in separate containers.
- **Infectious/clinical/pathological waste:** Collect in separate containers, such as heavy duty yellow or red plastic bags, with an INFECTIOUS logo on them.
- **General waste:** Collect in separate containers, such as brown paper bags or blue plastic bags, and place in clearly labelled rubbish bins with lids for collection.

Procedures for Handling Infectious / Clinical Waste Bags

- Check that waste storage bags and containers are effectively sealed. Bags should be picked up by the neck only. They should be placed down in such a way that they can again be picked up by the neck for further handling. Waste bags should be manually handled as little as possible.
- Bags should not be held against the body, nor should collection staff attempt to carry too many bags at a time.
- Avoid letting the bag come into contact with the body when being carried. A needle stick is the most likely hazard for the person collecting the waste bag. Hypodermic needles that are not properly segregated into correct sharps containers can cause this type of injury.
- Sharps have been known to pierce the sides and bottom of polypropylene containers. These containers should be picked up and carried by the handle provided. The other hand should not be used to support the bottom of the container. Sharps and expired pharmaceuticals are shipped from the Outer Islands to Rarotonga for disposal.
- Avoid puncturing or damaging waste bags, and do not throw or drop them.
- Ensure that infectious wastes are not mixed, and that bags are stored in designated storage areas within the waste management facility.
- Protective clothing should be worn during all waste-handling operations.
- Transport all waste bags directly to the designated central storage for disposal.
- Bags of hazardous medical waste and bags of general waste should not be mixed at any time but should be segregated throughout handling. Hazardous waste should be placed only in specific storage areas.

Note: If infectious/clinical waste is accidentally placed in general waste, the entire quantity of waste must be treated as hazardous.

Procedures for Handling Sharps Waste

- Wear thick work gloves when transporting sharps containers to the incinerator to prevent injury.
- Ensure that the sharps container lid is closed or sealed with tape before transporting it to the final disposal site.
- Wash hands after handling sharps containers.

Procedures for Handling Solid Infectious Waste

- This waste should be put in separate clinical waste bins that have a lid and are lined with a plastic bag with no holes. Bins should be labelled INFECTIOUS WASTE, NO SHARPS.
- Place the bins in places where they will be needed.
- Wear thick gloves when handling and transporting waste.
- Collect bins daily, or more often if needed, and transport to final disposal site.
- Clean up all spills immediately with a broom and shovel, and clean the area with a neutral detergent.
- Each day, wash waste bins with soap and water.
- Wash hands after handling waste bins.

Procedures for Handling Liquid Infectious Waste

Examples of liquid clinical waste include blood, urine, faeces, pus, sputum, spinal and peritoneal fluids, and pathology specimens. Proper disposal of liquid clinical waste helps to prevent the spread of microorganisms from contaminated waste to staff, patients and the community.

Procedures for the Disposal of Liquid Clinical Waste

- Wear thick work gloves when handling and transporting liquid clinical waste.
- Wear eye goggles to protect the eyes from splashes.
- Carefully pour blood, urine or other body fluids directly into a toilet or utility sink drain. Avoid splashing.
- Rinse the sink or toilet carefully and thoroughly with water.
- When stool or sputum is collected in paper specimen cups, treat as clinical solid waste.
- Wash hands after handling liquid waste.

Procedures for Handling Laboratory Waste

Examples of laboratory waste include used culture plates, specimen containers and specimens. The proper handling of laboratory waste helps to prevent the spread of microorganisms from microbiology laboratory waste and other specimens to staff, patients and the community.

These wastes should be stored in a separate plastic bin with a yellow or red plastic bin liner labelled (in black) BIOHAZARD WASTE.

Procedures for Disposing of Laboratory Waste

- Autoclave all Petri dishes and test tubes that have been used to grow microorganisms before disposal.
- After sterilising, discard disposable Petri dishes and test tubes into a bin marked CLINICAL WASTE.
- After sterilising, remove the culture media from reusable Petri dishes and test tubes and discard into a CLINICAL WASTE bin.

- Wash and dry reusable Petri dishes and test tubes.
- Collect CLINICAL WASTE bins daily, or more often if needed.
- Each day, wash bins with soap and water.
- Wash hands after handling bins.

Procedures for Handling General Waste and Controlling Pests

Garbage should be removed at least twice daily and no garbage should be left in kitchen areas overnight. Not only are many common pests capable of transmitting infection, but the sight of insects and pests in the hospital environment can be very disturbing to patients, staff and visitors alike. It is, therefore, a basic requirement of the hospital cleaning programme that adequate attention be paid to preventive and protective measures designed to minimise this form of cross infection. The following elements are essential in any effective programme for the control of pests in a hospital:

- Environmental spraying for pest control and laying of rat bait conducted every quarter.
- Thorough, constant cleaning of all potential areas of infestation.
- Regular, careful inspections for evidence of pests.
- Storage of waste and garbage in water-tight containers.
- Thorough cleaning of all garbage containers after use.
- Daily removal of all stray garbage not placed in the correct receptacles.
- Proper storage of all goods and supplies likely to attract pests.

Collection of Healthcare Waste

To prevent open piles and scattering of rubbish, bins must be placed in places where they are easily accessible. Signs on general waste containers should read:
GENERAL WASTE – NO CONTAMINATED/INFECTIOUS WASTE, NO SHARPS

Procedures for Disposing of General Waste

- Collect waste in leak-proof bins.
- Place bins in convenient locations so they will be used.
- Encourage patients to use the bins.
- Provide separate containers for non-burnable waste such as bottles and cans.
- Wear thick work gloves when handling and transporting waste. This will help to prevent injury.
- Collect bins daily, or more often if needed, and carry to the waste area for incineration or for collection by municipal authorities. A trolley may be used to help transport waste from the hospital to the incinerator.
- Clean up all spills immediately with a broom and shovel and wash the area with soap and water.
- Wash all rubbish bins with soap and water daily.
- Wash hands after handling rubbish bins.

Safe Collection of Infectious Waste in the Health-Care Facility

Collection times should be fixed and appropriate to the quantity of waste produced in each area of the health-care facility.

- Collection should be daily for most types of waste.
  - Operating theatres generate a high proportion of potentially infectious waste and could have several collections during the day to fit in with the schedule of operations.
  - Child and maternal health clinics might primarily generate sharps waste from injections, which should be collected at the end of each working day.
- General waste should not be collected at the same time or in the same trolley as infectious or other hazardous wastes.

Offsite Transport of Waste

- Offsite transport is the carriage of health-care waste on public streets away from a health-care facility.
- Offsite transport of hazardous health-care waste should comply with national regulations.
- **Any vehicle used to transport health-care waste should fulfil the following design criteria:**
  - The body of the vehicle should be of a suitable size in proportion to the design of the vehicle.
  - There should be a bulkhead between the driver's cabin and the vehicle body, which is designed to retain the load if the vehicle is involved in a collision.
  - There should be a suitable system for securing the load during transport.

Minimum Standard for Treatment and Disposal of Health-Care Waste

Hazardous health-care waste should be treated to reduce the potential for harm. Hence, segregation of waste must be strictly observed.

In extreme circumstances **where no treatment is possible,** the options below may be implemented but should be considered as transitional, interim solutions.

- **Small health-care facilities**
  - Hazardous health-care waste can be buried within the premises of the facility where public access can be restricted.
- **Larger health-care facilities**
  - Should have arrangements with a local landfill to provide a special cell or pit, daily soil cover, and restricted access.
- **Disinfection using a commonly available disinfectant such as sodium hypochlorite**
  - Except for sharps waste, disinfected waste can be disposed of with regular municipal solid waste.
- **Disposal of specific infectious/clinical waste**
  - Sharps waste:
    - A well-designed sharps pit is a minimum option.

- Can also use encapsulation, inertisation, and land disposal. Even after decontamination, sharps waste may still pose physical risks. There may also be risk of reuse. Decontaminated sharps waste can be disposed of in safe sharps pits on the health-care facility premises, or encapsulated by mixing the waste with an immobilizing material, such as cement, before disposal. These procedures are only recommended in cases where the waste is handled manually and the landfill for general waste is not secured.

- Pathological waste:
  - Placenta pits can be effective but need to be located at specific sites to avoid contamination of groundwater, and must be locked and fenced for security.
  - Can be buried in cemeteries or approved burial sites.
- Pharmaceutical waste:
  - Encapsulation, inertisation and land disposal could be used for some pharmaceutical and chemical waste.

Methods of Health-Care Waste Disposal

Steps must be taken to ensure that scavenging does not take place at hospital waste storage sites as this could be detrimental to health. The waste storage shed or area must be kept locked at all times when not attended, and care should be taken to ensure that only properly prepared and non-hazardous waste is disposed of through the municipal garbage disposal system.

Disposal of General Non-Hazardous Waste

General non-hazardous waste should not be disposed of on the premises of health-care facilities. Non-hazardous waste should be collected regularly by the municipality or transported by the facility to a known and safely managed public disposal site.

Hazardous Medical Waste Disposal Options [35]

- **Incineration:** If incineration is the preferred option, the burning temperature must be high (850°C to 1500°C) to avoid production of dioxins and furans. The best available technology should be used to achieve an emission of lower than 0.1 ng toxic equivalents (TEQ7)/m³ of dioxins and furans). This could be achieved by using dual chamber incineration (850°C/1100°C) with an auxiliary burner, two seconds' residence time of air in the second chamber, sufficient oxygen content, and high turbulence of exhaust gases.
  - The containerised hospital incinerator is in an enclosure and used only by trained operators.
  - The incinerator must be operated in accordance with the manufacturer's instructions.
  - Incineration equipment must be kept in good working condition and be serviced regularly in accordance with the manufacturer's instructions.
  - Procedures must be in place to manage incomplete incineration and disposal of waste.
- **Steam-based treatment technologies:** Steam-based treatment technologies are used to disinfect/sterilise infectious waste and sharps waste by subjecting it to moist heat and steam for a defined period of time, depending on the size of the load and the content. The combined action of saturated steam and heat kills microorganisms.

- **Autoclaving:** Autoclaving, the most common type of steam treatment, utilises saturated steam under pressure to decontaminate waste. Potential infected air evacuated from the autoclave is filtered effectively (e.g. through a high-efficiency particulate air filter). Autoclaves operate at temperatures of 121°C to 134°C.
- **Microwave:** Microwaving technology heats the water contained in the waste by microwave energy. Some microwave-based devices include transformation systems, such as blending or shredding.
- **Frictional heat treatment:** This treatment is based on friction and grinding of the waste in a moist environment. The treatment process takes place inside a chamber containing a high-speed rotor. The temperature rises to 150°C and is held for the time necessary to achieve sterilisation. When all the liquid contained in the waste has evaporated, it is brought to dry, superheated conditions. The residue is a dry and unrecognisable product with reduced volume.
- **Land disposal:** When wastes are buried, certain requirements must be met so that children, scavengers and animals cannot dig up the waste.

Note: Sharp objects may not be destroyed by burning and may later spread tetanus infection. Dispose of all sharp objects by putting them underground, even after burning.

Procedures for Making and Using an Underground Waste Disposal Site

1. **Select a site that:**
    - Is at least 50 metres (150 feet) away from any water source, to prevent contamination of the water supply;
    - Has proper drainage, is located downhill from any wells, and is free of standing water; and
    - Is not in an area that floods.
2. Dig a pit 1 metre (3 feet) wide and 2 metres (6 feet) deep. The bottom of the pit should be 2 metres above the water table.
3. Fence in the site to keep animals, scavengers and children away.
4. Wear heavy gloves when handling waste buckets.
5. Empty buckets of non-burnable waste into the pit every day.
6. Cover the waste with a thin layer of earth each day. The final cover should be at least 10 centimetres deep.

Note: General waste is the only waste that is taken to the Arorangi Waste Management Facility.

Disposal Options in Emergency Situations

- In an emergency and where no treatment is possible, the safe burial of infectious and sharps waste on health-care facility premises or in a protected concrete pit may be the only viable option available. Open dumping of boxes/bagged waste should be avoided.
- Pharmaceutical waste and chemical waste should be stored until a safe disposal option has been identified.

4.1.8 Safe Re-Processing of Reusable Equipment and Instruments

Used instruments and equipment can be a reservoir for infectious agents, and can therefore transmit avoidable HAIs to patients. Sterilisation and decontamination of medical instruments and devices play a crucial role in the prevention of health-care associated infections. All instruments must be cleaned with neutral detergent, rinsed and dried before disinfection or sterilisation [36].

Criteria for Disinfection and Sterilisation

In 1968, Earl Spaulding established the first criteria for minimum levels of disinfection or sterilisation required for the three different categories of medical/surgical devices based on their potential to transmit infections (Table 4.3) [37].

TABLE 4.3: Methods for Disinfecting / Sterilising Instruments and Equipment Depending on their Application

Device Classification	Patient Contact	Type of Processing and Minimum Level of Disinfection	Example of Items
Critical	Enter sterile tissues in the body, the vascular system, or equipment through which blood flows.	***Pre-cleaning and sterilisation***	Surgical instruments, e.g. dressing trays, etc., diagnostic catheters, dental instruments, bronchoscopes, cystoscopes.
Semi-critical	Items that come into contact with intact mucous membranes or non-intact skin.	***Pre-cleaning and high-level disinfection***	Respiratory therapy equipment, dental impressions and other prosthetic appliances, gastroscopes, vaginal probes, colonoscopes, endoscopes, ultrasound probes.
Non-critical	Instruments that come in contact with intact skin.	***Low level or intermediate disinfection*** Clean with a neutral detergent or 70% ethanol, or use more rigorous cleaning and disinfection, especially when suspected of contamination, e.g. with vancomycin-resistant ***enterococcus.***	Bedpans, ECG leads, thermometers, sphygmomanometers and cuffs, stethoscopes, beds, bedside tables, pulse oximeters, patient trolleys and wheelchairs, etc.

Cleaning and Pre-Cleaning [36]

Proper pre-cleaning and cleaning are essential first steps. They include friction or rubbing the equipment to remove dirt, using detergent to suspend the dirt, and ensuring the equipment is exposed to the detergent. If a device is not clean, it cannot be disinfected or sterilised.

Effective cleaning and pre-cleaning of devices often requires chemicals, combined with mechanical action and heat. It can be performed manually or with machines. Manual pre-cleaning requires using detergents or enzymes with friction (rubbing, brushing, flushing) to remove soil from the outside and inside of the items being re-processed.

After cleaning or disinfection, items must be rinsed and flushed thoroughly to remove any chemical residues and then dried as recommended by the manufacturer. The cleaning solution must be appropriate for the type of equipment or instrument. Enzymes, usually proteases, are added to solutions to neutralise the pH solutions to aid in removing organic material such as blood and pus. Additionally, lipases (enzymes to act on breaking down fats) and amylases (enzymes to act on breaking down starch) are added to solutions.

Note: Enzymes are not disinfectants and should be rinsed off instruments.

Transfer of Used Equipment from Wards / Units to Autoclave Room

- Wear appropriate PPE for protection.
- Remove any linen and disposable items and dispose of these items appropriately.
  - Sharps, such as knife blades and needles, should be correctly discarded in the SHARPS container.
  - Segregate sharps that can cause injury to health-care workers.
- Remove gross soil from instruments by wiping with a clean damp cloth. Pre-cleaning (e.g. soaking or spraying) prevents soil from drying on devices and makes them easier to clean.
- Cleaning products used should be appropriate for medical devices and approved by the device manufacturer.
- If detergent-based products are used, ensure that they are mixed to the correct dilution.
- Avoid prolonged soaking of devices.
- Do not use saline or sodium hypochlorite as soaking solutions as they damage some medical devices.
- Contaminated items should be contained in dedicated, fully enclosed, leak-proof and puncture-proof containers prior to transport.
- **Soiled instruments should be opened and kept moist as follows:**
  - Spray with an enzymatic spray.
  - Cover with a moist towel with water (not saline) or foam, spray, or gel specifically intended for this purpose.
  - Do not transport in containers with water as water is a splash hazard.

SOAKING OF INSTRUMENTS IN DISINFECTANT PRIOR TO CLEANING

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

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

For effective cleaning, it is essential that detergents are prepared at the concentration recommended by the manufacturer/supplier. To achieve the correct concentration, the correct volume of concentrated detergent has to be added to the correct volume of water at the correct temperature. The following calculation can be used:

$$\textbf{\textit{Volume of detergent or chemical (supplied)}} = \frac{\textbf{\textit{concentration required x capacity of the sink/bowl (in ml)}}}{\textbf{\textit{Concentration supplied}}}$$

For example, if a 1% solution of detergent is required and the sink/bowl capacity is 10 litres (10,000 ml) and the concentration supplied is 100%: volume of supplied detergent = $\frac{1 \times 10{,}000}{100} = 100$

Therefore, 100 ml is used and made up to 10 litres to achieve a 1% solution. The detergent does not have to be measured precisely each time, but a fill line can be placed on the sink/bowl and a galipot or jug used to measure the detergent [36].

DO'S and DON'TS of Cleaning

DO

- Ensure detergent is prepared at the correct concentration and temperature and used for the recommended contact time;
- Keep instruments moist, and clean as soon as possible after the procedure;
- Disassemble instruments prior to cleaning;
- Open hinged/jointed instruments to ensure access to all surfaces;
- Use appropriate-sized brushes to clean lumened items;
- Use soft bristle brushes to clean serrations and box locks;
- Inspect instruments after cleaning to ensure they are completely cleaned;
- Clean instruments under the surface of the water to reduce the risk of aerosol production;
- Follow the manufacturer's instructions for the cleaning of all medical devices. This information is in the instruction manual. If not available, check with your biomedical engineer.

DON'T

- ⊗ **Use metal brushes or any abrasive item when cleaning instruments;**
- ⊗ **Clean instruments under running water because this can produce aerosols;**
- ⊗ **Submerge power equipment or electrical items (unless they have a waterproof cap);**
- ⊗ **Use a detergent that is not intended for medical devices.**

Disinfection [36] [38]

Disinfection means to reduce the number of pathogens on an inanimate surface or object by using heat, chemicals, or both. Most disinfection procedures have little activity against bacterial spores; any reduction in the spore load is mainly achieved by mechanical action and flushing [38].

Chemical Disinfectants

The most common disinfectants are glutaraldehyde, chlorine and chlorinated compounds, formaldehyde, and alcohol (ethanol or isopropanol), which is commonly used at concentrations of 60%–90%. Disinfectants are placed into three categories depending on their microbicidal activity (Table 4.4).

TABLE 4.4: Disinfectants and Their Uses

Level of Disinfectant	Chemical	Activity	Uses	Time	Comments
High-level disinfectants (HLD)	Ortho-phthalaldehyde solution 0.55% (e.g. Cidex®)	Active against vegetative bacteria, viruses (including non-enveloped ones), fungi, and mycobacteria	Disinfecting heat-sensitive and semi-critical devices such as flexible fibreoptic endoscopes	At least 20 minutes of contact time for disinfection	Items require thorough rinsing with sterile or filtered water to remove any chemical
Low to Intermediate	Ethanol or isopropanol is commonly used at concentrations of 60% –90%	Active against vegetative bacteria, mycobacteria, fungi, and most viruses. May fail to kill spores, even after prolonged exposure	Used to disinfect physically cleaned hard surfaces or equipment, and as a skin disinfectant	Alcohol evaporates so no rinsing to remove residues is required	Alcohol is not sporicidal and should not be used for hand disinfection when ***Clostridium difficile*** is known or suspected

Level of Disinfectant	Chemical	Activity	Uses	Time	Comments
Low to high level disinfection	Sodium hypochlorite (bleach) or as a solid (calcium hypochlorite or sodium dichloroiso-cyanurate [NaDCC]). NaDCC tablets	Broad spectrum of antimicrobial activity (including bacterial spores)	Decontamin-ation of environment and shared equipment following infectious cases, and of other items	> 30 minutes	Corrosive to metal, damaged plastic, rubber and similar components. Can cause irritation of the mucous membranes, skin, eyes and lungs, especially if used frequently in poorly ventilated areas

Keep the following points in mind when using chemical disinfectants:

- Material safety data sheets must be provided and made available for all cleaning chemicals and updated when a change occurs, or every 3–5 years.
- The efficacy of chemical disinfection is often uncertain and difficult to control/standardise, so wherever possible, disinfection by heat is preferable to chemical methods.
- All chemical disinfectants must be clearly labelled and used within the expiry date. They should be freshly prepared and used at the correct concentration and stored in an appropriate container.
    - Chemical disinfectant solutions must not be mixed or detergents added unless they are compatible.
- Disinfectant or detergent solutions must not be prepared and stored in multi-use containers for occasional use. Solutions prepared and stored in this manner can become contaminated with microorganisms. Use of such solutions will contaminate a surface rather than clean it.
- Disinfectants can be corrosive and can damage fabrics, metals and plastics. Consult the manufacturer's instructions on the compatibility of materials with the method of sterilisation or disinfection.

Sterilisation of Reusable Medical Devices [36] [37]

Sterilisation is required for devices in the critical category of the Spaulding classification (a device that enters sterile tissue or the vascular system). Sterilisation is the only process that destroys all forms of microorganisms, including those that cause tetanus and gangrene (these spore-forming microorganisms are very hard to kill).

Sterilisation methods

The most common sterilisation method used in Cook Island health-care facilities is **steam sterilisation** (autoclave).

Steam sterilisation is a process that uses saturated steam under pressure as the sterilant. It is the preferred method for sterilising critical medical devices. The removal of air is essential to ensure an efficient sterilisation process – sterilisation cannot occur in the presence of air.

