

1. Key principles of infection control

Overview of infection control

Infection control principles are derived from the epidemiology of infectious disease transmission, involving the interaction between host, agent and environment. Infection control practices aim to prevent infection transmission by limiting the exposure of susceptible people (hosts) to microorganisms (agents) that may cause infection.

Disease transmission

Transmission of microorganisms with the potential to cause infection requires the presence of three elements: a susceptible host, an agent, and an environment facilitating the interaction between host and agent.

Susceptible host

Host susceptibility to infection is greater in the presence of factors that alter or compromise host defence mechanisms. Factors increasing susceptibility include:

- immunosuppression (eg radiation therapy, steroids, chemotherapy)
- presence of an underlying disease process (eg diabetes, cancer)
- presence of devices that bypass the body's normal defences (eg intravenous lines, urinary catheters, respiratory assistive devices)
- age (i.e. the elderly and very young are at higher risk)
- incomplete immunisation
- functional impairment (eg dysphagia, immobility)
- non-intact skin or mucous membranes (eg surgical wounds, burns)
- other altered structural, biochemical and physiological responses

Agent

An agent is a micro-organism capable of transferring to and colonising a susceptible host, with or without subsequent invasion and infection.

Reservoirs and sources of microorganisms may be exogenous (eg other patients, health care workers, contaminated medical equipment, contaminated food, water, air or surfaces) or endogenous (i.e. resident flora of the individual)

Environment

For transmission to occur, the environment must enable interaction between the agent and host. In health care settings, interaction (transmission) may occur via contact, droplet and airborne routes.

Infection Prevention and Control

Infection control measures protect people in health care settings from infection by:

- maximising host defences;
- removing or controlling sources and reservoirs of microorganisms (the 'agent'); and
- reducing the risk of transmission by promoting an environment where the risk of interaction (i.e. contact, droplet or airborne) between potentially infectious agents and susceptible people is minimised

Standard precautions form the basis for the prevention and control of infection in healthcare settings and include:

- hand hygiene
- immunisation
- asepsis
- personal protective equipment
- maintenance of a clean, safe environment
- Cough etiquette
- Sharps management

In circumstances where extra measures are required to prevent transmission, additional precautions (i.e. contact, droplet or airborne precautions) may be used.

Infection risk in health care facilities

The risk of infection varies widely between health care facilities and service contexts. The infection risk is low in settings involving generally healthy individuals with intact host defence mechanisms who receive care in a facility designed, managed and resourced to facilitate the prevention and control of infection.

Infection - definition

Infection arises from invasion and multiplication of microorganisms in a host, with an associated host response (eg fever, purulent drainage). Infections may require antibiotic treatment aimed at inhibiting or ceasing further growth of the infectious agent. Infection is preceded by colonisation.

Colonisation - definition

Colonisation, whereby microorganisms are present in the host but do not invade or cause an associated host response, is distinct from infection. No treatment is warranted.

2. Hand Hygiene

Hand hygiene is the single most important strategy for preventing or reducing healthcare associated infections (HAI). Hand hygiene must be performed before touching a patient, before a procedure, after a procedure or body fluid exposure, after touching a patient or after touching a patient's surroundings. Other opportunities for hand hygiene include but are not limited to food preparation, linen handling and staff involved in maintenance of facilities.

For additional information, please refer to the [Queensland Health Protocol 1: Hand Hygiene](#).

Hand hygiene compliance is influenced by the following factors:

- Environmental factors – such as sinks inconveniently located and / or not available
- Hierarchical factors – such as lack of clinical role models
- Educational factors – such as the perception that glove use dispenses with the need for additional hand hygiene
- Physical factors – such as hand hygiene agents causing irritation and dryness

Microbial flora of hands

Resident micro-organisms

Organisms that are naturally found in or on the body which do not cause disease ('colonising'). Microbial load can be reduced by performing routine/social hand hygiene.

ELEMENTS OF INFECTION CONTROL

Transient micro-organisms

Organisms that are acquired during hand contact with patients, or contaminated fomites. May be pathogenic (i.e. cause disease), but are easily removed by routine/social hand hygiene.

Hand hygiene techniques

There are three types of hand hygiene techniques:

1. Routine/social hand hygiene – soap and water or alcohol-based hand product
2. Aseptic/clinical hand hygiene
3. Surgical

Routine/social hand hygiene – Soap and water:

Plain liquid soaps have minimal, if any, antimicrobial activity and are suitable for routine/social handwashing. Handwashing with plain liquid soap can remove dirt, soil, and various organic substances from the hands and loosely adherent transient flora (micro-organisms).