Assembling Medical Devices for Sterilisation

When preparing devices for packaging and sterilisation, it is essential that all surfaces are presented to the sterilisation media (i.e. steam). It is equally important that devices to be sterilised are disassembled and presented in this state:

- Devices with ratchets should be closed on the first ratchet only to ensure that steam can penetrate to all surfaces.
- Similar devices should be kept together when placing them on the tray, e.g. artery forceps can be placed together with a device pin.
- The device tray should be selected so that devices can be placed in one single layer.
- Tray liners should be placed on the base of the surgical tray.
- Devices should be spread evenly by weight over the tray surface; this helps to prevent condensate flowing together.
- Each device should be checked against the surgical list specific to the tray being assembled.
- Plastic items should be evenly placed in the tray; avoid placing them in one section of the tray.
- Ensure that sharp devices are assembled correctly to avoid penetration of the outer packaging and overheating.
- Protectors placed on sharp devices should be validated for steam penetration.
- Ensure that delicate devices are placed on the tray in a manner that will not cause damage to them.
- Any device missing from a tray should be reported to the supervisor for further action, and non-conformance documented.
- A dedicated person should be solely responsible for operating the autoclave machine – to ensure trays are stacked properly.

Packaging Materials

Examples of packaging materials:

- Woven or non-woven textile wrappers.
- Rigid sterilisation containers.
- Paper/plastic pouches (peel packs) – items may be wrapped and placed in paper/plastic peel-pouches based on what they are and the manufacturer's instructions for use.

Sterilisation wraps, including bleached crepe paper and wraps combining cellulose and synthetic fibres, are

commonly used packaging materials for steam, dry heat and ethylene oxide gas sterilisation. They are permeable to steam, air and chemical vapours and provide an effective barrier if the packs are stored in clean, dry conditions. Medical-grade paper is free from loose particles, but frees particles if packs are opened by tearing, cutting or by opening using a fibre tear seal.

It is important that sterilisation wraps are used in accordance with the manufacturer's recommendations. The use of double paper-based sterile barrier systems (PSBS) is not recommended as a wrapping method as this increases the probability that the steam may not penetrate the packing material.

Rigid reusable containers

Rigid reusable containers are used for moist heat sterilisation of large sets of surgical instruments. They are made from diverse metals, aluminium, high-density polymers, or metals and plastic in combination. Perforations in the base and lid are lined with a steam-permeable HEPA material. Containers should be properly loaded in terms of density to avoid problems of moisture retention and increased drying times. After use, containers should be disassembled, cleaned by washing with detergent and water, and dried before sterilisation. Routine inspection and maintenance are essential to ensure their ongoing effectiveness. Container systems must be validated before use.

Reusable fabrics

Reusable woven cotton or cotton/polyester material can be used for heavy packs that are sterilised in pre-vacuum or downward displacement steam sterilisers. They are less resistant as a bacterial barrier than sterilisation wraps.

Two layers of reusable fabrics, with the textile configured as an inner wrap, should always be used, or one layer of reusable fabric and one disposable sterilisation wrap. Defects in the fabric, such as holes and threadbare patches, render the wrap ineffective. All reusable fabric outer wraps should be of double thickness. The performance of reusable fabrics (cotton or polyester/cotton materials) as microbial barriers is not as good as the many single-use sterilisation wraps. However, reusable fabric wraps should maintain sterility for several weeks under clean, dry storage conditions.

SOPs for inspecting reusable fabrics (woven cotton/polyester materials) for holes should be carried out daily. Fabrics must be replaced if damaged.

Recommendations for Packaging Material

Recommended

- Sterilisation wraps made from cellulose fibres, and non-woven wraps made from a combination of cellulose and synthetic fibres, may be used. Both types are suitable for porous-load steam sterilisation and most gas processes because they are permeable to air, steam and other gases.
- Rigid reusable sterilisation containers should be suitable for the method of sterilisation used and compatible with the cleaning method and cleaning agent.
- Transparent pouches should be placed paper to plastic for sterilisation. Single instruments only should be packed in pouches.

Not Recommended

- Metal (sterilisation) drum trays with holes that can be opened and closed manually. These do not guarantee sterility of the contents. Instead, use rigid reusable sterilisation containers.
- Newspaper, brown paper bags and other products that do not allow air removal or penetration of steam.
- Recycled packaging materials because these have lost their integrity and the bacterial barrier, and do not allow adequate air removal or steam penetration.

Labelling

Packages to be sterilised should be labelled before sterilisation. Label information should include:

- Name of the product
- Name of the wrapper
- Expiry date and/or sterilisation date
- The word 'sterile' where appropriate
- Load number

Monitoring the Sterilisation Cycle

Monitoring each sterilisation machine and every cycle is essential to ensure the sterility of re-processed medical devices (Table 4.5). Monitoring methods include:

- Physical (use of notebook)
- Chemical (internal and external indicators)
- Biological

TABLE 4.5: Sample Record for Each Cycle

Date	Autoclave Number	Load Number	Start Cycle	Start Sterilization Time	Start Sterilization Time	End cycle Time	Signature

Steam sterilisers come in many different sizes, and steriliser cycles can vary among manufacturers. The cycle that a steriliser runs can typically be found in the steriliser manual.

Table 4.5 lists the standard cycle parameters of the Association for the Advancement of Medical Instrumentation & Association of Peri-Operative Registered Nurses (AAMI ST79, AORN) for packaged instruments. The cycle selected should be appropriate for the device(s) being sterilised according to the medical device manufacturer's IFU for sterilisation [37].

TABLE 4.6: Standard Cycle Parameters for Steam Sterilisation

Cycles of Sterilizer	Temperature	Exposure Time	Drying Time
Gravity	121°C / 250°F	30 minutes	15–30 minutes
Gravity	132°C / 270°F	15 minutes	15–30 minutes
Gravity	135°C / 275°F	10 minutes	30 minutes
Dynamic Air Removal	132°C / 270°F	4 minutes	20–30 minutes
	135°C / 275°F	3 minutes	16 minutes

Source: The Joint Commission 2016.

Immediate Use System Sterilisation (IUSS) / Flash Sterilisation

Note: The use of flash sterilisation is not best practice for sterilising medical devices. It should only be used for emergency sterilisation of critical devices that are heat and moisture tolerant. It should not be used for implantable devices or complete sets.

The following measures should be in place to monitor the use of flash sterilisation:

- Sterilisation should be monitored with biological indicators (at least daily), chemical indicators (each package), and physical indicators (each cycle).
- Biological indicator testing should include each type of cycle and load configuration (e.g. open tray, enclosed container, single wrapper) to be used that day.
- Cycles must be documented in such a way that the IUSS device can be linked to the patient on which it was used if there is an adverse sterilisation event, e.g. failed biological indicator.

Table-Top Sterilisers

The table-top model is the most frequently used steam steriliser in dental and rural clinics. These sterilisers are designed for small instruments, such as dental instruments, and are not recommended for any lumen instruments. The ability of the steriliser to reach the physical parameters necessary to achieve sterilisation should be monitored by mechanical, chemical and biological indicators. Ensure that items or packs removed from the steriliser are visibly dry as moisture will wick contaminants into the package contents. Unwrapped items are vulnerable to contamination.

Biological and Chemical Indicators Must be Used for Routine Monitoring of Autoclaves [38] [39]

Biological indicators (BI) contain the spores of the bacterium Geobacillus stearothermophilus. Commercially-available spore strips or vials containing the spores are strategically placed in the load to be sterilised. After a cycle, the BI are cultured or evaluated for growth; they must all indicate no growth to declare the sterilisation process a success. Follow the manufacturer's instructions.

Chemical indicators (CI) are used to assess whether the required time and temperature were attained during the sterilisation process. One type of CI is an autoclave tape that can be affixed to the outside of a package; it shows a colour change if the package was exposed to heat. **Though CIs are not meant to indicate that a**

product has been sterilised, they can help to detect equipment malfunctions and identify procedural errors.
High-vacuum process – For the high-vacuum process, steam penetration of the load depends on adequate air removal. This can be monitored in two ways:

1. A 'leak test' – Can the vacuum be maintained or will air leak in (often around the door)?
2. By the ability of steam to penetrate a small pack of towels (used in the 'Bowie Dick' test).

Should a steriliser fail the Bowie-Dick test, it should be stopped and fixed immediately.

Parametric release – An alternative monitoring approach is 'parametric release'. This system relies on ensuring that the autoclave cycle has fulfilled all specifications with regard to temperature, pressure, and time, using calibrated instruments in addition to, or in place of BIs. Since this approach is based on measurable data and calibrated equipment, the results tend to be more reliable and much more rapid than the use of BIs.

Bowie-Dick type indicator [37]

- For routine steriliser testing (dynamic-air-removal sterilisers only); should be run, within a test pack, each day in an empty steriliser before the first processed load.
- For steriliser qualification testing (dynamic-air-removal sterilisers only); should be run, within a test pack, following steriliser installation, relocation, malfunction and major repairs, and after sterilisation process failures. The test should be run three times consecutively in an empty chamber after BI tests.

4.2 Transmission-Based Precautions [40] [41] [42] [18]

Transmission-based precautions (TBP) are designed for use on patients who are diagnosed with, or suspected to have, a specific infectious pathogen transmitted by **contact, airborne or droplet routes, or a combination of these.** Whether used singly or in combination, TBP are always applied in addition to standard precautions. The application and combination of TBP depends on the infectious agent involved.

The aim of implementing TBPs is to prevent further transmission of the infectious agent.

Common Measures for TBP

- Continued implementation of standard precautions.
- Appropriate use of PPE, including gloves, apron or gowns, surgical masks or P2 respirators, and protective eyewear.
- Dedicated patient equipment.
- Allocation of single rooms, or cohorting of patients.
- Appropriate air handling measures.
- Enhanced cleaning and disinfecting of the patient environment.
- Restricted transfer of patients within and between facilities.

Apply TBPs:

- To patients who are symptomatic and suspected to have, or have a confirmed infection with a highly transmissible pathogen transmitted via contact, droplet or airborne routes;
- When a pathogen is considered important from an epidemiological point of view; and
- When medical interventions increase the risk of transmission of a specific infectious agent, such as an aerosol generating procedure.

For diseases that have multiple routes of transmission (e.g. COVID-19), more than one TBP should be applied. Whether used singly or in combination, TBPs are always applied in addition to standard precautions.

4.2.1 Contact Precautions [18]

Contact transmission of infectious agents is the most frequent mode of HAI transmission. Infectious agents are spread directly or indirectly from an infected or colonized individual by touch or contact with the patient, or the patient's environment (surfaces and equipment). Contact transmission occurs through:

- **Direct contact** – involving direct body surface to body surface;
- **Indirect contact** – involving contact by the health-care worker's hands with a contaminated surface or patient care equipment, or contact with contaminated gloves that are not changed between patients.

Transmission of infectious agents occurs via direct and indirect contact routes:
Organisms that require contact precautions include all multidrug-resistant organisms such as *MRSA, VRE,* Carbapenem-resistant ***enterobacteriaceae*** (CRE) ***C. difficile*** and ***Varicella zoster*** (shingles); and neonatal or mucocutaneous herpes simplex virus and enterovirus meningitis, etc.

Contact Precautions in Addition to Standard Precautions

- Ensure appropriate patient placement, with separate toilet and bathroom facilities:
  - Single room isolation, or cohorting of patients that are colonized or infected with the same organism in a dedicated area).
- Use PPE (gloves and gown) when in contact with the patient or patient's surrounding area.
- Use disposable or dedicated patient equipment (if dedicated patient equipment is not available – clean and disinfect equipment between uses).
- Ensure environmental cleaning and disinfection of the patient's room or unit.
- Ensure CONTACT PRECAUTIONS signage (Fig. 4.9) is placed on the patient's door to ensure that staff and visitors do not enter without appropriate PPE.

Transfer of Patients on Contact Precautions

If transfer of a patient within or between facilities is necessary, contact precaution measures should be adhered to during transfer. Contaminated PPE should be removed and disposed of, and hand hygiene performed before the patient is moved. Clean PPE should be put on before assisting the patient at the destination.

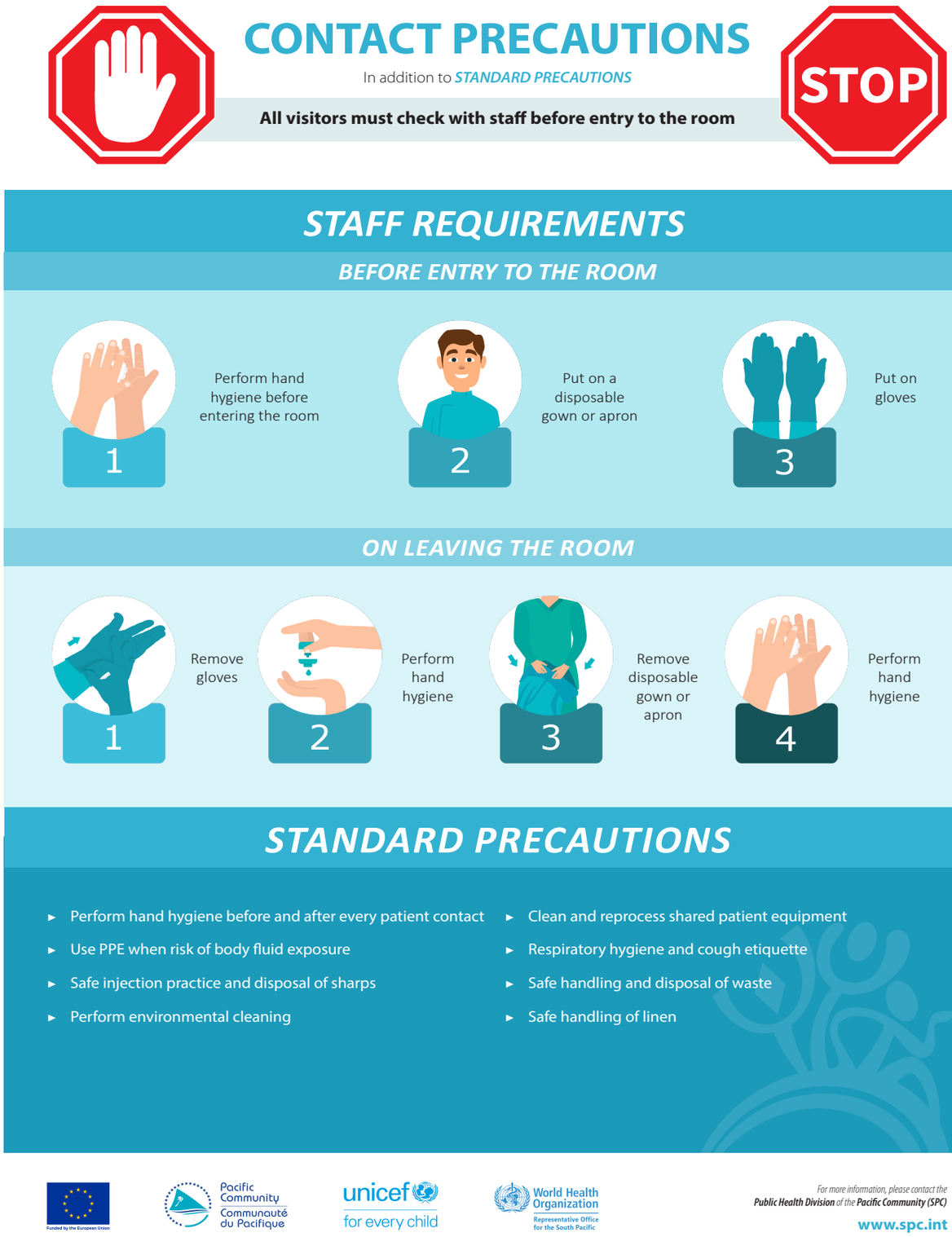


Figure 4.9: Contact Precautions Signage for Isolation Room (Source: SPC 2020.)

4.2.2 Droplet Precautions [17] [43] [18]

Droplet transmission occurs when droplets (>5 microns in size) are produced by sneezing, coughing, or even talking. The droplets can travel in the air for about 1 metre (3 feet) or less before falling. Additionally, transmission occurs when droplets containing infectious agents land on objects and surfaces around the infected person. The hands of health-care workers can become contaminated through contact with these surfaces.

Patients are placed on droplet precautions when they have a known or suspected infection transmitted by large respiratory droplets (larger than 5 µm in size). Droplet precautions are intended to prevent transmission of infectious agents spread through close respiratory or mucous membrane contact with respiratory secretions. Infectious agents for which droplet precautions are indicated include influenza, norovirus, pertussis and meningococcus.

Droplet Precautions

- Continue to apply standard precautions, including respiratory hygiene and cough etiquette.
- Patients should wear a surgical mask in waiting rooms and when outside the patient room.
- **Use of PPE:** Wear eye protection and a face mask or face shield that covers the eyes, nose, and mouth completely before entering the patient care area.
- **Patient placement:** Ideally, place the patient in a single room with ensuite bathroom and toilet facilities.
- In multi-patient rooms, waiting rooms, or similar areas, separation between patients (chairs or beds at least 1 metre [3 feet] apart) and use of a physical barrier, such as a curtain or divider, are especially important to prevent transmission by droplets.
- **Cleaning:** Ensure that the rooms of patients on droplet precautions are frequently cleaned and disinfected (at least daily, and prior to use by another patient). Focus cleaning on surfaces, frequently touched items, and equipment in the immediate patient area.
- Place signage for DROPLET PRECAUTIONS (Fig. 4.10) outside the isolation room to ensure that staff and visitors do not enter without appropriate PPE.

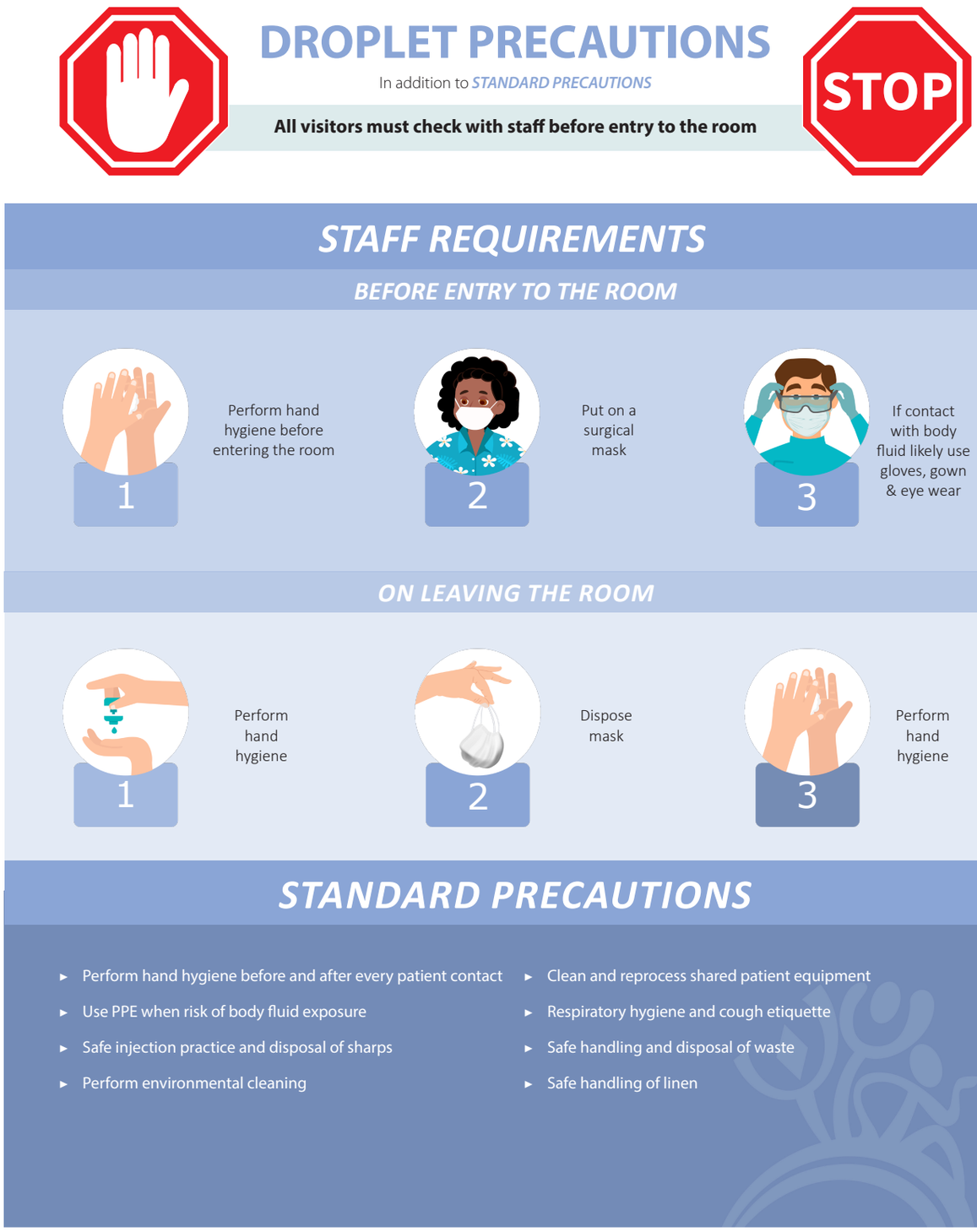


Figure 4.10: Droplet Precautions – Isolation Room Signage (Source: SPC 2020.)

4.2.3 Airborne Precautions [17] [43] [18]

Airborne transmission refers to the presence of microbes within droplet nuclei, which are generally considered to be particles <5µm in diameter. They can remain in the air for long periods of time and be transmitted to others over distances greater than 1 metre [43].

Patients are placed on airborne precautions when they have known, or suspected infections transmitted by airborne routes. Rooms with specific ventilation requirements – airborne infection isolation rooms (AIIRs) – are recommended, when possible.

Airborne precautions are required for managing patients with suspected or confirmed ***Mycobacterium tuberculosis,*** measles, varicella viruses and SARS-CoV-2 (COVID-19 virus), especially in settings where aerosol-generating procedures are performed. These procedures include endotracheal intubation, open suctioning, manual ventilation before intubation, non-invasive positive pressure ventilation, tracheotomy, cardiopulmonary resuscitation, bronchoscopy and high-frequency oscillatory ventilation [17] [43].

Airborne precautions are based on evidence that [40]:

- The use of P2/N95 respirator masks prevents inhalation by health-care workers of small particles that may contain infectious agents transmitted via the airborne route.
- The use of negative pressure rooms reduces the transmission of infection.
  - The ventilation rate should be 6–12 air changes per hour (ACH) (e.g. equivalent to 40–80 L/s/patient for a 4x2x3 m3 room), ideally 12 ACH.
  - New constructions should have a recommended negative pressure differential of ≥2.5 Pa (0.01-inch water gauge) to ensure that air flows from the corridor into the patient's room.

If Negative Pressure Rooms Are Not Available

Under these circumstances, the following environmental and engineering controls are recommended in consultation with an environmental engineer [17]:

- Installation of exhaust fans. Fans need to be installed so that the air is released directly outdoors.
- Installation of whirlybirds (e.g. whirligigs, wind turbines). These devices do not require an electrical supply. They provide a roof-exhaust system, increasing the airflow in a building.

Airborne Precautions Include the Following:

- Continue to apply standard precautions, including respiratory hygiene and cough etiquette.
- Patients should ideally be placed in a negative pressure room with doors closed. If a negative pressure room is unavailable, place the patient in a single room (doors closed) with open windows for natural ventilation, and use a fan (blowing outward) to control the direction of air flow.
- Separate toilet and bathroom facilities.
- Use dedicated equipment, such as blood pressure cuffs and thermometer.
- Use appropriate PPE. Respirator masks (N95, FFP2) should be worn by health-care workers and visitors before entering the room, in addition to standard precautions.
- Visitors should be restricted and screened by nursing staff, with visitors' names recorded either in a log book or in the case notes.

- Place signage for AIRBORNE PRECAUTIONS (Fig. 4.11) outside the isolation room to ensure that staff and visitors do not enter without appropriate PPE.

Transfer of Patients

If transfer of the patient outside the isolation room is necessary, ask the patient to wear a correctly fitted surgical mask while they are being transferred and to follow respiratory hygiene and cough etiquette. Cover any skin lesions associated with the condition (e.g. chickenpox [varicella]) to reduce the risk of cross-transmission.

Children should wear a correctly fitting mask when they are outside an isolation room. The child's oxygen saturation should be monitored.

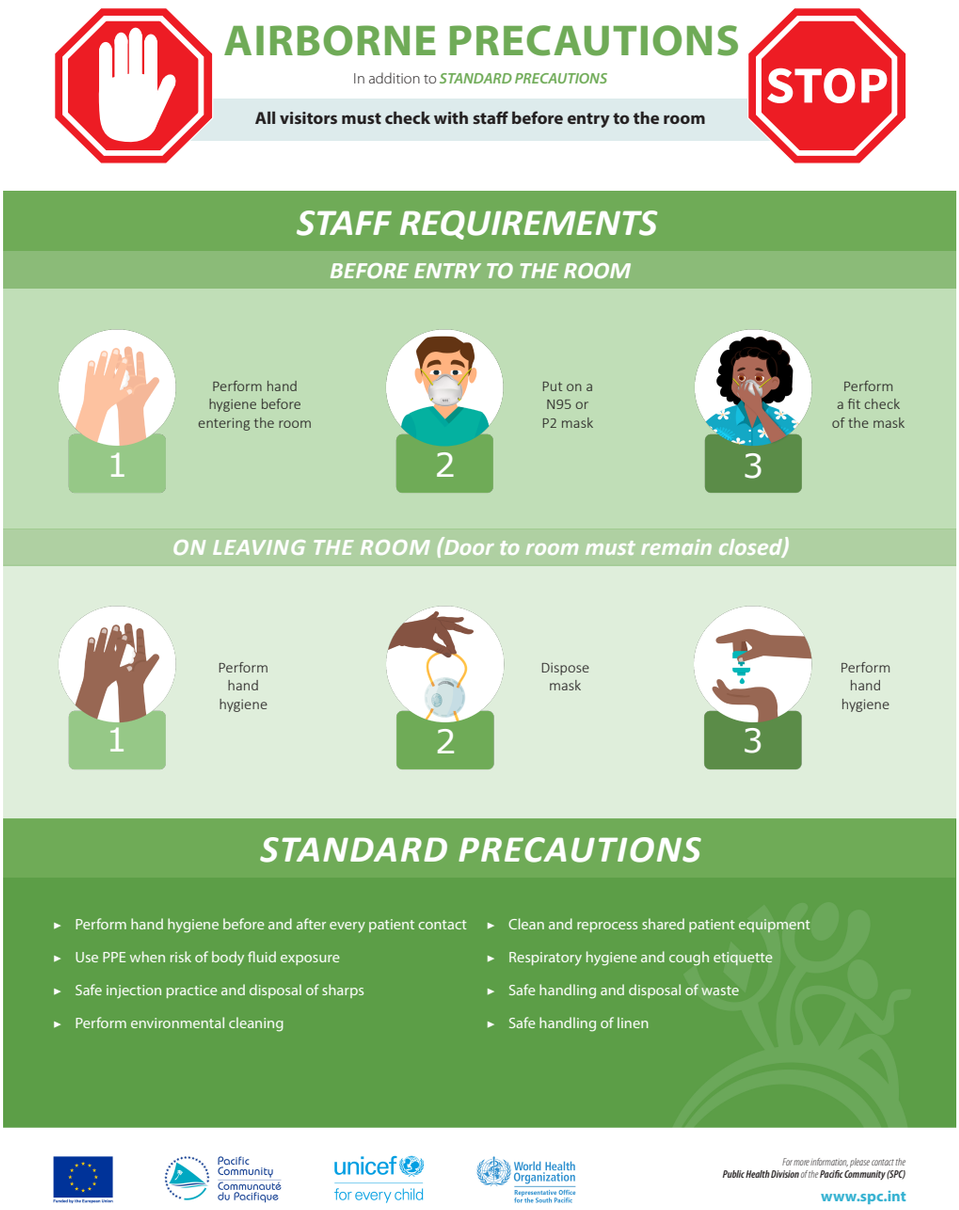


Figure 4.11: Airborne Precautions – Isolation Room Signage (Source: SPC 2020.)

Combination of TBP – Droplet and Contact Precautions, or Droplet and Airborne Precautions

Certain infectious diseases require a combination of TBPs due to the mode of transmission. For example, the COVID-19 virus is transmitted via **close contact** and **droplets** and **airborne spread**. Therefore, a combination of TBPs should be implemented.

TABLE 4.7: Recommended IPC Measures for Standard and Transmission-based Precautions

IPC Measures	Standard Precautions	Airborne Precautions	Droplet Precautions	Contact Precautions
	All patients All blood Body fluids Secretions (except sweat) Excretions Contaminated items	Pulmonary TB suspect/ confirmed Measles, Varicella (chickenpox) SARS MDR TB, COVID-19	SARS, MERS- CoV Norovirus Haemophilus influenza Meningitis/epiglottis ***Neisseria meningitidis*** Septicaemia/menin-gitis Diphtheria (pharyngeal) Mycoplasma (pneumonia) Pertussis Influenza Parainfluenza Mumps Parvovirus B19 Rubella Pneumonic plague Group A streptococcal infections in infants and young Group A streptococcal pneumonia, Scarlet fever in all groups Viral haemorrhagic fever Filovirus disease (Ebola and Marburg), Crimean-Congo haemorrhagic fever Lassa fever	Multidrug-resistant organisms infection or colonization, e.g. methicillin resistant S. aureus (MRSA) Vancomycin-resistant ***enterococci*** (VRE) Extended spectrum beta lactamases [ESBLs] Carbapenem resistant-***Enterobacteriacae*** [CRE] Resistant ***S. pneumoniae*** ***C. difficile*** RSV Herpes simplex (neonatal or mucocutaneous) Highly contagious skin infections (e.g. scabies, lice, impetigo) ***Herpes zoster*** (shingles), localised and disseminated Infants/ young children (<6 years old), or any patient inconsistent with: Enterovirus Hepatitis A Rotaviral enteritis Shigella Giardia Other forms of gastroenteritis Viral haemorrhagic fever Influenza Norovirus Ebola/Marburg Crimean-Congo haemorrhagic fever Lassa fever SARS, MERS- CoV, COVID-19

IPC Measures	Standard Precautions	Airborne Precautions	Droplet Precautions	Contact Precautions
Single Room	No	**Yes - keep door closed;** If unavailable, may cohort with patients with same organism	**Yes - Keep door closed;** If unavailable, may co-hort with patients with same organism	Use if possible, or cohort with patient with similar condition
Negative Pressure-Room	No	Yes	No	No
Hand Hygiene	Yes	Yes	Yes	Yes
Gloves	For body substances	See standard precautions	Yes	Yes
Gown or Coverall	If soiling likely	See standard precautions	Yes	Yes
Apron	Yes	Yes	Yes	Yes
Mask	Protect face if splash likely	Yes (particulate mask N95)	Yes	See standard precautions
Goggles/Face Shields	Protect face if splash likely	See standard precautions	See standard precautions	See standard precautions
Headcover	Use based on risk of ex-posure from infectious agent			
Special Handling of Equipment	Gloves for handling equipment contaminated with blood and body fluids	See standard precautions	See standard precautions	Single use if possible
Transport of Patients	Cover all patient's open wounds	Mask for patient; Notify area receiving Patient	Regular mask for patient; Notify area receiving patient	Notify area receiving patient

IPC Measures	Standard Precautions	Airborne Precautions	Droplet Precautions	Contact Precautions
Room Cleaning	Standard cleaning protocol	Additional cleaning with neutral detergent followed by a disinfectant, depending on infectious agent See IPC nurse	Additional cleaning with neutral detergent followed by a disinfectant, depending on infectious agent See IPC nurse	Additional cleaning with neutral detergent followed by a disinfectant, depending on microorganism See IPC nurse

Preparation of the Isolation Room / Ward

Isolation room preparation is crucial in ensuring that standard precautions and TBPs are implemented to ensure a safe working environment for all staff and patients.

- A sign should be placed on the patient's door explaining the necessary precautions.
- Remove unnecessary furniture – keep only necessary furniture that can be easily cleaned.
- Ensure adequate linen is available.
- Stock hand hygiene products (e.g. liquid soap, alcohol-based products, paper towels).
- **The isolation room should also contain:**
  - PPE, with a trolley to hold the PPE.
  - A container for collection of used eye shields to be decontaminated.
  - A sharps container.
  - Garbage bags and bins.
- Place a recording sheet at the entrance to the isolation room for staff to record the names and contacts of visitors who enter the room so that contact tracing can be done if necessary.

Setting up an Isolation Room

The following steps should be considered the minimum required when setting up an isolation room/ward [42]. (Annex 6 provides an equipment list for isolation rooms.)

- If the room is air-conditioned, ensure 12 air changes/hour and filtering of exhaust air. Negative pressure in isolation rooms is desirable for patients requiring aerosolisation procedures (intubation, suction nebulisation). These rooms may have stand-alone air-conditioning. These areas should not be a part of the central air-conditioning.
- If air-conditioning is not available, negative pressure can also be created by putting up three or four exhaust fans to drive air out of the room or, where there is sufficient space, use natural ventilation. Such an isolation ward/room should have large windows on opposite walls of the room, allowing a natural

unidirectional flow and air changes. The principle of natural ventilation is to enhance the flow of outdoor air by natural forces, such as wind blowing from one opening to another, to achieve the desirable air change per hour.

- Ensure adequate supplies of PPE and hand hygiene supplies.
- Doctors, nurses and non-clinical staff posted to the isolation ward need to be dedicated and not allowed to work in other patient care areas. All health staff involved in patient care should be well trained in the use of PPE.
- Ensure regular cleaning and proper disinfection of common areas, and adequate hand hygiene by patients, visitors and caregivers.
- Visitors to the isolation facility should be restricted. For unavoidable entry, visitors should use PPE according to the hospital guidance, and should be instructed on its proper use. They should also practise hand hygiene before entering the isolation room/area.
- A telephone or other method of communication should be set up in the isolation room/area to enable patients or family members/visitors to communicate with nurses.
- Avoid sharing equipment. If unavoidable, ensure that reusable equipment is disinfected between uses.

Isolation Area

The isolation area should have a low-risk and high-risk zone. The zones should be marked with red tape so everyone is aware of them.

The low-risk zone should include:

- A 'clean' area for health workers to store consumables and supplies of PPE, stationery, hand hygiene and medicine supplies, etc.;
- Clear instructions on the flow between areas;
- Restricted movement signage;
- A dedicated changing space for putting on PPE.

An isolation room or ward area is a high-risk zone:

- It should be well ventilated with an adjoining bathroom and toilet facilities.
- Have hand hygiene facilities, including alcohol-based hand rub.
- Have beds one metre apart (3 feet).
- Have a sharps container.
- Have a container for used linen and other contaminated waste.
- **Have a dedicated area for disposal of:**
  - Liquid and solid waste.
  - Storage of used linen.
- **Have a dedicated area just outside the isolation room/ward to take off PPE, which must be done under the supervision of a trained buddy or supervisor. This area should have:**
  - Hand hygiene supplies.
  - Waste containers for contaminated and reusable PPE.
  - A container for decontaminating eye goggles/face shields if necessary.

CHAPTER 5

SPECIAL HEALTH-CARE AREAS

CHAPTER 05

SPECIAL HEALTH-CARE AREAS

Some areas of a health-care facility require very specific IPC measures because of the heightened risk of infection or because of the nature of the work undertaken.

This section covers IPC in the following units/departments:

- **High Dependency Unit (HDU)**
- **Operating Theatres**
- **Maternity Units – Labour Suites**
- **Mortuaries**

5.1 High Dependency Unit (HDU)

Intensive care units (ICU), including neonatal intensive care units, are where our most vulnerable patients are admitted. These patients are also most susceptible to HAIs. The most common infections in the ICU or HDU are related to pneumonia from mechanical ventilation, and blood stream infections due to intravascular devices. Section 3.3 provides more information on common HAIs and prevention strategies [44] [45].

The following measures are crucial to prevent HAIs with intravascular devices and mechanical ventilation.

Hand Hygiene Compliance

- The five moments for hand hygiene (Fig. 4.1) should be strictly adhered to by all health-care workers including visitors in the HDU. They are designed to protect patients from the risk of microbial transmission from the hands of health-care workers and they also prevent microbial transmission from the patient to health-care workers and patient surroundings.
- Also important is the need to ensure consistent availability of hand hygiene supplies. These include alcohol-based hand rub, liquid hand soap and single-use paper towels.
- Ensure a system of ongoing monitoring for hand hygiene compliance on a regular basis.

To Prevent Contact Transfer of HAIs in the HDU, the following Transmission-Based Precautions Must be Strictly Adhered to:

- Strict adherence to hand hygiene.
- Limited number and frequency of visitors. Visitors must wear masks and perform hand hygiene when entering and leaving the HDU.
- **Appropriate use of PPE:**
  - Use sterile gloves when undertaking aseptic techniques, such as insertion of a central venous catheter, indwelling urinary catheterisation, and other procedures that require aseptic techniques.
  - Use non-sterile gloves for procedures such as emptying urinary drainage bags, and when in contact with contaminated surfaces or equipment.
  - Use gloves for handling respiratory secretions or objects contaminated with the respiratory secretions of any patient.
  - **Change gloves and perform hand hygiene in the following situations:**
    - Between contact with different patients.
    - After handling respiratory secretions or objects contaminated with secretions from one patient.
    - Before contact with the surrounding environment.
    - Between contacts with a contaminated body site and the respiratory tract of, or respiratory device on, the same patient.
- **Appropriate use of gowns:**
  - Wear a gown if a patient is on contact precautions or when exposure to respiratory secretions from a patient is anticipated, and change it after soiling occurs and before providing care to another patient.
  - Use plastic aprons when contact with patient body fluids is anticipated.
- **Strict adherence to aseptic techniques:**
  - Clean injection ports with alcohol before accessing the ports for IV medication therapy.
  - Cap all stopcocks when not in use.
  - Use aseptic techniques, including a mask, sterile gown, sterile gloves, and a large sterile sheet, for the insertion of central venous catheters (including peripherally inserted central catheters) or guide-wire exchange.
- **Use of multi-dose vials:**
  - Use a single dose from one vial for one patient, rather than multi-doses from larger vials, especially when medication is being administered to multiple patients.

Enhance Environmental Cleaning and Re-Processing of Re-Useable Medical Equipment

The environmental surfaces of the HDU and all patient equipment, such as ventilators, IV infusion pumps, monitors, warmers and incubators, are potential reservoirs for infectious agents and AMR if not cleaned regularly. Therefore, it is vital that environmental surfaces, including patient equipment, are adequately cleaned to eliminate reservoirs of infectious agents and reduce the risk of acquiring HAI and AMR for critically ill patients who are immunosuppressed in the HDU [46].

The following measures should be implemented, and monitored for compliance:

- Implement a two-step cleaning system that involves physical cleaning using a neutral detergent solution, followed by a chemical disinfectant of 0.1% hypochlorite solution or 70% alcohol. (Section 4 provides guidance on environmental cleaning. Annex 5 describes chlorine dilution.)
- Bag valve masks, including laryngoscope blades and handles and all other patient care equipment frequently used in the HDU, should be cleaned and disinfected at a minimum on a daily basis and between use.
- Suction bottles should be cleaned and disinfected or sent in for the sterilisation process. Unused bottles should never be left attached to machines with water.
- Ventilators, infusion pumps and other equipment should be cleaned daily and upon discharge (refer to the manufacturer's cleaning instructions).
- Change curtains frequently. At a minimum, curtains should be washed once a month, but when a patient is a carrier of an infectious agent requiring transmission-based precautions, curtains should be washed or changed after patient discharge.

Care of the Incubator

- Wipe daily using liquid soap and water or a neutral detergent. Do not clean with sodium hypochlorite when in use.
- All incubator inserts should be removed and thoroughly washed and dried.
- Filters should be changed every 3 months (labels should indicate the due date for change).
- Incubators should be changed every 7 days (labels should indicate the due date for change).

How to Clean an Incubator upon Discharge or Transfer of an Infant

- Disconnect from electrical socket.
- Use a disposable cloth and a neutral detergent solution or liquid soap to clean/wipe the entire external surface of the incubator and its parts.
- All large components of the incubator (i.e. incubator walls, mattress tray and mattress, main deck) should be wiped down. If recommended by the manufacturer, smaller pieces of the incubator can be submersed in the detergent or sodium hypochlorite solution.
- Sodium hypochlorite solution is corrosive to metals so avoid using it on metal surfaces.
- Reassemble the incubator according to the manufacturer's instructions.
- All used cleaning solution must be discarded after cleaning.

5.2 Operating Theatre

The operating theatre is enclosed to minimise dust, eliminate insects, and facilitate sterility. The environment should be conducive to preventing infection of patients and health-care workers. SSI are common and can be

prevented by high standards of pre-, intra-, and post-operative care. Health-care worker infections, such as the acquisition of bloodborne viruses, can be prevented by safe practices in the operating theatre.

It is essential that the number and flow of visitors, patients, clients and staff be regulated and kept to an absolute minimum in the following areas of the hospital [47]:

- Operating rooms and recovery rooms – areas where patients wait and where health-care workers examine and treat patients prior to and after being operated on.
- Operating theatres (OT).
- Procedure rooms – where minor operations are performed, including their pre-operative and recovery rooms.
- Sterile service departments or areas designated for the decontamination of surgical instruments.
- Storage areas for clean items/equipment and sterile instruments.
- Staff stationed in a dirty area and septic operating room should not move to a clean area or Cleaner Operating room unless they change their OT scrubs.
- Intra-operatively, only two doors (door from scrub room to OT, anaesthetic supply room) should be used to enter the OT currently being used.

Other perioperative standards are vital for safe operating environments and optimum patient outcomes. These include PPE, hand decontamination (scrubbing), cleaning schedules, appropriately trained staff, storage and lay up of sterile equipment, ventilation (air flow), designated zones in the area, and reporting systems for any incidents.

Ensure the Following in the Operating Theatre Environment

Ventilation and temperature controls:

- Maintain operating theatres at positive pressure so that air flows from the cleanest areas to the least clean areas.
- Maintain positive pressure ventilation with respect to corridors and adjacent areas.
- Maintain good ventilation.
- Maintain the air-handling system, so filtration mechanisms and vents are clean and dust free.
- Keep the temperature of the operating theatre between 68°F and 75°F (20°C and 23°C).
  - Keep doors and windows closed.
  - Keep personnel to a minimum during a procedure, and restrict personnel once the operation has started (unless absolutely essential).
  - Minimise movement and opening and closing of doors.
- Avoid noise pollution.

Cleaning

- Clean the operating theatre between each patient, and at the beginning and end of each day.
- Do not clean instruments in the operating theatre after an operation. Send them to the designated

decontamination area or the sterile supply department.

- Keep floors smooth, slip resistant and robust enough to withstand frequent washing and harsh cleaning/scrubbing.
- Walls should be protected from impact by gurneys and other equipment entering and leaving the operating theatre department.
- The theatre should be free of all items other than the equipment necessary to perform the surgical procedures. There should be no clutter.
- Clean air conditioner/fans regularly to remove dust.

Instrument Sterilisation and Storage

The decontamination unit should be a one-way flow from dirty to disinfected/sterile. The clean and dirty areas should be clearly demarcated. Decontaminated instruments should be stored in a clean, dry area, appropriately packaged and sealed to prevent contamination prior to use.