For detailed practical information regarding performing routine/social hand hygiene process with soap and water, please refer to the [Queensland Health Protocol 1: Hand Hygiene](#).

Routine/social hand hygiene – Alcohol-based hand product (ABHP):

ABHPs are more effective against most bacteria and many viruses than either plain liquid soap or antimicrobial soap. If hands are visibly soiled they must be washed with soap and water.

For detailed practical information regarding performing routine/social hand hygiene process with ABHP, please refer to the [Queensland Health Protocol 1: Hand Hygiene](#).

Aseptic/clinical Hand Hygiene

Aseptic/clinical hand hygiene is undertaken to remove transient micro-organisms and inhibit the growth of resident micro-organisms prior to any care activity that implies a direct or indirect contact with a mucous membrane, non-intact skin or an invasive medical device. During such a procedure no micro-organisms should be transmitted.

For detailed practical information regarding performing aseptic/clinical hand hygiene process, please refer to the [Queensland Health Protocol 1: Hand Hygiene](#).

Surgical Hand Wash

- A five minute scrub which includes cleaning of the fingernails is to be undertaken as the first scrub of the day
- Subsequent scrubs of three minutes duration (which omit the fingernails) are undertaken between cases
- Hands are kept higher than the elbows at all times to allow water to run in one direction only – from clean to dirty (hands to elbows)
- The bristles of the nail brush are used to clean the fingernails only
- Arms are washed in a circular motion, from the hands to the elbows without returning to the hands
- The antimicrobial soap used for the first scrub of the day should continue to be used for subsequent scrubs

For detailed practical information regarding surgical hand wash process, please refer to the [Queensland Health Protocol 1: Hand Hygiene](#).

Changing hand hygiene behaviour

Change in any organisation is difficult. Queensland Health has developed the *clean hands are life savers* program which aims to improve hand hygiene compliance of healthcare workers in acute care settings. The program aims to change healthcare workers' behaviour and organisational culture to ensure hand hygiene is a high priority.

For detailed information regarding the *clean hands are life savers* program, please refer to the *Clean Hands are Life Savers* program homepage (http://www.health.qld.gov.au/chrisp/hand_hygiene/about.asp).

3. Standard Precautions

Overview

Standard precautions are:

- standard safe work practices that are to be applied to all patients and clients regardless of their known or presumed infectious status
- minimum requirements for the control of infection in all settings and all situations, including those where a high risk of infection transmission exists
- designed to protect both patients and healthcare workers

Elements of standard precautions

Standard precautions comprise the following measures:

- hand hygiene
- use of appropriate personal protective equipment to provide a barrier to contact with blood, body fluids, non-intact skin or mucous membranes
- immunisation of healthcare workers
- use of aseptic technique to reduce patient/client exposure to microorganisms
- management of sharps, blood spills, linen, and waste to maintain a safe environment
- routine environmental cleaning

Hand hygiene

Hand hygiene is essential to prevent infection transmission. Refer to 'hand hygiene'.

Personal protective equipment

Standard precautions categorise all body fluids and substances as potentially infectious and aim to minimise exposure of hands, skin and mucosa to these substances through the use of personal protective equipment (PPE).

Personal protective equipment is required in the following situations:

- when there is risk of exposure to blood and other body fluids, secretions and excretions regardless of whether they contain visible blood (excluding sweat)
- contact with non-intact skin, including skin rashes
- contact with mucous membranes

ELEMENTS OF INFECTION CONTROL

Healthcare facilities are responsible for providing readily available personal protective equipment for staff that complies with relevant Australian Standards. Personal protective equipment for standard precautions comprises:

- use of gloves (appropriate to the task)
- facial protection: use of protective eyewear and a fluid repellent surgical face mask, or use of a face shield
- use of impermeable aprons or gowns

Gloves

Gloves protect skin from direct contamination with blood and body fluids. The following guidelines apply:

- gloves are not a substitute for hand hygiene
- hands should be washed following glove removal
- gloves are changed between patients, when punctured or torn, and between different procedures on the same patient
- gloves are not to be washed or disinfected between patients as the surfactants damage the integrity of the glove(s)

Glove selection is to be task appropriate:

- non sterile gloves – for contact with non-sterile body areas and performing procedures that do not require sterile technique, use disposable, non-sterile (examination) gloves compliant with AS/NZS 4011
- sterile gloves – for sterile procedures, wear disposable, sterile gloves compliant with AS/NZS 4179. It is recommended that surgeons wear double sterile gloves during exposure prone procedures (RACS 1994)
- utility gloves – for instrument cleaning and housekeeping activities, wear general purpose utility gloves. These are to be cleaned and stored dry between uses, and replaced when showing signs of deterioration