Pre-Operative Preparation of the Patient

Surgical antibiotic prophylaxis: It is essential that each health-care facility adhere to the surgical antibiotic prophylaxis policy based on the Cook Islands Antibiotic Guidelines (2023). Give IV prophylactic antibiotics 0–60 minutes before knife to skin incision (ideally 15–30 minutes) [48]. Surgical antibiotic prophylaxis should be considered for:

- Clean surgery involving the placement of a prosthesis or implant;
- Clean-contaminated surgery;
- Contaminated surgery; and
- Surgery on a dirty or infected wound (requires antibiotic treatment in addition to prophylaxis).

Box 5.1: WHO's Strong Recommendations for Prevention of SSIs [47]

- **For patients with known nasal carriage of S. aureus – follow Cook Islands Antibiotic Guidelines (2023).**
- **Mechanical bowel preparation alone (without the administration of oral antibiotics) should not be used in adult patients undergoing elective colorectal surgery.**
- **In patients undergoing any surgical procedure, hair should either not be removed or, if absolutely necessary, should be removed only with a clipper before entering the OT. Shaving is strongly discouraged at all times, whether preoperatively or in the operating theatre.**
- **Surgical antibiotic prophylaxis (SAP) should be administered as per the Cook Islands Antibiotic Guidelines (2023).**
- **Surgical hand preparation should be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable alcohol-based handrub before donning sterile gloves.**
- **Alcohol-based povidone solutions for surgical site skin preparation should be used in patients undergoing surgical procedures.**
- **Adult patients undergoing general anaesthesia with endotracheal intubation for surgical procedures should receive 80% fraction of inspired oxygen intraoperatively and, if feasible, in the immediate postoperative period for 2–6 hours.**
- **SAP ADMINISTRATION should not be prolonged after completion of the operation.**

Pre-Operative Care

- **Pre-operative shaving:** Hair should not be removed at the operation site unless the presence of hair will interfere with the operation. Pre-operative shaving, especially with a razor, should be avoided because shaving can cause small nicks and breaks, leaving the skin bruised and traumatised, increasing the risk of colonisation and infection. If hair is to be removed from the operation site, only the area to be incised should be shaved. If hair removal is necessary, use clippers. Removal of hair, if necessary, should be done immediately before surgeons perform the incision, not the night before surgery.
- **Pre-operative showers:** It is preferable that the patient is instructed to shower or bathe the night before an operation.
- Sterile drapes should be applied after proper asepsis, which must be maintained throughout the surgical procedure.
- The patient's identity (e.g. name and date of birth) and allergy status should be confirmed, along with any other risk factors (e.g. risk of significant bleeding), and the site of the surgery should be marked.

Personal Protective Equipment – Theatre Attire

- PPE is designed to minimise the transfer of microorganisms from the mucous membranes, skin and hair of the surgical team to the patient.
- PPE provides the surgical team with some protection from the patient.
- It is recommended that perioperative personnel in the semi-restricted and restricted areas wear facility-provided, clean, freshly laundered, or disposable surgical scrub attire.
- When in the restricted areas, all non-scrubbed personnel should completely cover their arms with a long-sleeved scrub top or jacket. (The facility may require this in a semi-restricted area as well.)
- Perioperative personnel should change into surgical attire in designated dressing areas to decrease the possibility of cross-contamination.
- Scrub attire and cover apparel (e.g. lab coats) should be laundered as per facility guidelines after each daily use and when contaminated.
- Personnel should change back into street clothes if they need to leave the facility or travel between buildings within the hospital in order to prevent contaminating the surgical attire through contact with the external environment.
- ***Gloves:*** Sterile gloves of good quality and the correct fit/size must be worn.
- ***Disposable hats/hoods:*** These should completely cover the hair (including facial hair and sideburns) and must be worn when entering the semi-restricted and restricted area. This is particularly important for arthroplasty/prosthetic implant surgery.
- ***Masks:*** The scrub team must wear surgical masks that completely obscure the mouth and nose. They should be removed by the tapes and discarded at the end of each case. Masks must be removed prior to leaving the theatre suite. Respirator masks, e.g. N95 (fluid repellent), must be available in theatre for procedures where there is a risk of exposure to TB or other airborne pathogens.
- ***Eye protection:*** Full face shields/visors or protective goggles must be available for all staff and must be worn during invasive procedures that potentially generate splashing. Face shields/visors and goggles should either be disposable or decontaminated according to the manufacturer's instructions after use. If magnifying loupes are available, visors cannot be used. Loupes should, therefore, be fitted with side shields.

- ***Scrub gowns:*** The scrub team should wear either disposable fluid-repellent gowns or reusable gowns that are provided by the organisation and returned for laundering.
- ***Footwear:*** Staff should wear closed-toe non-slip footwear. Boots should be worn if there is a high risk of heavy blood/body fluid loss. Staff should not leave the operating theatre wearing shoes that are visibly stained. Footwear must be washed regularly.
- **Shoe covers are discouraged in the operating theatre as they increase the bacterial floor count.**
- ***Cover gowns:*** The need for cover gowns can be determined using a risk assessment. Cover gowns have been found to have little or no effect on reducing contamination of surgical scrubs but, if used, should be laundered daily.

Theatre Cleaning [47]

Preparation of the operating theatre before the first case:

- All horizontal surfaces (e.g. furniture, surgical lights, equipment) should be damp-dusted with a clean, lint-free cloth, moistened with 0.05% hypochlorite solution.
- Equipment from areas outside the operating theatre should be cleaned (e.g. with a lint-free cloth, moistened in 0.05% hypochlorite solution) before being brought into the operating theatre.
- Equipment that cannot be cleaned should not be brought into the operating theatre.

Between case cleaning

- **After the procedure ends and the patient has exited the room, the following personnel and areas need to be cleaned:**
  - Members of the sterile team, all furniture, anesthesia equipment, the floor immediately surrounding the focus area or patient area, and patient transport carts;
  - Furniture and equipment that are visibly soiled should be cleaned with soap and water, followed by disinfection with 0.05% hypochlorite solution following each procedure.
  - Walls, doors and surgical lights and ceilings should be cleaned if soiled with blood, tissue or body fluids.
- Anesthesia equipment should be cleaned according to international guidelines for good practice.
- Floors that are visibly soiled must be cleaned using a new or freshly laundered mop head and soap and water, followed by 0.05% hypochlorite solution.
- Mechanical friction should be used when cleaning – the efficacy of the cleaning depends on the scrubbing action.

Terminal cleaning

- At the end of each day, thoroughly clean operating theatres, even if they have been cleaned between cases.
- Terminally clean operating theatres in which procedures may be performed, regardless of use, every 24-hour period during the regular work week.
- Terminally clean scrub/utility areas daily during the regular work week.
- Clean and disinfect all exposed surfaces, including wheels and casters, of all equipment (e.g. foot pedals,

kick buckets, telephones, light switches, push plates, Mayo stands, handles on cabinets, vents, walls, etc.).

- Place special emphasis on cleaning and disinfecting high/hand touch surfaces.
- Clean and disinfect the floor with a wet vacuum or single-use mop, moving equipment around the room to clean the floor underneath.

Waste

- All clinical waste should be placed in biohazard waste bags.
- Biohazard waste bags should not be filled more than 3/4 full and should be secured/tied to ensure an effective seal.
- Heavily contaminated waste should be placed in double biohazard waste bags to prevent leakage.
- Human body parts should be placed in an approved receptacle.
- Sharps boxes must be used for all metalware.
- All suction equipment, including liners, must be changed between patients to prevent cross-infection.

Managing Infectious Diseases (e.g. TB, COVID, MRSA) in the Operating Theatre

- Elective surgery on infectious TB patients should be postponed until such patients have received adequate drug therapy.
- If emergency surgery is indicated, schedule the TB patient as the last surgical case to provide maximum time for adequate air changes per hour (ACH) (ventilation of the theatre), and allow terminal cleaning of the operating theatre.
- Operating theatre personnel should use a fluid-repellent respirator mask or equivalent (e.g. N95, FFP2).
- Keep the operating theatre door closed after the patient is intubated, and allow adequate time for sufficient ACH to remove 99% of airborne particles (for rooms with 15 ACH, 18 minutes are required to achieve 99% removal of airborne particles).
- Extubate the patient in the operating theatre or allow the patient to recover in an airborne infection isolation (AII) room, rather than in the regular open recovery facility.
- If an AII room is not available, allow the patient to recover in a well-ventilated private room.
- Breathing circuit filters with 0.1–0.2 µm pore size (if available) can be used as an adjunct infection control measure.

After Surgical Procedures

- After each surgical procedure, staff wearing utility gloves should clean the operating theatre.
- Collect all waste in closed, leak-proof containers and remove them from the room.
- Close and remove puncture-resistant containers when they are 3/4 full.
- Remove soiled linen, soiled instruments and equipment, and supplies that have been opened, but not used, in an enclosed cart for re-processing.

5.3 Maternal and Child Health [49]

The importance of IPC is crucial in health-care facilities including maternal and child health units where there are many potential sources of transmission, including contaminated equipment and surfaces, other mothers and newborns, health-care workers, and visitors. The use of recommended IPC practices during the perinatal period can significantly reduce maternal and newborn infections in maternity and neonatal/paediatric units.

Pregnant women require appropriate clinical and obstetric care at all stages of their pregnancy while preventing potential exposure of others to infection. It is important to assess the risk of possible infection transmission at each stage of pregnancy and wear appropriate PPE for the activities being undertaken. Standard precautions as set out in the various sections of these guidelines should always be adhered to, with rigorous attention to hand hygiene; waste, sharps and laundry management; environmental cleaning; and decontamination at all times. In addition, it is important that all pregnant women are screened to determine contact risks for infections such as HIV and hepatitis B.

All health-care workers must comply with the five moments for hand hygiene, follow standard precautions and transmission-based precautions (section 4), and ensure meticulous environmental cleaning (section 4.1.5) and safe re-processing of reusable equipment and instruments (section 4.1.8). These processes are key to preventing maternal and newborn infections during labour and childbirth.

Performing a Digital Vaginal Exam

Limit the number of vaginal examinations, and perform exams using clean techniques to prevent introducing vaginal or intestinal organisms into the uterus.

- Avoid digital vaginal exams until active labour occurs or to induce labour.
- Perform hand hygiene and put on sterile gloves.
- Perform a digital vaginal exam only every 4 hours for routine assessment of labour progress in low-risk women during the active first stage.
- Monitor and record the frequency of exams.
- Only perform if necessary for care decisions.

PPE for Delivery

Health-care workers should use appropriate PPE to protect against the risk of exposure to blood and body fluids during labour, delivery, and resuscitation of the infant.

- **Wear appropriate PPE for delivery:**
  - Sterile, fluid-resistant, long-sleeved gown (or apron under a non-fluid resistant gown), face shield or goggles and mask.
- Wear non-sterile gloves for handling the newborn until blood and amniotic fluid have been removed.

Preventing Infection in the Newborn

AT BIRTH

Preventing infection in newborns at birth includes the following:

- Keep the baby in a clean warm area and follow standard precautions for newborn resuscitation.
- Ensure that the newborn resuscitation team wears appropriate PPE: non-sterile, fluid-proof, long-sleeved gowns, face shields or goggles and masks, boots or shoe covers, and non-sterile gloves.
- Wear non-sterile gloves for contact with the newborn until after the first bath.
- Do not perform routine suction or aspiration at the delivery of the head. It should be done only in the presence of dense substances blocking the nose and mouth.
- Wipe both of the newborn's eyes with a sterile gauze square and discard the wet cloth. Use a separate square for each eye and wipe from the inner corner to the outer corner.
- Keep the newborn warm.
- After delivery, do not perform routine suction or aspiration.
- **Use of multi-dose vials:**
  - Use a single dose from one vial for one patient, rather than multi-doses from larger vials.

5.4 IPC in Mortuary Settings

The hospital management should provide a safe working environment in the mortuary and ensure all mortuary staff, including cleaners, are vaccinated against hepatitis B and SARS-CoV-2 (COVID-19).

Prior to commencing a post-mortem, the pathologist and mortuary staff should be notified when known or suspected high-risk infections are present.

Care of the Dead Body

- Personal care of a dead body should honor the spiritual or cultural wishes of the deceased person. It is essential that the management of dead bodies be handled with extreme sensitivity and a sensible approach. An individualized approach assists with the relationship between families and carers at a time of distress.
- The recommended temperature for refrigeration/storage of dead bodies is between 2°C and 4°C (35.6°F and 39.2°F).
- All blood and body substances of all deceased bodies are potentially infectious so standard precautions should be practised at all times. The risk of transmission of infection increases following the death of an infectious patient. Therefore, to minimise the risks of transmission of known and unsuspected infectious diseases, standard precautions are required when handling dead bodies to safeguard the health-care worker, mortuary attendant and funeral director.
- It is unusual for organisms in a dead body to infect healthy people with intact skin, but there are other

ways infection may be transmitted. For example:

- Needle stick injuries from a contaminated instrument or sharp fragment of bone;
- Intestinal pathogens from anal and oral orifices;
- Leaking body fluids;
- Through abrasions, wounds and sores on the skin;
- Contaminated aerosols from body openings or wounds, e.g. tubercle bacilli;
- When condensation could possibly be forced out of the mouth, and splashes and/or aerosols on to the eyes.

- The risks of infection are usually prevented by the use of standard precautions. Occasionally, transmission-based precautions are required, as in the handling of a known or possible case of an infectious pathogen. IPC standard precautions should be adhered to at all times in the mortuary, including:
  - Hand hygiene;
  - Appropriate use of protective clothing, i.e. water-repellent aprons and gloves when handling a body or decontaminating the environment (either disposable or heavy-duty reusable gloves);
  - Use of body bags when indicated (see below);
  - Appropriate cleaning of the environment;
  - Appropriate decontamination of equipment;
  - Body fluid spillage management;
  - Waste disposal as per waste management guidelines; and
  - Safe use and disposal of sharps.
- There may be occasions when a body bag is required because the body is leaking body fluids or exudates, because the cause of death is unexplained, or the individual was dead on arrival at hospital. If a body is likely to leak or the cause of death is unknown, it must be placed in a body bag, regardless of the infectivity status.

Contaminated, Clean and Transitional Zones of the Mortuary

The areas of the mortuary and post-mortem room are best segregated into 'clean' and 'dirty' areas and 'transition zones'. These areas can be demarcated by using barriers or red tape and should include warning notices or labels.

A ***dirty*** area is where all work with bodies, organs and unfixed specimens is carried out. Dirty areas normally include:

- The post-mortem room;
- A dirty utility room;
- The soiled protective clothing discard area; and
- Refrigerators where bodies are stored.

Clean Areas Include:

- Reception and waiting areas;

- Viewing rooms;
- A post-mortem examination observation area.

Transition zones are located between clean and dirty areas. It is recommended that information be provided to the mortuary staff and pathologist (if a post-mortem is to be undertaken) on all deaths where an infection risk is known or thought to exist before the body is delivered.

Personal Protective Equipment for a Post-Mortem

- Standard precautions must apply when handling all bodies.
- Protective clothing must be put on before carrying out a post-mortem examination.
- Staff performing a post-mortem must wear surgical theatre type clothing: a long-sleeved gown with a plastic apron. This should include anyone entering a dirty area to observe a post-mortem examination. They should wear a gown, rubber boots, a plastic apron and a visor, even though not actively engaged in the work.
- Impermeable footwear (waterproof boots or gumboots) must be worn by all persons working in the mortuary area.
- Surgical or post-mortem gloves must be worn by all personnel involved in the post-mortem procedure. Double gloving is required. It is recommended that cut-proof gloves are worn. (Staff must wear them at least on the non-dominant hand.)
- To protect against splashes, full face protection in the form of either a visor or combination of wrap-around eye protection, such as safety glasses, and a full surgical mask must be worn during post-mortems.
- Respirators with appropriate filters must be available for use in cases of suspected or known high-risk microbiological or chemical contamination and during aerosolising procedures (high-powered saws, for example).

Personal Hygiene in the Post-Mortem Room

- Hand hygiene must be adhered to at all times. Always wash hands before leaving any of the designated dirty work areas in the mortuary.
- Remove protective clothing after use and do not wear it outside the mortuary.
- No smoking, drinking, eating, or applying cosmetics in any work or rest area within a mortuary.
- Avoid all actions that can bring the hands (gloved or otherwise) into contact with the face, eyes, nose and mouth, e.g. cleaning and touching spectacles or contact lenses.
- Ensure that any skin abrasions or cuts are covered with waterproof dressings before starting work.
- People with open wounds or active dermatitis on exposed skin must not come directly into contact with any bodies, body fluids or specimens, unless the wound/affected skin can be adequately protected by dressings.

General Precautions During Post-Mortem Examination

- Never pass instruments from hand to hand during a post-mortem examination. The assistant should set them out on a table for selection by the pathologist as required.

- Once used, instruments that are no longer required during a post-mortem examination must be thoroughly cleaned in detergent solution.
- Never attempt to catch a falling instrument. To help prevent accidental falls, do not lay instruments down indiscriminately after use. If no longer required, clean them in detergent solution.
- Wherever possible, avoid actions likely to cause splashing or generate aerosols, such as washing down with high-pressure hoses, cleaning instruments under running water and squeezing organs that have been removed from the body.
- For infectious bodies, at the end of the examination, all clothing and protective equipment worn during the examination should be disposed of correctly or treated, where appropriate, as infected linen and placed in appropriate bags for collection or disposal.

Environmental Cleaning

The aim of cleaning is to maintain an environment where any infectious agents that might be present are reduced to a level not harmful to health. Regular cleaning of the mortuary must be carried out using a **two-step clean:**

1. Clean with detergent and water, and allow to dry.
2. Disinfect the surface or objects with disinfectant concentration of 0.1% (1000 ppm) sodium hypochlorite (bleach) and allow to dry.
    - Wipe surfaces. Do not use compressed air and/or water under pressure for cleaning, or any other methods that can cause splashing or that might re-aerosolize infectious material.
    - Environmental surfaces, where the body was prepared, should be cleaned immediately after use.
    - Protective equipment, such as waterproof boots and eye goggles, should be cleaned with detergent and disinfected with sodium hypochlorite 0.1% at the end of each session involving known or suspected high-risk cases; otherwise, detergent and water are sufficient.
    - All waste from the post-mortem room should be treated as clinical waste, so a clinical waste bag/container should be available for use. No general waste bag/container should be allowed in dirty areas.

CHAPTER 6

MANAGING OCCUPATIONAL EXPOSURE TO BLOOD AND OTHER BODY SUBSTANCES

CHAPTER 06

MANAGING OCCUPATIONAL EXPOSURE TO BLOOD AND OTHER BODY SUBSTANCES

Health-care workers are at risk of exposure to blood and body substances and to infectious diseases. Implementing preventive measures against infectious diseases and managing occupational exposure to blood and body substances assist in the maintenance of staff health.

The following measures help to minimise the risk of bodily injury and/or infection in health-care workers. All health-care managers should ensure that all health-care workers adhere to the evidence-based guidelines in this section.

Infrastructure/system change: Access to the right equipment and supplies, including PPE, and an environment that is designed and planned to facilitate patient and health worker safety. This includes immunisation programmes.

Training and education: A programme of routine health and safety education and training and periodic re-training for all personnel.

Monitoring, evaluation and feedback: Pre-placement health evaluation of health-care workers and the establishment of protocols for surveillance and management of job-related illnesses and exposure to infectious diseases.

Awareness raising/promotion: Safe work practices, including an appropriate waste disposal management plan, are reinforced through awareness raising, e.g. use of posters displayed across the health-care facility.

Safety culture: Managers at every level demonstrate visible support for occupational health and safety to help develop and reinforce a culture of health-care worker and patient safety. This includes counselling services for personnel regarding infection risks related to employment, and the development, review and revision of policies and procedures that are readily available to staff. Maintenance of confidential employee health and injury records is important.

Responsibilities of Health-Care Managers and IPC Committee

- Ensure a healthy and safe working environment for all health-care workers.
- Provide all health-care workers with appropriate orientation, training and supervision on safety procedures.
- Ensure safety and employee health SOPs are readily available to staff.
- Assess and manage any identified risks (e.g. investigate accidents and illnesses).
- Document and report worker injury or illness.

- Ensure best practices for health-care workers' safety and IPC, including provision of PPE and staff immunisation for vaccine-preventable diseases.
- Have a process for worker feedback on safety issues.

Eliminating Risks and Preventing HAI

The following recommendations are intended to improve compliance with procedures and eliminate the risk of occupational injuries or HAI:

- Establish appropriate engineering controls (controls used to remove/reduce a hazard, or place a barrier between workers and hazards in health-care facilities).
- Make available and use appropriate supplies and equipment.
- Hand hygiene facilities and materials must be readily accessible.
- Puncture-resistant, leak-proof, labelled or colour-coded sharps containers must be located as close as possible to their places of use.
- Leak-proof containers for specimens and other regulated wastes must be properly labelled or colour-coded.
- Ensure there are mechanisms for safe storage, transport and disposal of regulated waste.
- Have an easily accessible first-aid kit in all departments.
- **Implement controls for work practices:**
  - Prohibit eating, drinking, smoking, applying cosmetics, and handling contact lenses in work areas and on work surfaces that carry an inherent potential for contamination.
  - Do not store food and drink in refrigerators, freezers, or cabinets where blood or other potentially infectious material is stored. Such storage equipment should be clearly labelled to prevent this possibility.
  - Wash hands and other skin surfaces that become contaminated with blood or other potentially infectious materials immediately and thoroughly with soap and running water.
  - Thoroughly wash with water (flush) mucous membranes that become contaminated with blood or other body substances.
  - Prohibit health-care workers with open wounds or weeping skin rashes from all direct patient-care, potentially hazardous laboratory procedures, and handling patient-care equipment until recovery.
  - Cuts or abrasions should be protected with a waterproof dressing and gloves prior to performing any procedure that involves contact with blood and other potentially infectious material.
  - Provide information and training about workplace health and safety and IPC.
  - Record and monitor exposure to blood and body fluids.
  - Monitor and maintain surveillance of work practices.

Health-Care Workers' Responsibilities

- Follow safe work practices at all times as defined by the health facility's policy.
- Be familiar with the employer's written departmental policies.
- Know the potential health and safety hazards of the job, and protective measures, by participating in

appropriate occupational health and safety training programmes.

- Use PPE as trained, and report changes in any personal medical conditions that require a change in PPE-wearing status.
- Report unsafe working conditions as per the health facility policy.
- Report any work-related injury or illness to the supervisor.
- Participate in accident and injury investigations.
- Know what to do in an emergency of accidental occupational exposure to blood and body substances.
- Participate in health and safety committees (when available).

Immunisation

An effective immunisation programme safeguards the health of personnel and also protect patients from becoming infected by personnel. The MOH provides hepatitis B vaccine for health-care workers whose occupational tasks place them at risk of exposure to blood or other potentially infectious material. In addition, COVID-19 vaccination is also provided to all health-care workers.

6.1 Infection Prevention for Health-Care Workers

The following sections cover infection prevention issues for health-care workers and include:

- COVID-19 Virus (SARS-CoV-2);
- Human immunodeficiency virus (HIV);
- Hepatitis B virus (HBV);
- Hepatitis C virus (HCV);
- Tuberculosis (TB);
- Meningococcal meningitis;
- Tetanus;
- Work restrictions for health-care workers exposed to, or infected with, selected infectious diseases; and
- Guidelines for managing occupational exposure to blood and body substances for HIV and hepatitis B.

COVID-19 Virus (SARS-CoV-2) (also refer to section 8.1)

- The virus that causes COVID-19 infection mainly spreads between people when an infected person is in close contact with another person. Transmissibility of the virus not only depends on the amount of viable virus being shed and expelled by a person, but also on the type of contact they have with others, the setting, and the prevention and control measures in place.
- The virus can spread from an infected person's mouth or nose in small liquid particles when the person coughs, sneezes, sings, breathes heavily or talks. These liquid particles are different sizes, ranging from larger 'respiratory droplets' to smaller 'aerosols'.
- Aerosol transmission can occur in specific circumstances and settings in which procedures that

generate aerosols are performed. These procedures may be performed in the ICU and any other settings or wards/units in which treatments that generate aerosols are performed. They include endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.

- Health workers in contact with, or who care for COVID-19 patients are at a higher risk of infection than the general population. Mitigating and reducing this risk is essential to protect their well-being and reduce the spread of COVID-19.
- Viable virus has been found on surfaces and objects. Thus, the virus could also be transmitted through contaminated objects or surfaces, although there is limited evidence demonstrating actual transmission through this route.

Symptomatic, Pre-symptomatic and Asymptomatic Transmission

- Current evidence suggests that people infected with COVID-19 can transmit the virus whether they have symptoms or not.
- Infected individuals have the highest viral loads (meaning they are more infectious) just before or around the time they develop symptoms and during the first 5–7 days of illness.

Viable virus has been isolated from specimens of pre-symptomatic and asymptomatic individuals, suggesting that people who do not have symptoms are able to transmit the virus to others. Available studies suggest that asymptomatically infected individuals are less likely to transmit the virus than those who develop symptoms.

Prevention of SARS-CoV-2 Infections in Health Workers

The prevention of SARS-CoV-2 infections in health workers requires integrated approaches that include occupational health and safety measures as well as IPC. The IPC measures include ensuring:

- All health-care workers have been provided with COVID-19 vaccination;
- Adequate clinical staffing levels and rostering are well planned to prevent the transmission of HAI;
- Early detection of SARS-CoV-2 infection among health workers through syndromic surveillance and/or laboratory testing to prevent secondary transmission from health workers to patients, between health-care workers throughout health-care settings, and from health-care workers to contacts outside of health facilities;
- A system for managing exposure based on risk assessment is in place to promote and support health workers' reporting of occupational and non-occupational exposure to, or symptoms of COVID-19;
- A system for managing suspected infections, including measures for health workers who test positive for SARS-CoV-2 and those who are symptomatic and test negative for SARS-CoV-2;
- Health-care workers are supported by having clear criteria for returning to work according to the WHO principles for discontinuing isolation for COVID-19.

COVID-19 Vaccination in Cook Islands

The COVID-19 vaccine available in Cook Islands is Comirnaty® – the vaccine manufactured by Pfizer.

HIV

HIV is transmitted from person to person via sexual contact, sharing of needles contaminated with HIV, infusions contaminated with HIV, and transplantation of organs or tissues infected with HIV. The risk of a health-care worker acquiring HIV after a needle stick or other sharps injury route is 0.3%, and 0.9% via the mucous membrane and non-intact skin [50].

While there are some treatments to control HIV symptoms there and no cures for HIV, so the focus must be on preventing exposure to HIV through safe infection control work practices, such as standard precautions, ongoing IPC education and training, safe management, proper disposal of health care-related waste and sharps, and appropriate use of PPE. There is no vaccine for HIV.

Exposure to Hepatitis B Virus (HBV)

Hepatitis B is transmitted through blood and other body substances such as blood products, saliva, cerebrospinal fluid, peritoneal, pleural, pericardial and synovial fluid, amniotic fluid, semen and vaginal secretions. Studies indicate that although HBV is present in saliva and tears, these body fluids have not represented an occupational risk of HBV infection unless they contain blood [51].

Blood from persons infected with HBV contains the highest HBV titres of all body fluids. HBV, like HIV, cannot be cured and often results in severe liver damage or death. There is a highly effective vaccine for HBV.

Hepatitis B Immunisation

Immunisation is the best way of preventing HBV transmission to health-care staff and should be offered to all health-care workers. Immunisation for adults involves a series of 3 injections: an initial injection, an injection given 1 month after the initial injection, and one given 6 months after the initial injection.

Antibody Testing

Post-immunisation testing for seroconversion should be done 1 to 2 months after the third immunisation dose. All health-care workers should be responsible for knowing their immune status. A health-care worker who does not respond to the initial course of hepatitis B vaccine (titres <10 mIU/mL) after the 3 doses, 1 month apart, followed by antibody testing, should have a repeat of the vaccine series and testing done after the second series [51] .

Exposure to Hepatitis C Virus (HCV)

In health-care settings, the transmission route of HCV is largely parenteral (e.g. a needle stick through the skin) through exposure to blood and body substances. Sexual transmission does occur but is far less frequent. As with HIV, there are no confirmed effective methods for treating HCV, so the focus must be on preventing exposure to HCV through safe infection control work practices (e.g. standard precautions, ongoing education and training, safe management and disposal of health-care-related waste and sharps, and appropriate use of PPE). There is no vaccine for HCV [52].

Tuberculosis

Tuberculosis (TB) is an airborne infectious disease caused by Mycobacterium tuberculosis (MTB). It is usually transmitted by exposure to airborne particles called 'droplet nuclei' produced by individuals infected with TB while coughing and/or sneezing. Prolonged close contact with TB-infected individuals increases the risk of transmission. The aerosol droplets are very small, less than five microns in size, and can stay infectious for long periods in the air, making transmission possible when they are inhaled and settle into the lungs.

It is important to ensure prompt detection, initiation of airborne precautions, and treatment of persons who have suspected or confirmed MTB disease. TB is highly infectious; hence, patients need to be isolated in a TB ward and not in a ward with non-TB patients. Health-care staff, including nurses, doctors, clinical officers, nursing and medical students, housekeeping staff, and others are vulnerable to TB exposure, infection, and disease.

Health-care workers are at even greater risk in the following circumstances [40]:

- During aerosol-generating or aerosol-producing procedures, including bronchoscopy, endotracheal intubation, suctioning, other respiratory procedures, open abscess irrigation, autopsy, sputum induction, and aerosol treatments that induce coughing.
- When they are working with difficult-to-treat TB, such as relapses, treatment failure, and multi-drug resistant (MDR), and extensively drug-resistant (XDR) TB.
- After prolonged contact with patients with unrecognised TB disease who are not promptly handled with appropriate airborne precautions, or with patients moved from an airborne infection isolation room too soon (e.g. patients with unrecognised TB, patients with MDR or XDR TB).
- Long duration of employment.
- Working without following IPC procedures.
- Having HIV infection.

Meningococcal Meningitis

Neisseria meningitidis is transmitted via direct contact, particularly by respiratory droplets from the nose or throat of colonised or infected people. Individuals with meningococcal septicaemia (blood poisoning) or meningitis are usually not infectious after 24 hours of appropriate antibiotic therapy.

The risk of transmission is high for health-care workers who have been in direct prolonged contact with the patient and have not been wearing PPE (i.e. masks), or have been involved in mouth-to-mouth resuscitation, intubation or bronchoscopy of infected patients. Antibiotic prophylaxis (treatment to prevent developing symptoms) should be made available to health-care workers in these situations, ideally within 24 hours if the risk of exposure has been deemed significant. No prophylaxis can be considered 100% effective. Therefore, droplet and contact precautions, in addition to standard precautions, should be adhered to by all staff when caring for individuals infected or suspected of being infected with ***Neisseria meningitis*** [53].

Tetanus

Tetanus enters the body through wounds contaminated with soil, human and animal faeces, and street dust.

Tetanus vaccinations are part of childhood vaccination schedules in most countries. A booster vaccination is required every 10 years. Tetanus status should be reviewed in the event of occupational exposure to blood or body substances, particularly when involving used or discarded sharps or needles, or for deep or dirty wounds. People who have not had a recent booster should be re-vaccinated [54].

TABLE 6.1: Work Restrictions for Health Care Workers Exposed To, or Infected with, Selected Infectious Diseases [50] [55] [51] [54] [56]

Disease/ Pathogen	Relieve from Direct Patient Contact	Partial Work Restriction	Duration
COVID-19	Yes		Staff to remain off work for 7 days from last exposure. Subject to change depending on situation or new protocol. Any health worker who identifies as symptomatic or tests positive for SARS-CoV-2 should: ■ Immediately be isolated and stop all patient care activities. ■ Inform their supervisor who should notify the IPC team (as per Cook Islands protocol).
Herpes zoster Shingles	Yes	Restrict immunocompetent personnel with localised zoster from the care of high-risk patients until lesions are crusted; allow them to care for other patients with lesions covered.	Restrict immunocompromised personnel with zoster from contact with patients until lesions are crusted. Restrict susceptible personnel exposed to zoster from patient contact from the 10th day after the first exposure through the 21st day after the last exposure.
HIV	Assess	May be restricted from performing exposure prone procedures (invasive procedures that carry a risk of injury to the health-care worker, which may result in the exposure of the patient's open tissues to the blood of the worker)	*Refer to specialist*

Disease/ Pathogen	Relieve from Direct Patient Contact	Partial Work Restriction	Duration
Influenza and other viral respiratory illness, including the common cold	Yes		Consider excluding personnel with acute febrile respiratory infections from the care of high-risk patients (e.g. neonates, young infants, patients with chronic obstructive lung disease and immunocompromised patients) during community outbreaks of influenza or respiratory syncytial virus (RSV) infections.
Measles active	Yes		Until four days after the rash appears or for the duration of their acute illness, whichever is longer.
Measles – post-exposure (susceptible personnel)	Yes		From the 5th through to the 21st day after the last exposure OR seven days after the rash appears OR for the duration of their acute illness, whichever is longer.
Meningococcal disease	Yes		Exclude personnel with ***N. meningitidis*** infections from duty until 24 hours after the start of effective antibiotic therapy. Do not routinely exclude personnel from duty who only have nasopharyngeal carriage of ***N. meningitidis.***
Mumps	Yes		Exclude from duty susceptible personnel who are exposed to mumps from the 12th day after the first exposure through the 26th day after the last exposure or, if symptoms develop, until nine days after the onset of parotitis.
Pertussis	Yes		Exclude personnel that develop symptoms (cough ≥ seven days, particularly if accompanied by paroxysms of coughing, inspiratory whoop, or vomiting) after known exposure to pertussis from patient care areas until five days after the start of appropriate therapy.

Disease/ Pathogen	Relieve from Direct Patient Contact	Partial Work Restriction	Duration
Rubella	Yes		Exclude from duty susceptible personnel who are exposed to rubella from the 7th day after the first exposure through to the 21st day after the last exposure. Exclude personnel who acquire rubella from duty until 7 days after the beginning of the rash.
Hepatitis B acute symptoms	Assess		*Refer to specialist*
Hepatitis C	Assess	May be restricted from performing exposure prone procedures.	*Refer to specialist*
Hepatitis A	Yes		Until seven days after onset of jaundice.
Varicella	Yes		Exclude personnel from work who have onset of varicella until all lesions have dried and crusted. Exclude from duty after exposure to varicella personnel who are not known to be immune to varicella (by history or serology), beginning on the 10th day after the first exposure until the 21st day after the last exposure.

6.2 Guidelines for Managing Occupational Exposure to Blood and Body Substances

Occupational exposure is defined as an incident that occurs during the course of a person's employment and involves contact with blood or body substances. Such exposure may put the person at risk of acquiring a blood-borne infection. Adherence to standard IPC practices remains the first line of protection for health-care workers against occupational exposure to HIV, HBV and HCV.

Prevention of Occupational Exposure to Blood and Other Body Substances

Preventing exposure through safe practices, barrier precautions, safe needle devices and other methods is the most effective strategy for reducing the risk of infection with HIV and other bloodborne pathogens in health-care settings.

Two significant prevention priorities:

1. All health-care workers should be trained in, and able to demonstrate competency in standard precautions.
2. All staff should be provided with the necessary materials and protective equipment.

Staff should also be knowledgeable about the risks of acquiring HIV and other bloodborne pathogens through sexual contact, and should have ready access to condoms and confidential treatment services for sexually transmitted infection.

The following measures to reduce the incidence of occupational exposure should be taken:

- Never recap needles.
- Do not disconnect needles from the syringe.
- Always transport (or pass to another person) sharp objects in a kidney dish or puncture-proof container.
- Sharps should be disposed of in puncture-proof containers. Containers should not be filled further than the 'fill line' and should be disposed of promptly.
- Wear appropriate PPE if there is anticipated exposure to blood and body substances.
- Take care with all blood-contaminated equipment.

Definition and Reporting of Occupational Exposure

Occupational exposure includes:

- Percutaneous injuries or cuts with used instruments, such as needles or scalpel blades, and involving blood or other body substances;
- Contamination of fresh cuts or abrasions with blood or other body substances; and
- Contamination of the eyes or other mucous surfaces with blood or other body substances.

Immediate Care of the Exposed Person

It is strongly recommended that immediately after an occupational exposure to blood or other body substances, these measures are followed:

- Perform first aid.
- Wash the exposure site with soap, and remove any remaining blood on the skin under running water.
- Apply a sterile dressing if necessary and apply pressure through the dressing if the wound is still bleeding.

- Do not squeeze or rub the injury site.
- Do not use strong solutions such as iodine or bleach on the wound.
- If eyes have been exposed or contaminated, irrigate gently with normal saline or water while the eyes are open for at least 30 seconds (remove contact lens).
- If blood or body substances get in the mouth, spit it out immediately and rinse the mouth with water several times.
- If clothing is contaminated, remove it and shower.
- If water is not available for washing percutaneous exposure or punctures of the skin, use alcohol-based hand rub or antiseptic to replace soap and water.

Needle Stick Injuries

- Report occupational exposure/incidents immediately to your immediate supervisor who will make arrangements for counselling and baseline blood tests with the Chief Medical Officer and IPC focal point.
- Needle stick injuries should be reported and documented.
- It is strongly recommended that immediately after occupational exposure to blood or other body substances, these measures are followed.
  - Wash affected site of exposure and any remaining blood on the skin under running water with soap.
  - Apply a sterile dressing if necessary and apply pressure through the dressing if the wound is still bleeding.
  - Do not squeeze or rub the injury site.
  - Do not use strong solutions such as iodine or bleach on the wound.
  - If water is not available for washing percutaneous exposures or punctures of the skin, use a non-water cleanser or antiseptic to replace soap and water.

Procedures for Reporting Occupational Exposure

The health-care worker should IMMEDIATELY report the exposure to their supervisor or manager.

- The supervisor should arrange immediate medical assessment of the health-care worker and the patient who is the source of the exposure.
- **Complete an exposure report. The exposure report should contain the following information:**
  - The name of the staff member involved.
  - The area where the incident occurred, such as the ward, operating room or emergency room.
  - A description of the incident.
  - The name of the source person whose blood or body substances were involved in the incident.
  - If the source of the blood is unknown, this must also be documented.

As soon as possible (within one day), a copy of the incident form should be sent to the exposed health-care worker's supervisor, so that they are aware of any risks or lapses in standard precautions or procedures, and can assess them in a confidential, sensitive and non-judgmental way.

Medical Assessment

Health-care workers should have immediate, freely available access to post-exposure prophylaxis (PEP) 24 hours a day, seven days a week, at the Rarotonga Hospital Pharmacy, regardless of the location or type of work they do. The minimum care following potential exposure to HIV should be risk assessment and, if deemed necessary, the first dose of PEP medication.

A medical risk assessment by a medical officer involves taking and recording the history and details of the occupational exposure and assessing the risk of HIV, HBV and HCV from the source person and the exposed person. This assessment should be undertaken by a trained person IMMEDIATELY after first aid is given, regardless of the time of day that the occupational exposure occurs. Immediately after reporting the incident, arrangements should be made to release the health-care worker from work so that immediate risk assessment can be made and, if deemed necessary, the first dose of PEP medication can be given.

Practical Guidance for Assessing PEP Eligibility for HIV [57]:

- HIV PEP should be offered and initiated as early as possible in all individuals after an exposure that has the potential for HIV transmission, and ideally within 72 hours.
- Eligibility assessment should be based on the HIV status of the source whenever possible. This may include consideration of background prevalence and local epidemiological patterns.
- **Exposures that may warrant HIV PEP include:**
  - Bodily fluids – blood, blood-stained saliva, breast milk, genital secretions;
  - Cerebrospinal, amniotic, peritoneal, synovial, pericardial, or pleural fluids;
  - Mucous membrane – sexual exposure, splashes to the eye, nose, or oral cavity;
  - Parenteral exposures.
- **Exposure that does not require HIV PEP:**
  - When the exposed individual is already HIV positive;
  - When the source is established to be HIV negative;
  - Exposure to bodily fluids that do not pose a significant risk, i.e. tears, non-blood-stained saliva, urine, and sweat.

In cases that do not require PEP, the exposed person should be counselled about limiting the risk of future exposure. Although HIV testing is not required, it may be provided if desired by the exposed person. A starter pack (or first dose) of PEP drugs should be offered to individuals who are determined to be at risk as soon as possible, within one hour and ideally within 72 hours after exposure. An HIV test should normally not be a condition of initiating PEP, nor should PEP be delayed until the results of an HIV test become available.

Exposure and Source Patient

Exposure should be assessed for its potential to transmit a bloodborne pathogen (based on the clinical assessment of the exposure and the eligibility for PEP).

If it is possible to test a source patient of unknown status, testing should occur only after obtaining informed

consent and should include appropriate pre-test counselling and a referral plan for care, treatment and support. Confidentiality must be maintained throughout the process.

Medical assessment constitutes an emergency for the exposed health-care worker.

Baseline testing for HIV and follow-up testing should form part of the clinical pathway, but this should not delay initiating PEP where warranted.

Baseline testing is done at this time to ascertain whether the exposed person may have been infected from a previous exposure.

- After first aid has been completed, baseline testing should occur as soon as possible, but at least within 72 hours following exposure.
- Baseline tests are usually for HIV antibody, hepatitis B surface antigen (HbsAg) and hepatitis B and C antibodies.
- The health-care worker's tetanus immunisation status should be considered.
- Pre-test counselling for HIV should be provided before any blood is taken for testing (but blood drawing should not be delayed if an appropriate counsellor cannot be located right away).
- Follow-up retesting for HIV, HBV and HCV should occur at 6 weeks and 3 months. There is also a 6-month follow up for HIV and HCV only.

Clinical evaluation and baseline testing of the exposed health-care worker should proceed only after pre-test counselling and after obtaining informed consent. It should always include:

- An explanation of privacy and confidentiality;
- Further explanation of HIV, HBV and HCV infection and its consequences if necessary;
- An explanation of testing, possible results and confirmatory testing;
- Assessment of risk related to past and current sexual and other behaviour;
- Assessment of risk related to the occupational exposure in question;
- An explanation of low transmission risk associated with occupational exposure;
- Assessment of anxiety level and coping mechanisms;
- Informed consent for testing;
- Informed consent for a pregnancy test (if indicated);
- A plan for precautions while awaiting test results (and while on PEP, if indicated), e.g. adverse effects of antiretrovirals (ARVs), safer sexual practices or abstinence, cessation of breast feeding if lactating;
- A list of any other risks identified by sexual and behavioural history;
- A mechanism for support while the patient waits for test results, and while on PEP if indicated;
- A review of the sequence of events that preceded the exposure, and provision of exposure risk reduction education in a sensitive and non-judgmental way.

Risk of HIV and Other Infections Following Occupational Exposure

Data from several studies of health-care workers exposed to HIV in the workplace suggest that the risk of HIV

transmission after percutaneous exposure to HIV-infected blood is approximately 0.3% (95% confidence interval [CI] 0.2 to 0.5%). After mucous membrane exposure, the risk is approximately 0.09% (CI = 0.006%–0.5%) [50].

According to the Centers for Disease Control and Prevention [55], for health-care workers who sustained injuries from needles contaminated with blood contaminated by HBV, the risk of developing **clinical hepatitis** if the blood was both HBsAg-positive and HBeAg-positive was 22%–31%, and the risk of developing serologic evidence of HBV infection was 37%–62%. By comparison, the risk of developing clinical hepatitis from needles contaminated with HBsAg-positive and HBeAg-negative was 1%–6%, and the risk of developing serologic evidence for HBV infection was 23%–37%.

HIV PEP

Box 6.1: HIV PEP Regimen for Adults and Adolescents	
Post- exposure prophylaxis	A two drug PEP regimen is effective, but three drugs are preferred (conditional recommendation, low quality evidence) **Tenofovir disoproxil fumarate** (TDF) + **lamivudine** (3TC) or **emtricitabine** (FTC) is recommended as the preferred backbone regimen for HIV PEP for adults and adolescents ***(strong recommendation, low-quality evidence)*** **Dolutegravir (DTG) is suggested as the preferred third drug for HIV PEP for adults and adolescents**

Timing and Duration of PEP for HIV

Occupational exposure to HIV should be treated immediately as a matter of urgency. Although PEP is ideally provided within 72 hours of exposure, people may not be able to access services within this time. Hence, initiating PEP after a longer period (one week) should still be considered for exposures that represent an extremely high risk of transmission. Expert advice is recommended.

Needle stick injuries in Cook Islands should be reported to the Rarotonga Hospital. Follow-up testing should be established at 6 weeks and 3 months. PEP can be administered but access is limited for the outer islands. Therefore, the serology status of all Cook Islanders in the Pa Enua (Outer Islands) should be assessed.

A 28-day prescription of antiretroviral drugs should be provided for HIV PEP following initial risk assessment [50] [57] [58].

- Clinical assessment of exposure.
- Eligibility assessment for HIV PEP.
  - Parenteral or mucous membrane exposure.
  - The following bodily fluids may pose a risk of HIV infection: blood, blood stained saliva, breast milk, genital secretions and cerebrospinal, amniotic, rectal, peritoneal, synovial, pericardial or pleural fluids.
- HIV testing of exposed people and source if possible.
- Provision of first aid in case of broken skin or other wound.

- Risk of HIV.
  - Parenteral or mucous membrane exposure.
- Risks and benefits of HIV PEP.
- Side effects.
- Enhanced adherence counselling if PEP is to be prescribed.

- PEP should be initiated as early as possible following exposure.
- 28-day prescription of recommended age appropriate ARV drugs.
- Drug information.
- Assessment of underlying comorbidities and possible drug-drug interactions.

- 1st follow up with 72 hours (discuss again risks for infection and risks and benefits of PEP).
- HIV test at 3 months after exposure.
- Link to HIV treatment if possible.
- Provision of prevention intervention as appropriate.

Figure 6.1: Summary of Care Pathway for Health-care Workers Exposed to HIV (Source: WHO 2014.) [58]

Clinical Follow-Up and Counselling

Health-care workers who have had an occupational exposure to HIV should receive follow-up counselling regardless of whether they receive PEP. It is essential to provide follow up for health-care workers on HIV PEP within 72 hours post-exposure to provide an opportunity for the worker to ask questions and for the counsellor to make certain that the worker understands the risks of infection and the risks and benefits of PEP.

In addition to HIV antibody testing at the time of the injury, exposed health-care workers should also undergo repeat testing at 6 weeks, 3 months and 6 months after exposure.

If the health-care workers sero-converts (acquires HIV infection), this will usually occur 2 to 6 weeks after exposure, accompanied by a symptomatic acute retroviral syndrome; that is, an acute mononucleosis-like illness with fevers, sweats, malaise, lethargy, anorexia, nausea, myalgia, arthralgia, headache, sore throat, diarrhoea, lymphadenopathy and rash.

Health-care workers on PEP should practise safer sex (or abstain from sexual intercourse) until serology is negative at 3 months post-exposure. Female health-care workers who are lactating should consult a specialist regarding cessation of breast feeding while they are taking antiretrovirals.

Occupational exposure to HIV can be a frightening experience and some psychological morbidity (e.g. anxiety, depression, insomnia) and even post-traumatic stress disorder are relatively common following such an exposure. Early and frequent follow-up appointments for counselling and clinical review are essential.

Should health-care workers become HIV positive, clinical management should follow existing national guidelines, and counselling and support should be maintained. International guidelines and recommendations for the management of HIV-positive health-care workers are also available online.

Hepatitis B PEP

Childhood vaccination against hepatitis B is included in the expanded programme on immunisation. Management of possible exposure to hepatitis B should follow existing national guidelines and protocols but, ideally, all health-care workers should already be immune to hepatitis B. If hepatitis B immunoglobulin (HBIG) is available, it should be administered with vaccination to exposed individuals who have not been vaccinated previously (Table 6.2).

Hepatitis B vaccination (20 µg intramuscularly per dose) is administered at 0, 1 and 6 months.

Note: HBIG should be administered soon after exposure when indicated. It is administered intramuscularly either on the gluteal or deltoid muscle. The dosage for HBIG is 0.06ml/kg or 500 IU.

TABLE 6.2: Summary of Recommended Actions to Protect Health-care Workers against Occupationally acquired Hepatitis B [51]

SOURCE PATIENT		
HEALTHCARE WORKER	**HBSAg+**	**Unknown**
UNVACCINATED		
	HBIG x 1 dose *plus* Hepatitis B vaccine x 3 doses	Hepatitis B vaccine x 3 doses

SOURCE PATIENT		
VACCINATED		
Serological "responder" (anti-HBs ≥10 mIU/ml)	No treatment	No treatment
Serological "non-responder" (anti-HBs <10 mIU/ml)	HBIG x 1 dose ***plus*** Hepatitis B vaccine x 3 doses	**If higher risk exposure:** HBIG x 1 dose ***plus*** Hepatitis B vaccine x 3 doses
Antibody status unknown	**Test for anti-HBs if available** If anti-HBs ≥10 mIU/ml: No treatment If anti-HBs <10 mIU/ml: HBIG x 1 dose ***plus*** Hepatitis B vaccine x 1 dose	**Test for anti-HBs if available** If anti-HBs ≥10 mIU/ml: No treatment If anti-HBs <10 mIU/ml: Hepatitis B vaccine x 3 doses

CHAPTER 7

SURVEILLANCE FOR INFECTION PREVENTION AND CONTROL

CHAPTER 07

SURVEILLANCE FOR INFECTION PREVENTION AND CONTROL

Studies have shown that health-care facilities with an effective surveillance system and IPC programme can effectively reduce HAIs. IPC programmes can reduce HAIs by 30%, and an active HAI surveillance programme can contribute to reducing HAIs by 25%–57% [59] [60].

WHO [61] defines surveillance as ***an ongoing, systematic collection, analysis and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice.*** The specific goals of surveillance may vary depending on who is conducting it and the population under study. Surveillance may include any or all of the following: (i) establishing baseline or endemic rates of disease; (ii) identification of disease outbreaks or changes in disease trends; (iii) determination of risk factors for, or the natural history of, specific diseases; (iv) measurement of compliance with established standards; and (v) assessment of the effect(s) of practice changes, new interventions, or new technology.

The following may be considered for HAI surveillance:

- Specific sites of infection (e.g. bloodstream, SSI, indwelling urinary catheters).
- Specific populations (e.g. health-care workers who have had occupational exposure to blood and body substances; neonates).
- Specific organisms that can have severe outcomes (e.g. multidrug-resistant organisms).
- Specific locations (e.g. intensive care units; neonatal intensive care units).

A surveillance programme should include:

- A nationally standardised set of case definitions that are consistently and accurately applied;
- Standardised methods for identification of the number of persons developing an infection (numerator);
- Standardised methods for detecting the exposed or at-risk population (denominator);
- The time period involved;
- A process for analysis of data and reports, calculation of rates and both numerator and denominator.

Other surveillance/audit activities can include:

- Hand hygiene audits for specific areas, e.g. intensive care units;
- Environmental audits on cleaning schedules, with colour-coding of cleaning equipment;
- Waste management audits;
- Audits on specific work practices, such as:
  - Use of surgical antimicrobial prophylaxis; and
  - Aseptic manipulation of invasive devices.

Health-Care Facility Surveillance [3] [62] [63]

At the health service delivery level, IPC surveillance activities and responsibilities should include the following:

- Documenting the situation of HAI and IPC processes in the health-care facility.
- Establishing the priorities for surveillance according to the scope of care in the facility.
- Establishing the minimum registers necessary for medical records used for surveillance purposes, and monitoring compliance.
- Conducting surveillance, applying national standardised case definitions and methods of surveillance of infections.
- Detecting outbreaks and coordinating the response.
- Reporting HAIs and events to the IPC committee and relevant teams.
- Assessing IPC practices and other relevant processes in a blame-free organisational culture.

Common priority areas can include:

- Ventilator-associated pneumonia;
- Surgical site infections;
- Intravascular device associated infections; and
- Multi-resistant organisms (MRSA, extended spectrum beta-lactamase producing organisms).

CHAPTER 8

INFECTION BY SELECTED DISEASES

CHAPTER 08

INFECTION BY SELECTED DISEASES

This section discusses IPC measures for selected diseases that are either present in Cook Islands or may become present and that are of importance to health care and public health settings.

For further information, refer to the relevant guidance of the MOH.

8.1 SARS-CoV-2 (COVID-19)

Coronavirus disease 2019 (COVID-19) is caused by SARS-CoV-2, a novel coronavirus that was first detected in Wuhan, China, in December 2019. Genetic sequencing of the virus suggests that it is a beta-coronavirus, closely linked to the SARS virus. By way of definition, a symptomatic COVID-19 case is a person who has developed signs and symptoms suggestive of COVID-19 [64] [65].

The WHO International Health Regulations Emergency Committee declared the COVID-19 outbreak a Public Health Emergency of International Concern on 30 January 2020. On 11 March 2020, WHO declared the COVID-19 outbreak a global pandemic.

Mode of Transmission [43]

- The virus that causes COVID-19 infection mainly spreads between people when an infected person is in close contact with another person. Transmissibility of the virus not only depends on the amount of viable virus being shed and expelled by a person, but also on the type of contact they have with others, the setting and the prevention and control measures in place.
- The virus can spread from an infected person's mouth or nose in small liquid particles when the person coughs, sneezes, sings, breathes heavily or talks. These liquid particles range in size from larger 'respiratory droplets' to smaller 'aerosols'.
- Aerosol transmission can occur in specific circumstances and settings in which procedures that generate aerosols are performed.
- Outside of medical facilities, aerosol transmission can occur in specific circumstances and settings, particularly in indoor, crowded and inadequately ventilated spaces such as restaurants, fitness classes, nightclubs, offices, and places of worship, where infected persons spend long periods of time with others.
- Viable virus has been found on surfaces and objects. Thus, the virus could also be transmitted through contaminated objects or surfaces, although there is limited evidence demonstrating actual transmission through this route.

Symptomatic, Pre-Symptomatic and Asymptomatic Transmission

- Current evidence suggests that people infected with COVID-19 can transmit the virus whether they have symptoms or not.
- Infected individuals have the highest viral loads, meaning they are more infectious, just before or around the time they develop symptoms and during the first 5–7 days of illness. Viable virus has been isolated from specimens of pre-symptomatic and asymptomatic individuals, suggesting that people who do not have symptoms are able to transmit the virus to others.

IPC Measures Required to Prevent or Limit Transmission of COVID-19 [17]

- Facilitate screening and triage for early recognition of patients with suspected COVID-19 and rapid implementation of isolation measures.
  a. Display information at the entrance of the facility, directing patients with signs and symptoms of COVID-19 to report to the designated area for screening.
  b. Establish well-equipped screening and triage stations, where screening questionnaires are used according to the most recent WHO case definitions, and where staff have access to adequate supplies of PPE, based on WHO's guidance on rational use of PPE.
  c. Isolate suspected and confirmed COVID-19 patients with full implementation of standard, droplet, contact and airborne precautions.

Emergency department isolation rooms

- There should be a separate, well-ventilated area where patients with suspected COVID-19 can wait. This area should have benches, stalls or chairs placed at least 1 metre apart.

COVID-19 isolation area

- The area should have dedicated toilets, hand hygiene stations, and trash bins with lids for disposal of paper tissues used for respiratory hygiene or after hand washing.

- Apply standard precautions for all patients (section 4). The application of standard precautions are the basic IPC measures that should be applied in all areas, including during outbreak situations. These measures are necessary to reduce the risk of transmission of the COVID-19 virus from both recognised and unrecognised sources.

Hand Hygiene

Hand hygiene, either washing with soap and water or using an alcohol-based hand rub (containing at least 70% alcohol), is one the most effective measures to prevent the spread of COVID-19 and other pathogens (section 4.1.1). The correct steps must be followed to achieve effective hand hygiene; that is, washing with soap and water for 40–60 seconds when hands are visibly soiled, or using alcohol-based hand rub for 20–30 seconds when hands are not visibly soiled.

Respiratory Hygiene

Health-care workers should promote respiratory hygiene by ensuring that information posters are displayed on:

- The need to cover the nose and mouth with a tissue or bent elbow when coughing or sneezing;
- The importance of performing hand hygiene after contact with respiratory secretions or objects that may be potentially contaminated with respiratory secretions.

Health-care workers should also ensure that masks are provided for and worn by suspected COVID-19 patients.

Use of PPE

PPE must be worn by health-care workers caring for patients with suspected or confirmed COVID-19 virus to prevent transmission to themselves and others. The effective use of PPE strongly depends on adequate and regular supplies, staff training on how to put on and remove PPE, disposal of PPE, and appropriate hand hygiene. (Figs 4.6 and 4.7 illustrate the correct sequence for putting on and removing PPE safely.)

For suspected or confirmed COVID-19 cases, this is the required PPE for staff:

- Disposable long-sleeved, fluid-resistant gown.
- Gloves.
- N95/FFP2 respirator mask.
- Protective eyewear (goggles or face shield).
- Apron (to be worn on top of a gown) when performing AGPs.

Environmental Cleaning

It is important to ensure that cleaning and disinfection procedures are followed consistently and correctly in all COVID-19 isolation and quarantine centres. All surfaces in health-care facilities should be routinely cleaned and disinfected, especially high-touch surfaces, and whenever visibly soiled or if contaminated by body fluids Cleaning with neutral detergent, followed by a chemical disinfectant – 0.1% (1000ppm) sodium hypochlorite (also known as household bleach) or 70-90% ethanol – can effectively inactivate the COVID-19 virus. However, if there are large spills of blood or body fluids, a concentration of 0.5% (5000 ppm) sodium hypochlorite should be used. (Annex 5 describes how to mix sodium hypochlorite solutions.)

Environmental Cleaning Requires a Two-Step System

1. Thoroughly clean all hard surfaces and frequently touched areas with a solution of water and normal neutral detergent. Allow to air-dry completely.
2. Disinfect all cleaned surfaces with a household bleach solution, 0.1% sodium hypochlorite, or 70% alcohol. After appropriate contact time of a minimum of 1 minute for ethanol and sodium hypochlorite, disinfectant residue may be rinsed off with clean water if required.

Waste Management and Laundry

All health-care waste generated in a facility with COVID-19 patients is considered infectious and should be collected safely in clearly marked lined containers and sharps boxes.

All waste handlers should be trained in appropriate use of PPE and IPC measures, and must wear the following PPE: boots, long-sleeved disposable gown, heavy-duty rubber gloves, eye goggles/face shield and a mask.

Laundry from COVID-19 patients should ideally be machine-washed with warm water and laundry detergent at 60–90°C. If machine washing is not possible, linens can be soaked in hot water and soap in a large drum using a stick to stir them, taking care to avoid splashing. Following this, the linen should be soaked in 0.05% chlorine

for approximately 30 minutes and then rinsed with clean water and allowed to dry fully, if possible in sunlight.

Airborne Precautions

IPC Management for Airway Management [66]

Airway management is a high-risk period for contact, droplet or aerosol-based transmission. Coughing, positive pressure ventilation, laryngoscopy, tracheal intubation, bronchoscopy, open tracheal suctioning, and front of neck airway access can generate aerosols during airway intervention. During this time, staff are also in close proximity to the patient's airway.

The following considerations are designed to minimise health-care worker infection:

- **Environment**
  - Intubation should preferably be performed in a negative pressure room. If a negative pressure room is not available, use a single room with open windows.
  - If no single rooms are available, ensure the maximum distance possible from unprotected staff and patients.
- **Airborne and contact precautions are required for all staff assisting with intubation, i.e.:**
  - N95/P2 mask.
  - Eye protection.
  - Long-sleeve gown.
  - Gloves.

- **Equipment** – If there are large numbers of patients with COVID-19 admitted, consider the use of a dedicated COVID-19 airway trolley that has designated pre-prepared intubation equipment. This may avoid the need for a main airway trolley to be taken into a patient's bed space and avoid contamination. The dedicated trolley should be kept close to the area of the ward where COVID-19 positive patients are cared for.

Other considerations for procedures:

- The airway management procedure should be performed by the most qualified staff available to increase the success rate of first attempts.
- Ensure only the minimum number of staff required to undertake a safe intubation are present.
- If available, video laryngoscopes should be used to increase the distance between the operator and the patient's airway.
- Optimise pre-oxygenation to reduce the need for rescue interventions and generation of aerosols.
- Apnoeic oxygen with nasal cannula, or high-flow oxygen is not recommended.
- A viral filter should be placed between the mask and bag in the bag-valve-mask (BVM) setup.
- The duration of use of BVM should be minimised.
- A two-handed BVM technique should be used to minimise leak.
- Avoid open airway suctioning. It is not recommended because it involves breaking the ventilator circuit and exposes staff to aerosols. If closed suction systems are not available, the principles of open airway

suctioning are the same as for all aerosol-generating procedures. It should only be carried out when essential/minimised as much as possible. Only those staff who are needed to undertake the procedure should be present and they should apply airborne + contact precautions. It should be carried out in a single room with the doors shut, ideally a negative pressure room, or a room with windows open.

- Post-intubation, do not ventilate the patient until the endotracheal cuff is inflated.
- Suctioning can be performed post-intubation using a closed-circuit suctioning technique.
- The laryngoscope should be placed in a sealed bag immediately after use and sent for sterilisation (if not single use), or cleaned with detergent and water, dried, and wiped with 70% alcohol.

Have a dedicated COVID-19 emergency trolley in all outpatient and emergency departments. It should be equipped with PPE and equipment, including the following:

- Long-sleeved gown.
- Apron.
- Gloves.
- Eye protection (either goggles or face shield).
- N95/P2 respirator mask.
- Surgical mask.
- Intubation equipment that is COVID-compliant (e.g. the Air-Viva should be equipped with a HEPA filter).
- For all airway procedures, health-care workers must wear an appropriate mask, ideally P10.

The donning of PPE should be considered as part of the 'danger' assessment in an arrest situation – staff should not enter the patient's room and begin cardiac pulmonary resuscitation (CPR) until full PPE has been donned. It is recommended that the minimum number of staff required should enter the patient's bed space for the emergency call.

Given that AGPs may be required (high-flow oxygen, intubation), it is recommended that staff wear an N95/P2 respirator mask for resuscitation responses, in addition to a gown, apron, gloves, and eye protection.

In circumstances where it is clear that AGPs will not be required, e.g. for hypotension or pain, then a surgical mask rather than an N95/P2 mask is adequate. However, if in any doubt, or in an unstable situation, choose an N95/P2 mask.

If possible, the emergency trolley should be kept out of the patient's room.

A container should be provided to allow 'dropping' of items from outside the room to inside the room (this container is left with the patient and replaced after the call).

During Resuscitation

- Responders should assess for breathing by looking for chest rise and fall from the end of the bed. Do not place your face next to the patient's mouth/nose.
- Do not do mouth-to-mouth ventilation or use a pocket mask.
- Commence chest compression. Do not await intubation to commence CPR.

- To provide initial basic respiratory support, use a BVM, with a viral filter fitted, using the two-operator technique.

Patient risk factors such as age, comorbidities, and severity of illness should be considered when determining the appropriateness of starting and terminating CPR. If no readily reversible causes are identified, early cessation of resuscitation should be considered.

- If it is safe to do so, patients requiring tracheal intubation should be moved to an appropriate location. This may be a single room with a door, if available.
- Tracheal intubation should be undertaken by the most skilled airway operator available. If intubation is going to be delayed, a supraglottic airway should be inserted by an adequately trained clinician.
- Pause chest compressions during any airway intervention to minimise risk of aerosol generation.
- Where possible, single-use equipment is preferred.

Patient Transfers Post-Emergency

- Non-intubated patients should be transferred wearing a surgical mask over their oxygen delivery device.
- Staff should wear PPE (gloves, gown, eye protection and N95/P2 respirator).
- Where possible, hallways/corridors must be cleared, and only essential staff should accompany the patient.
- Intubated patients should be transferred using a closed circuit fitted with a viral filter.
- During the transfer, a plastic covering for transport equipment may be used (e.g. over the transport ventilator).
- Proper cleaning of transport equipment is required after the transport (e.g. wipe with 70% alcohol or sodium hypochlorite).

Transferring Patients with Suspected or Confirmed COVID-19 in the ICU / HDU

From the emergency department (ED) to HDU:

- A nurse assistant or porter, and HDU nurse and HDU doctor make up the transfer team and must wear PPE for the transfer.
- On arrival at HDU, the team assists with transferring the patient onto the bed.
- The nurse assistant or porter remains in the room with the trolley while waiting for equipment to be switched over.
- HDU staff turn on negative pressure (if available) in the patient's room once the transfer is completed.
- The nurse assistant or porter does not need to exit via the ante room.
- The nurse assistant or porter should remain in their original PPE (only need to change their gown and gloves if visibly soiled).
- The nurse assistant or porter takes the trolley and equipment out via the front door of the patient's room and heads immediately back to the ED cubicle for cleaning (they cannot leave the trolley/equipment in the ICU corridor).
- The nurse assistant or porter returns the trolley and all equipment to the ED cubicle of origin for a two-step clean, with a wipe down of neutral detergent followed by a disinfectant.
- Ensure verbal and written handover of the patient.

From HDU to theatre:

- All confirmed or suspect COVID-19 patients, who are intubated and mechanically ventilated in HDU requiring transport to an anaesthetizing location, are to be transported on their existing HDU ventilator using Respiratory Plus Precautions.
- This requires the HDU nurse to be present for transport, and to be responsible for operation of the ventilator, which anaesthetic staff are less familiar with.
- Transfer to the anaesthetic machine ventilator circuit can occur after placing the HDU ventilator on standby and clamping the endotracheal tube prior to circuit disconnection. The HDU ventilator circuit is then capped.
- Returning the patient to the HDU ventilator at the conclusion of the case requires the HDU nurse to return and be present for the transfer back to HDU.
- Disconnection of the anaesthetic ventilator tubing should first occur proximal to the heat and moisture exchanger (HME) filter (i.e. the filter still attached to the clamped endotracheal tube), after stopping fresh gas flow through the anaesthetic circuit.
- The HME filter is then removed and discarded as contaminated, and the HDU ventilator circuit uncapped and reconnected. The endotracheal tube clamp is then removed.
- Ensure verbal and written handover of the patient.

ICU / HDU Procedure-Specific Instructions

Pathology specimen collection

- Bedside nurse to take specimen (bloods or swabs) and place into specimen bag.
- If an ante-room is available, the bedside nurse uses 70% alcohol to wipe the bag over. If an ante-room is not available, use an allocated space outside the room.
- The nurse or assistant wears gloves to take the sample to pathology (hand delivered by the clinical/ward assistant).

Blood gas analysis

- Blood gas is handed to a second nurse (with gloves on) to take the sample to the analyser.
- The staff member remains at the blood gas machine while the sample is being processed.
- Once processed, the syringe is disposed of in the clinical waste bin, and the analyser is wiped down with 70% alcohol.

Handling urine, faeces, and body fluids

- Dispose of urine and loose faecal matter in the sluice room.
- For patients on haemofiltration – the bedside nurse takes the effluent bags to the dirty pan/sluice room wearing full PPE (no need to change PPE as the effluent bag is dirty), and hangs the bag over the sluice to drain.
- Once the bag is emptied, place into the clinical waste bin. The nurse removes the gown and gloves in the dirty room, goes back into the ante-room to take off the mask and goggles, and performs hand hygiene.

Extubation

- Take airborne, contact, and standard precautions (including wearing N95/P2 mask).
- A simple oxygen mask should be placed on the patient immediately post-extubation to minimise aerosolization from coughing.
- The endotracheal tube and feeding tube are removed and put straight into a yellow bag.
- Oral suctioning may be performed, with care taken not to precipitate coughing.
- The patient should not be encouraged to cough.

8.2 Dengue Fever

8.2.1 Dengue Fever Transmission [67] [68]

The dengue virus is transmitted by female mosquitoes, mainly of the ***Aedes aegypti*** species and, to a lesser extent, ***Ae. albopictus***. These mosquitoes are also vectors of chikungunya, yellow fever and Zika viruses. The main species responsible for transmission of dengue fever and dengue haemorrhagic fever are ***A. aegypti*** and ***A. albopictus. A. aegypti*** breeds inside and outside buildings in containers that store water (e.g. pot plants, water storage drums). A. albopictus can breed in scant amounts of water and in naturally occurring water collection areas such as tree holes. When dried under natural conditions, Aedes sp. eggs remain viable for six months. Transmission of the dengue virus may be either immediate (if the mosquito's blood meal is interrupted and it changes host) or delayed (occurring one week after feeding on an infected host when the virus load in the mosquito's salivary gland is high). The virus is transmitted to humans through the bites of infected female mosquitoes, primarily the ***A. aegypti*** mosquito. Other species within the ***Aedes*** genus can also act as vectors, but their contribution is secondary to that of ***A. aegypti.***

Dengue Fever Symptoms

Dengue fever causes flu-like symptoms that generally last for 2–7 days. Dengue fever usually occurs after an incubation period of 4–10 days after the bite of an infected mosquito.

High fever (40°C) is usually accompanied by at least two of the following symptoms:

- Severe headache
- Pain behind the eyes
- Muscle and joint pains
- Nausea
- Vomiting
- Swollen glands
- Rash
- Diarrhoea
- Generally feeling unwell (malaise)

Severe Dengue

A patient enters what is called the critical phase normally about 3–7 days after illness onset. It is at this time, when the fever is dropping (below 38°C/100°F) in the patient, that warning signs associated with severe dengue can occur. Severe dengue is a potentially fatal complication, due to plasma leaking, fluid accumulation, respiratory distress, severe bleeding, or organ impairment.

Warning signs that doctors should look for include:

- Severe abdominal pain
- Persistent vomiting
- Rapid breathing
- Bleeding gums
- Fatigue
- Restlessness
- Blood in vomit

If patients manifest these symptoms during the critical phase, close observation for the next 24–48 hours is essential so that proper medical care can be provided, to avoid complications and risk of death.

Dengue Prevention and Control Activities

If you know you have dengue, avoid getting further mosquito bites during the first week of illness. Virus may be circulating in the blood during this time, and therefore you may transmit the virus to new uninfected mosquitoes, who may in turn infect other people.

The proximity of mosquito vector breeding sites to human habitation is a significant risk factor for dengue as well as for other diseases that Aedes mosquitoes transmit. At present, the main method to control or prevent the transmission of dengue virus is to combat the mosquito vectors. This is achieved as follows:

- **Prevention of mosquito breeding:**
  - Prevent mosquitoes from accessing egg-laying habitats by environmental management and modification.
  - Dispose of solid waste properly and remove artificial man-made habitats that can hold water.
  - Cover, empty, and clean domestic water storage containers on a weekly basis.
  - Cover outdoor water storage containers.

- **Personal protection from mosquito bites:**
  - Use personal household protection measures, such as window screens, repellents, insecticide-treated materials, coils and vaporizers. These measures must be observed during the day both inside and outside of the home (e.g. at work/school) because the primary mosquito vectors bite throughout the day.
  - Wear clothing that minimises skin exposure to mosquitoes.

- **Community engagement:**
  - Educate the community on the risks of mosquito-borne diseases.
  - Engage with the community to improve participation and mobilization for sustained vector control.
- **Reactive vector control:**
  - Emergency vector control measures, such as applying insecticides in space spraying during outbreaks, may be used by health authorities.
- **Active mosquito and virus surveillance:**
  - Active monitoring and surveillance of vector abundance and species composition should be carried out to determine the effectiveness of control interventions.
  - Prospectively monitor the prevalence of virus in the mosquito population, with active screening of sentinel mosquito collections.

CHAPTER 9

FOOD SAFETY

CHAPTER 09

FOOD SAFETY

Clean and safe food preparation and storage practices are critical to:

- Prevent outbreaks of foodborne illness among patients;
- Minimise microbiologic contamination of food by using appropriate food handling techniques during the preparation of food; and
- Protect food from contamination by insects, rodents and moisture.

Role of IPC in the Food Service Department [69]

The IPC focal person at Rarotonga Hospital should work closely with the Food & Nutrition Supervisor of the Food & Nutrition Department to ensure that food provided to patients is safe. This includes:

- Developing guidelines for safe operation of the kitchen and delivery of food to patients;
- Providing education and training for staff;
- Monitoring work areas and work practices at regular intervals through audits to ensure that safety standards are being followed;
- Determining correct cleaning, sanitation, and disinfection agents and practices for the department;
- Random spot checks (food benches, cooler, cutlery, equipment, etc.) by the Service Support Manager every quarter;
- Assisting with compliance with local health regulations.

Proper food handling practices will help prevent outbreaks of foodborne illnesses. These practices include:

- Complying with guidelines for proper handwashing and glove use when handling food;
- Purchasing raw materials from reliable or certified sources to avoid potentially contaminated raw materials;
- Preventing contamination of raw materials during transport, storage, and preparation;
- Keeping raw ingredients separated from prepared food;
- Keeping work areas clean, including dedicated food delivery trolleys;
- Ensuring correct cooking practices and procedures;
- Using prepared food within the safe time period after preparation;
- Preventing contamination of prepared foods during transport and storage;
- Storing food properly, including maintaining the recommended temperature at which to hold food after it

is cooked and before serving;

- Following hygienic practices for storing food;
- Using proper procedures to clean kitchen equipment as soon as possible after use;
- Ensuring that employees infected with a disease, including gastrointestinal infections, are not allowed to work in the kitchen.

Food Service Hygiene

During food preparation, all kitchen staff should wear appropriate protective clothing such as waterproof or fabric aprons. If fabric aprons are used, the aprons should be changed after each task and before leaving the kitchen area. Staff should also wear clean hats or hairnets that completely cover the hair while preparing food. It is advisable for staff to keep an extra clean uniform on hand to change into, in case of excessive perspiration. This may particularly apply to cooking staff.

WHO Food Safety Guidelines

Hygiene

- **Wash hands before handling food or utensils and wear plastic seamed gloves when appropriate. Wash hands and clean nails:**
  - When arriving for work;
  - After using the toilet;
  - Before handling any foods;
  - After having contact with unclean equipment and work surfaces, soiled clothing and dishcloths; and
  - Before putting on kitchen gloves and after removing gloves.
- Coughing and sneezing near food or dishes should be avoided. Where necessary, disposable tissues (rather than a handkerchief) should be used to cover the nose and mouth; hands should be washed immediately.
- Tongs, forks and spoons should be used when preparing foods to minimise hand contact. Cracked and chipped crockery should be discarded.
- Food should not be tasted with the ladle or spoon used in food preparation. Utensils used for tasting should be thoroughly washed between tastes, or disposable utensils used.
- Work areas, surfaces and utensils must be cleaned between different preparation tasks.
- Plastic gloves are to be worn when direct contact is made with food that is to be consumed without further cooking.
- Food service staff must have clean fingernails. Wearing rings and nail polish should be discouraged.
- Employees suffering from infectious diseases should be excluded from duty. If staff with mild respiratory infections are allowed to work, they should wear surgical masks while preparing food.
- There should be a dedicated hand-washing basin within the food preparation and cooking area.
- Protect the kitchen and food from insects, pests, and animals.

Keep raw and cooked food separate

Raw foods and their juices may contain dangerous microorganisms that can be transferred to other food

during preparation and storage:

- Separate raw meat, poultry, and seafood from other foods.
- Use separate equipment and utensils, including knives and cutting boards, for raw foods.
- Store prepared food in containers with sealed lids, and position prepared food to avoid contact with raw food, such as drippings from raw foods onto prepared food.

Keep food at safe temperatures

Contaminants can multiply quickly in food stored at room temperature. The danger zone is 5°C – 60°C (41–140°F). To help prevent foodborne illness, hold food at temperatures below 5°C (41°F) or above 60°C (140°F):

- Do not leave cooked food at room temperature for more than 2 hours.
- Refrigerate all cooked and perishable food promptly (below 5°C [41°F]).
- Keep cooked food hot (> 60°C [140°F]) before serving.
- Do not store food for longer than 3 days in the refrigerator.
- Do not thaw frozen food at room temperature; thaw in a refrigerator or immersed in water.
- The operating temperature of the freezer should be below -18°C.

Preparing and Serving Food

To prevent contamination of food during preparation and serving

- Staff suffering from diarrhoea should not handle food or have contact with patients until they have been symptom-free for more than 24 hours.
- Do not allow staff with infections (sore throat, uncovered skin or wound infections, nausea or vomiting, or diarrhoea) to handle food or equipment.
- Raw food and cooked food should always be prepared separately, using separate equipment, including utensils, bowls and cutting boards (use colour-coded cutting boards).
- Clean benches and equipment properly before, during and after food preparation.
- Wash hands before and after handling any food.
- All unused food returned to the kitchen after the service should be discarded. Do not serve leftovers.
- Single-use disposable gloves should be worn to handle foods that will not receive any further heat treatment (i.e. cooked meats/salad vegetables).
- For the isolation patient(s), the meal is delivered separately from meals provided for normal ward patients.

Food Storage

Proper food storage prevents contamination from moisture and chemicals and protects against insects and rodents.

Important points to remember when storing food [70]

- All foods must be stored in appropriate storage conditions in accordance with their manufacturer's

recommendations. All high-risk foods must be stored in the refrigerator.

- All foods should be subject to good stock rotation. Check the expiry date of new stock and place it below or behind older stock. Check all foods to ensure they remain within their expiry date. Any food that has passed the manufacturers' expiry date should be discarded.
- No food or materials are to be stored on the floor.
- Storage of food at room temperature is not permitted under any circumstances.
- Do not store foods overnight unless refrigeration is available and reliable.
- All perishable food not currently being processed should be stored in a refrigerator at a temperature below 5°C.
- All frozen foods should be stored at a temperature of -18°C.
- Store foods in their dedicated storage space to avoid cross contamination.
- Raw foods and cooked foods should be kept separate at all times.
- Store raw food below cooked food to prevent drip contamination.
- Ensure that the storage facility (cooler) is included in the routine preventative maintenance schedule.

Thawing Food

Make sure that all poultry is totally thawed before cooking to prevent growth of surviving Salmonella and other bacteria.

Important points to remember when thawing food items:

- Never thaw foods at room temperature.
- **All frozen poultry, red meats and seafood should be thawed by one of two methods:**
  - **Slow thaw:** Food is removed from the freezer and placed in a refrigerator 24 hours in advance of using.
  - **Rapid thaw:** Food is kept under cold water for two hours.

Procedures for cleaning kitchen and food storage areas

1. At the beginning and end of each day, wipe all surfaces with a clean damp cloth.
2. Use separate cleaning equipment for the kitchen.
3. Clean floors daily with detergent and water.
4. Wash all cleaning equipment and dry thoroughly to prevent growth of microorganisms.
5. Remove all waste containers, and transport waste to disposal site.
6. Wash waste containers with soap and water.
7. Cleaning cloths, towels, and equipment should be kept clean and changed daily. Sponges should not be used. Use 0.1% sodium hypochlorite (household bleach) solution for cleaning cloths.

Food Service Audits [71]

When undertaking an audit, the IPC officer should work with the Food & Nutrition Supervisor to develop check-lists and use them to audit practices. The audit should include points related to common causes of foodborne illness.

Particular attention should be given to evidence of prolonged exposure of food to warm temperatures. Other critical factors include:

- Cross-contamination arising from lack of compliance with hygiene practices for hand or equipment cleaning;
- Undercooking of high-risk meat products such as poultry; and
- Cross-contamination between raw and cooked items.

Audit reports should be shared with the kitchen staff so that improvements can made together as a team.

CHAPTER 10

SAFETY OF WATER SUPPLY FOR HEALTH-CARE FACILITIES

CHAPTER 10

SAFETY OF WATER SUPPLY FOR HEALTH-CARE FACILITIES

Many factors influence the transmission of a HAI. One factor is the availability of water. Health-care facilities need to have access to basic water and sanitation services and hygiene facilities. Where there is no access, or limited access to safe/treated water, there must be disinfection of the source or access to alternative sources of water. The following section focuses on ensuring safe and secure water supplies at remote health-care facilities and during emergencies.

Water in Health-Care Facilities

Each health-care facility must have a safe, adequate water supply that is free of physical, chemical and microbiologic pollution. Water used for consumption needs to be free from toxic substances, and be clear, colourless, odourless and drinkable. There should be adequate water for:

- Drinking, bathing and washing patients;
- Operating excreta disposal systems;
- Washing hands and equipment after contact with patients (including for sterilisation of theatre instruments), and other cleaning activities to maintain a healthy environment.

Ensuring a Safe and Adequate Water Supply

Monitoring the water supply in health-care facilities

The quality and safety of the water supply in health-care facilities should be monitored regularly by the health inspector/environmental health officer or nurse as per requirements under existing MOH guidelines to ensure the water supply is:

- Protected from contamination;
- Stored appropriately, free from contamination;
- In sufficient quantity to meet all the needs of the health-care facility.

In addition:

- Aqua tablets are provided to Outer Islands health services;
- Water filters are checked weekly;
- Hospital water tanks are cleaned twice yearly;
- The Rarotonga Hospital wastewater and land application system service schedule is maintained monthly, six monthly and yearly.

Water safety planning

If the water supply is likely to be contaminated, then the source of contamination must be determined so it can be managed appropriately, such as by disinfection. If this is not possible, an alternative, safer source that can be supplied to the health-care facility must be identified.

The principles of 'water safety planning' (a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer) may be used to inform the next course of action [72].

Water Disinfection

Although disinfection can be an expensive exercise, it is the ideal method of ensuring access to safe drinking water. The alternative is to boil water for at least 10 minutes.

Procedures for disinfecting water are as follows:

Prepare a stock solution of 1% chlorine concentration according to Table 10.1.

1. Mix and wait for 30 minutes.
2. Pour the clear chlorine stock solution into another container for storage and use.
3. Always keep the stock solution in a cool, dark place.
4. To disinfect water that is clear and has a light colour, add three drops of the stock solution to each litre of water. If the water to be disinfected is clear, but has the colour of tea, add six drops of the stock solution to each litre of water. If the water is cloudy, it must be filtered before chlorine can be effective.
5. After adding the chlorine solution to the water, mix the water thoroughly and wait for 30 minutes before using the water.
6. Use clean containers that have a tap for storing disinfected water. Wash the containers once a week, or more often if they get dirty. Wash the containers using boiled water, or water that has six drops of chlorine stock solution to each litre of water.

Note: Stock solution must be freshly prepared each time it is used.
Stock solution that is left standing will quickly lose its disinfecting ability.

TABLE 10.1: Ingredients for Making a Stock Solution of Chlorine (1% concentration by weight of available chlorine)

Product (Per cent concentration by weight of available chlorine)	Amount (Add to 1 litre of water)
Calcium hypochlorite (70%) or	15 g
Bleaching powder or chlorinated lime (30%) or	33 g
Sodium hypochlorite (liquid bleach) (3.5%)	357 ml
(4.0%)	313 ml
(5.0%)	250 ml
Clorox (6.0%)	210 ml

Alternative water sources

In some areas, rainwater catchment systems and wells that are protected from sources of pollution can provide an adequate supply of safe water for health-care facilities without any need for further treatment.

Collecting Rainwater Using a Roof Catchment System

A rainwater collection and storage system consists of a catchment area (usually the roof of a permanent structure), guttering channels, and downpipes that direct rainwater into a water collection vessel (e.g. storage tank, pot, bucket).

Though rainwater sources are generally considered to be of a higher quality than surface water sources, appropriate disinfection/treatment of rainwater is recommended where there is a risk of contamination. Equipment used to catch rainwater from roofs includes:

- A water tank with outlet tap;
- Guttering;
- Spouting;
- Pipes; and
- Wire mesh screens.

Procedure for collecting rainwater

1. Only collect rainwater from clean roofs made of tiles, slates, galvanised iron or aluminium sheeting.

(Note: When roofs are clean it means that the roof and gutters are regularly cleaned to remove dust, tree branches or leaves and bird droppings. This will ensure that the collected water is safe to drink and that it does not pool in the gutter where mosquitoes can breed.)

2. Make sure roof gutters slope towards the downspout to prevent pools of water forming where mosquitoes can breed.
3. Arrange the downspout so that the first water from each rainfall does not run directly into the tank. This ensures that any debris from the roof does not end up in the tank. The downspout can be moved again to collect water after the first, dirty water has passed through. This will need to be done if it does not rain regularly in the area.
4. Put a wire mesh screen over the top of the downspout and the tank overflow to prevent debris from collecting.

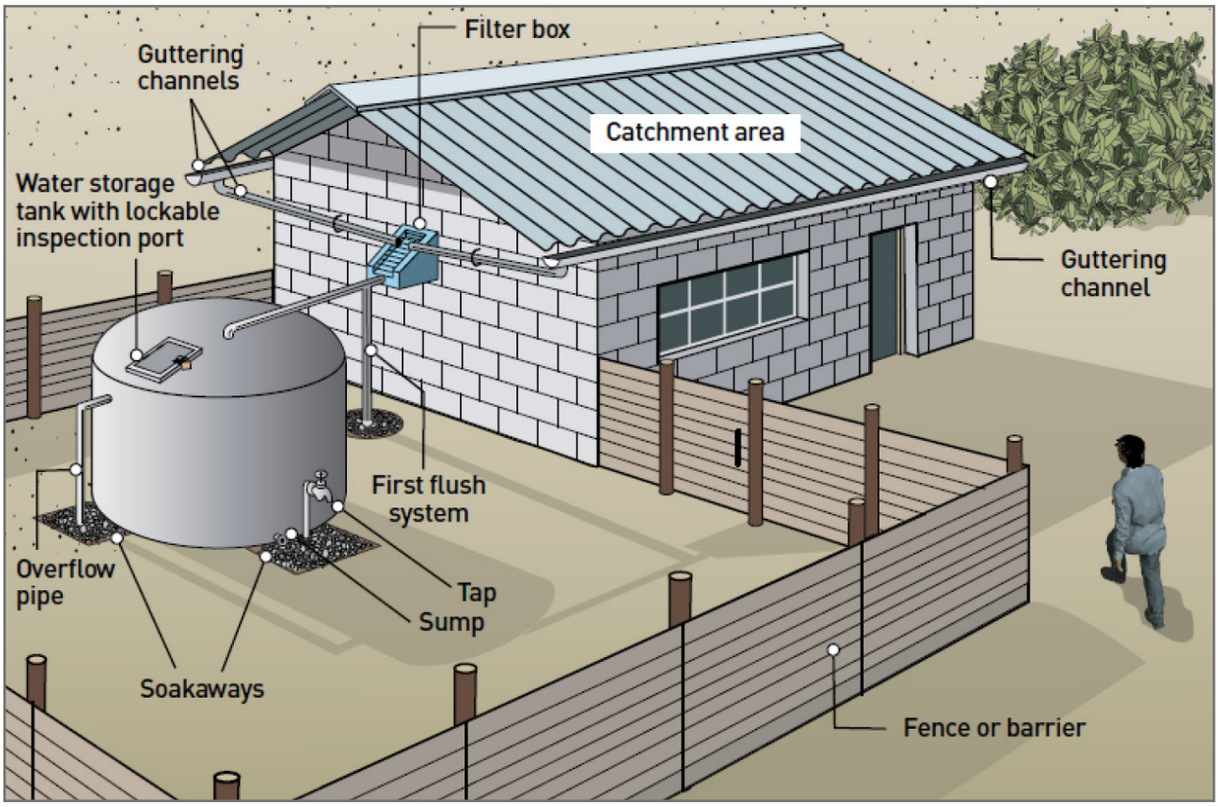


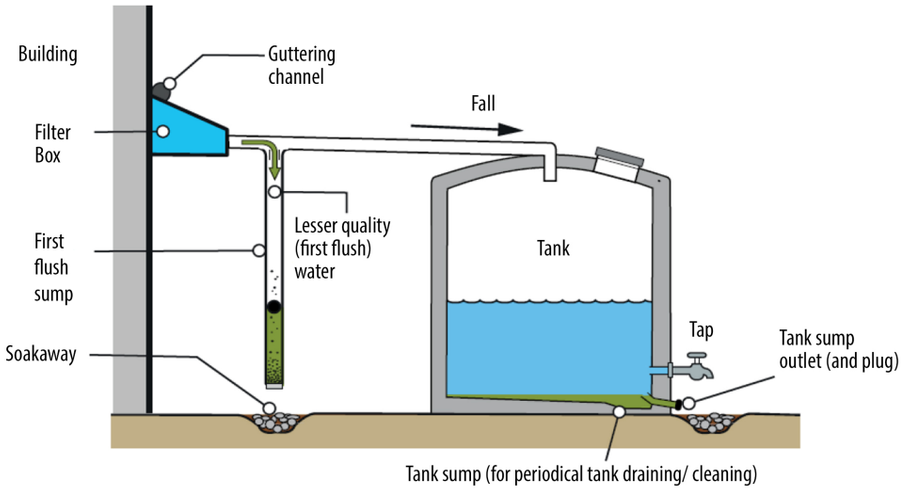
FIGURE 10.1: A Common Rainwater Collection and Storage System for Drinking Water (Source: WHO 2020.)

The First Flush System [73]

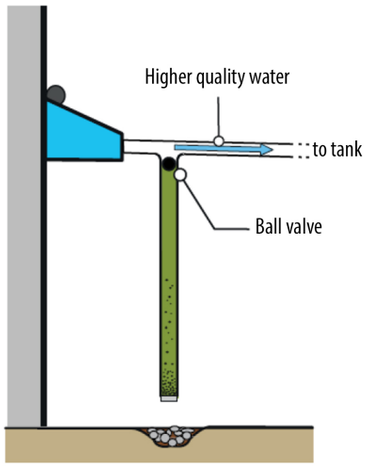
One of the important components of the rainwater collection and storage system is the first flush system. The first flush system (Figs 10.1 and 10.2) reduces the potential for contamination by redirecting the first flush of rainwater (which is typically of lesser quality due to the accumulation of contaminants on the catchment area between rainfalls) away from the water storage tank.

This first flush should be appropriately sized relative to the roof catchment area to effectively manage the first flush of rainwater and should drain to waste (or other non-drinking-water uses).

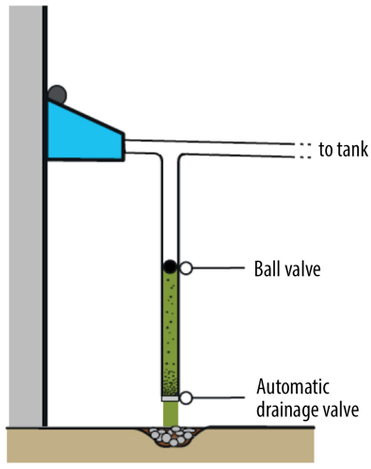
Ideally, the first flush system should drain automatically (e.g. via a drip valve) as opposed to manually, to minimise operational inputs from the user and the potential for contamination. The first flush system should be located downstream of the filter box to prevent larger debris entering/blocking the first flush device.



a. The first flow of captured rainwater and any suspended debris enter the first flush sump rather than the tank.



b. Later flows, which should contain much less debris, pass into the tank because the first flush sump is full. A ball valve should be in place to prevent any carry over of water from the sump to the tak once the first flush sump is full.



c. An automatic drainage valve cleans out the lesser quality water and sediment in the first flush sump preparing it for the next rainfall event.

FIGURE 10.2: Typical 'First Flush' System for Rainwater Collection (Source: WHO 2020.)

Protection of Wells Used for Drinking Water

The equipment needed to protect well-water includes:

- A handpump suitable for the well depth.
- Cement and reinforcement.
- Tools for concrete construction and handpump installation.
- A wire fence to protect the well from animals.

Procedure for protecting well-water

1. Select a handpump that is durable, easily maintained and suitable for local conditions.
2. Mortar the upper two liner joints to prevent contamination from the surface entering the well.
3. Use concrete well liner rings to construct the well.
4. Construct a concrete cover and apron on the top of the well (this will also prevent contamination entering from above).
5. The apron cover should also provide drainage of water away from the well.
6. Install the pump on the well.
7. Be sure to organise a maintenance procedure, including a stock of spare parts that may be required.

Drainage systems include pipe drains, open drains (lined or unlined), subsoil drains, vertical drains or soak holes. It is important to have drainage systems to remove unwanted surface water by gravity and prevent breeding of insects. Soak holes and soak pits are ground holes filled with stones – they should be around public taps and handpumps. Unwanted water in the facility grounds can be removed by filling hollows in the ground and building a piped or open ditch drainage system.

Note: Surface water is dangerous. Get rid of unwanted surface water so that mosquitoes cannot breed in it.

11

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12

ANNEXES

01

ANNEX 1:
Te Marae Ora Ministry of Health Cook Islands National Infection Prevention and Control Committee Terms of Reference

PURPOSE

The purpose of the National Infection Prevention and Control (NIPCC) Committee is to:

- Support facility-level IPC programs in reducing the risk of Healthcare - Associated Infections (HAIs) and Antimicrobial Resistance (AMR).
- Ensure allocation of resources for IPC activities for identified priorities and problems.

RESPONSIBILITIES OF THE NATIONAL IPC COMMITTEE

- To set objectives and functions of the national IPC program, at a minimum develop recommendations for IPC processes and practices to prevent HAIs and antimicrobial resistance.
- Review and update national, evidence-based IPC guidelines every five years and implementation strategies to reduce HAIs and antimicrobial resistance.
- Ensure that infrastructure and availability of appropriate supplies needed for IPC, to enable implementation of the guidelines.
- Develop surveillance program to monitor selected HAIs and antimicrobial resistance patterns, including locally appropriate, standardized definitions, reporting channels, data management, laboratory support, and timely data feedback.
- Ensure a monitoring and evaluation system to assess that IPC standards are being met.
- Monitor hand hygiene compliance data and feedback as a key performance indicator.
- To ensure staff training in IPC and safety, and mandate training programs for Health Care Workers (HCW) on IPC and guideline recommendations.
- To review and approve construction/renovation projects regarding IPC.
- Be responsible for IPC aspects of national preparedness planning.

MEMBERSHIP OF NATIONAL IPC COMMITTEE

Core members

1. Chairperson: Director of Hospital Health Services
2. Co-Chair: Chief Nursing Officer
3. Chief Medical Officer
4. Head of Surgery
5. Head of Anaesthesia
6. Director Primary Health Care or designate.
7. Head of Obstetrics & Gynaecology or designate
8. Community Nurse Manager
9. Hospital Nurse Manager

10. Chief Pharmacist.
11. Director of Planning and Funding or designate
12. General Support Service Manager
13. Theatre Nurse Representative
14. Laboratory Manager or Quality Coordinator
15. Director of Oral Health or designate
16. Director of Public Health or designate

Sub-core members:

Representatives of any group or service may be invited to attend meetings at the discretion of the Chairperson e.g., specialists from various departments to offer specialized information such as:

- Environmental Health (WASH) Representative

STANDING AGENDA SHOULD INCLUDE:

- Report by the IPC focal point on monitoring and surveillance activities.
- Report on actions taken on IPC issues identified at the last meeting.
- Report on IPC training activities and IPC needs.
- List of new IPC issues identified.

OPERATION OF THE NATIONAL IPC COMMITTEE

- The members of the NIPCC will be appointed by the Secretary of Health.
- The chair of the National IPCC will be the Director of Hospital Health Services.
- The Co-Chair will be the Chief Nursing Officer.
- The IPC focal point – will provide secretariat support services to the National IPC Committee and maintain the master set of minutes.
- The agenda of the meeting will be sent out to members five days prior to the scheduled meeting. Minutes of the previous meeting should be distributed with the agenda.
- The IPC focal point shall provide bi-monthly reports.

MEETINGS OF THE NATIONAL IPC COMMITTEE

- Meeting Quorum: A quorum will be 50% of the members present.
- Frequency of Meeting: National IPC committee will meet every 2 months at a venue and date that will be decided by the committee.
- In the event of a critical incident or outbreak situation, the committee should be able to convene promptly.

Date of Review of TOR: 2026 or when deemed necessary.

02 ANNEX 2: World Health Organization (WHO) Surgical Safety Checklist

Surgical Safety Checklist

World Health Organization | Patient Safety
A World Alliance for Safer Health Care

Before induction of anaesthesia

(with at least nurse and anaesthetist)

Has the patient confirmed his/her identity, site, procedure, and consent?
- ☐ Yes

Is the site marked?
- ☐ Yes
- ☐ Not applicable

Is the anaesthesia machine and medication check complete?
- ☐ Yes

Is the pulse oximeter on the patient and functioning?
- ☐ Yes

Does the patient have a:

Known allergy?
- ☐ No
- ☐ Yes

Difficult airway or aspiration risk?
- ☐ No
- ☐ Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?
- ☐ No
- ☐ Yes, and two IVs/central access and fluids planned

Before skin incision

(with nurse, anaesthetist and surgeon)

- ☐ **Confirm all team members have introduced themselves by name and role.**
- ☐ **Confirm the patient's name, procedure, and where the incision will be made.**

Has antibiotic prophylaxis been given within the last 60 minutes?
- ☐ Yes
- ☐ Not applicable

Anticipated Critical Events

To Surgeon:
- ☐ What are the critical or non-routine steps?
- ☐ How long will the case take?
- ☐ What is the anticipated blood loss?

To Anaesthetist:
- ☐ Are there any patient-specific concerns?

To Nursing Team:
- ☐ Has sterility (including indicator results) been confirmed?
- ☐ Are there equipment issues or any concerns?

Is essential imaging displayed?
- ☐ Yes
- ☐ Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:
- ☐ The name of the procedure
- ☐ Completion of instrument, sponge and needle counts
- ☐ Specimen labelling (read specimen labels aloud, including patient name)
- ☐ Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:
- ☐ What are the key concerns for recovery and management of this patient?

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009

03

ANNEX 3:
Personal Protective Equipment Competency Assessment Checklist

Employee Name: **Date:**

Competency Checked by:

Name/Designation/Signature: ..... Date: / /

	Putting on PPE	Competent Yes	Competent No
Gathers equipment and performs hand hygiene	Gathers all relevant PPE supplies, checks for correct size.		
	Removes personal items (e.g. ring/watch/bracelet).		
	Ensures they have a supervisor or mirror.		
	Performs hand hygiene steps:  Washes hands for 40 to 60 seconds; or cleanses hands with alcohol hand rub for 20 seconds.		
Gown	Puts on disposable single use long sleeve gown: Opens gown without gown touching any surfaces such as floor or walls. Ties secured to the back of neck and waist.		
Apron	Puts on apron, if necessary.		
Mask (surgical or respirator)	Puts on surgical mask. Places mask over the nose and mouth and below chin.		
	OR Puts on a respirator mask by placing mask over nose and mouth and pulls elastic bands over head.		
	Places upper band above ear line and lower band below ear line; and		
	Performs a fit check by moulding nose strip over bridge of nose with finger tips of both hands to get a snug fit.		

	Putting on PPE	Competent Yes	No
	Positive seal check ☐ Exhales sharply. A positive pressure inside the respirator = no leakage. ☐ If leakage, adjust the position and/or tension straps.		
	Negative seal check ☐ Inhales deeply, if no leakage, negative pressure will make respirator cling to face.		
Protective eye wear/ visor	Puts on protective eyewear, adjusts to fit.		
Gloves	Puts on gloves. Pulls over wrist of isolation gown.		

	Removing PPE	Competent Yes	No
Removes gloves	Grasps the outside of the first gloved hand with opposite gloved hand and peels off.		
	Holds removed glove in gloved hand.		
	With ungloved hand slides finger just under the wrist of the gloved hand and peels over the first glove.		
	Discards gloves in waste bin.		
Performs hand hygiene	Follows the steps for 40 to 60 second for hand washing; or hands are cleansed with alcohol hand rub for 20 seconds.		
Removes apron	If wearing apron, employee removes apron safely. Leans forward and tears off disposable apron from the neck and roll it forward without touching the front area of the apron.		
	If reusable, unties from the waist and lifts off apron from the neck away from the body.		
	Places in bin.		
Performs hand hygiene	Follows the steps for 40 to 60 seconds for hand washing; or hands are cleansed with alcohol hand rub for 20 seconds.		
Removes gown	Does not touch outside of gown.		
	Undo ties at neck and waist.		
	Roll off from neck and shoulders.		
	Turns gown inside out and rolls gown into a bundle and discard in waste bin.		
Performs hand hygiene	Follows the steps for 40 to 60 seconds for hand washing; or hands are cleansed with alcohol hand rub for 20 seconds.		

	Removing PPE	Competent Yes	No
Removes protective eye wear	Does not touch the front of the goggles or face shield.		
	Removes re-usable eye protection from behind the head and places in a container for reprocessing.		
Removes mask (surgical or respirator)	Does not touch the front of the mask.		
	Removes mask from behind and lifts away from face and discards in a bin.		
	OR If wearing a respirator mask, grasp the top tape and then the bottom tape from behind with your hands.		
	Lift carefully overhead and remove and discard in a bin.		
Performs hand hygiene	Follows the steps for 40 to 60 seconds for hand washing; or hands are cleansed with alcohol hand rub for 20 seconds.		

04 ANNEX 4: Recommended Cleaning Schedule

LEVEL OF RISK	AREA / WARD
VERY HIGH RISK	Outbreak area
HIGH RISK	Intensive care units, operating theatres, burns units, dialysis units, post-operative care units
SIGNIFICANT RISK	General wards
LOW RISK	Office area, non-clinical areas
LEVEL 1	Detergent
LEVEL 2	Disinfectant for MRO and Detergent (disinfectant should have a label indicating evidence against the organism of concern)

MINIMUM CLEANING FREQUENCY					
Item	**Very High Risk**	**High Risk**	**Significant Risk**	**Low Risk**	**Method**
Bathrooms	Daily after use	Daily after use	Daily after use	Daily after use	1 2
Bed	Daily & after discharge	Daily & after discharge	Daily & after discharge	After discharge	1 2
	Weekly & at discharge under bed	Weekly & at discharge under bed	Weekly & at discharge under bed		1 2
Bedrails Bedside table and lockers	Twice daily and at discharge	Twice daily and at discharge	Daily and at discharge	Weekly and at discharge	1 2
Catheter stands and brackets	Clean daily and after use	Clean daily and after use	Clean before and after use	Clean before and after use	1
Ceiling	Spot clean and yearly	Spot clean and yearly	Spot clean and yearly	Spot clean and yearly	1
Chairs	Twice daily	Twice daily	Daily & at discharge	Daily & at discharge	1 2
Cleaning equipment	Clean after use	Clean after use	Clean after use	Clean after use	1 2
Clipboards	Daily and between patient use	Daily and between patient use	Daily and between patient use	Daily and between patient use	1
Commode	After use and daily	After use and daily	After use and daily	After use and daily	1 2
Computer and key boards	Weekly	Weekly	Weekly	Weekly	1
Curtains	After discharge	Monthly	Biannually	Annually	Laundry wash
Door knobs and handles	Twice daily	Daily	Daily	Weekly	1 2

MINIMUM CLEANING FREQUENCY					
Item	**Very High Risk**	**High Risk**	**Significant Risk**	**Low Risk**	**Method**
Floors	Damp mob twice daily	Daily	Daily	Daily	1 2
Fridges	Daily	Daily	Daily spot clean, and clean weekly	Spot clean weekly	1
Fridge (drug)	Weekly	Weekly	Weekly	Weekly	1
IV stands, and Poles and Hooks	Daily and after use	Daily and after use	Daily and after use	After use	1 2
Light switch	Daily	Daily	Weekly	Weekly	1
Mattress	Weekly and after discharge	Weekly and after discharge	After discharge	After discharge	1 2
Medical equipment (infusion pumps) not connected to patient	Daily between patient use	Daily between patient use	Daily between patient use	Weekly between patient use	1 2
Medical Gas	Daily	Daily	Daily	Weekly	1
Neubulizer machine	Daily after use	Daily after use	Daily after use	Daily after use	1
Oxygen equipment	Daily after use	Daily after use	Daily after use	Daily after use	1
Pillows (waterproof cover)	Weekly and after discharge	After discharge	After discharge	After discharge	1 2
Dressing Trolleys	Before & after use	Before & after use	Before & after use	Before & after use	1 2
Sinks (hand washing)	Twice daily	Daily	Daily	Daily	1
General surfaces in patients room	Twice daily and after discharge	Twice daily and after discharge	Daily and after discharge	Weekly and after discharge	1 2
Telephones	Twice daily	Twice daily	Daily	Weekly	1
Toilet	Twice daily	Twice daily	Twice daily	Daily	1
Trolley Linen	Daily	Daily	Daily	Weekly	1
Trolley resuscitation	Daily	Daily	Daily	Weekly	1
Walls	Spot clean	Spot clean	Spot clean	Spot clean	1
Patient bowls	Between use	Between use	Between use	Between use	1 2
Wheelchair	Daily and after use	Daily and after use	Monthly and after use	Monthly and after use	1
Waste Bins	Weekly	Weekly	Weekly	Weekly	1

Adapted from: *Australian Guidelines Prevention and Control of Infection in Healthcare (2010)*

05 ANNEX 5:
How to Calculate Sodium Hypochlorite and Chlorine Solutions

EXAMPLE 1: USING LIQUID SODIUM HYPOCHLORITE (HOUSEHOLD BLEACH SOLUTION)

Chlorine in liquid bleach comes in different concentrations. Any concentration can be used to make a dilute chlorine solution by applying the following formula:

$$\left[\frac{\text{\% chlorine in liquid bleach}}{\text{\% of chlorine desired}}\right] - 1 = \text{Total parts of water for each part bleach†}$$

Example: To make a 0.5% liquid sodium hypochlorite solution from 3.5% ‡ sodium hypochlorite solution bleach:

$$\left[\frac{3.5\%}{0.5\%}\right] - 1 = 7 - 1 = 6 \text{ parts water for each part bleach}$$

Therefore, you must add 1 part 3.5% bleach to 6 parts water to make a 0.5% chlorine solution.

† "Parts" can be used for any unit of measure (e.g. ounce, litre or gallon) or any container used for measuring, such as a pitcher.

EXAMPLE 2: CALCULATION OF CHLORINE SOLUTIONS FROM CALCIUM HYPOCHLORITE [32]

Solid formulations of hypochlorite (powder or granules) may also be available in a variety of settings. Solid formulations are available as concentrated, high-test hypochlorite (HTH) (65-70%) and as chlorine or calcium hypochlorite powder (35%). To produce the final desired concentration, the weight (in grams) of calcium hypochlorite that should be added per litre of water can be determined based on the calculation below:

[% chlorine desired / % chlorine in hypochlorite powder or granules] × 1000 = grams of calcium hypochlorite powder for each litre of water.
Ex: [0.5% chlorine desired / 35% in hypochlorite powder] × 1000 = 0.0143 × 1000 = 14.3

Therefore, you must dissolve 14.3 grams of calcium hypochlorite powder in each litre of water used to make a 0.5% chlorine solution

06 ANNEX 6:
Equipment List for Isolation Rooms and Ward

- Signage for rooms and/or wards.
- **Stocks of PPE:** eye protection, face shields, disposable gowns, surgical and N95 particulate masks, gloves, aprons. Optionals include hair covers, boots, etc.
- Stocks of hand hygiene (liquid soap, alcohol-based hand rub, paper towels).
- Stocks of linen.
- Trolley to hold PPE outside isolation room.
- Sharps containers.
- Linen bag for isolation room.
- Garbage containers for isolation room.
- Garbage bags.
- Container for collection of reusable eye shields, etc.
- Stethoscope, blood pressure cuff, sphygmomanometer, thermometer, blood sample bottles, specimen bottles, intravenous giving sets, intravenous fluids, plaster, tourniquet, lab forms and other necessary items such as needles, syringes.
- Equipment for cleaning and disinfection.
- Telephone should also be made available in the ward and isolation room for ease of communication to minimise the need for HCWs to enter isolation rooms.
- Stationery.

Note: Items should be kept to a minimum inside the isolation room.

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