Glove use in phlebotomy

The risk of exposure to blood during phlebotomy depends on the skill of the phlebotomist and whether the procedure is conducted in a routine or emergency setting. Gloves (in addition to other relevant personal protective equipment) are recommended during phlebotomy in the following circumstances:

- when hand contamination with blood is anticipated
- if the phlebotomist has non-intact skin
- for finger and heel sticks on infants and children
- when receiving phlebotomy training

Facial protection

When splash or spray to the face is anticipated, both protective eyewear and a fluid repellent surgical mask should be worn, or a full face shield.

Protective eyewear

Eyewear is to comply with AS/NZS 1337. Wear eye protection in conjunction with a mask, during dental procedures, phlebotomy, operating room procedures, manual cleaning of instruments and other events that have the potential to splash or spray the face. These should be able to be cleaned routinely and when visibly soiled.

Masks

Masks are to comply with AS 4381. Wear a fluid repellent surgical mask to cover the nose and mouth, in conjunction with eye protection, when potential exists for splashes or sprays to the face. Remove and discard mask when the procedure is completed and if the mask becomes wet or visibly soiled.

Gowns/plastic aprons

Wear a non-sterile gown or plastic apron when there is potential for contamination of clothing with blood or body fluids, secretions, excretions. For exposure to large volumes of body fluids, fluid-impermeable or resistant gowns are recommended. Change gowns between patients. AS 3789.2 and AS 3789.3.

Immunisation

Immunisation protects healthcare workers and those in their care from vaccine preventable diseases. Refer to the Queensland Health policy on the vaccination of healthcare workers in relation to (this policy is available on QHEPS):

- measles, mumps, rubella
- hepatitis B (mandatory for Queensland Health's healthcare workers)
- hepatitis A
- varicella zoster virus (chickenpox)
- influenza
- pertussis

Aseptic technique

Aseptic techniques are measures to lower the risk of infection risk by minimising the number of pathogenic microorganisms people are exposed to:

- 'clean' technique involves the use of standard precautions to limit the number of microorganisms present, such as hand hygiene, reprocessing of equipment between patients, environmental cleaning, and other measures to reduce microbial load
- 'sterile' technique involves practices that aim to eliminate the introduction of microorganisms into surgical incisions, tissue or wounds (eg use of sterile instruments, dressing materials and gloves, skin antisepsis, and creation of a 'sterile field' within which to operate). Refer to 'antisepsis'.

Sharps management

ELEMENTS OF INFECTION CONTROL

Contaminated sharps pose the greatest risk to healthcare workers of exposure to blood-borne viruses. They should be handled with due care:

Sharps handling and disposal

- all staff should be educated with regard to the safe use, handling and disposal of sharps
- people using a sharp object are responsible for safely disposing of the item, preferably directly at the point of use. The task should not be delegated
- contaminated sharps should not be broken or bent, removed from disposable syringes prior to disposal or passed by hand between health care workers
- avoid re-sheathing and passing needles (safety equipment such as puncture-resistant needle mats/trays and re-sheathing devices may be used but they must be assessed by infection control personnel prior to purchase, approved by the facility, and staff educated in their safe use)
- utilise safety devices e.g. retractable needle/syringes, blood taking devices
- in the case of inappropriately disposed sharps, a sharps container should be taken to the location, the sharp handled and disposed of in a manner to avoid injury, and hands washed following disposal. Report inappropriate disposal to facilitate remedial action

Sharps containers

- sharps should be disposed of in a labelled, puncture-resistant container that conforms to Australian Standards specifications (AS 4031 or AS/NZS 4261)
- place containers in a secure position or mount on the wall to prevent tipping
- locate sharps containers strategically to facilitate disposal at point of use
- place containers at a safe height to provide good visibility
- fill containers only to the $\frac{3}{4}$ level or as marked by the manufacturer. The lid should be closed for disposal

Cleaning of blood spills

Cleaning of blood spills should occur as soon as possible. Refer to 'blood and body fluid spills management'.

Environmental cleaning

Routine environmental cleaning of healthcare facilities is required to minimise the number of microorganisms in the environment. Microorganisms are unable to multiply on clean, dry surfaces. Refer to 'environmental cleaning'.

Linen handling

- all used linen should be handled with care to avoid dispersal of microorganisms into the environment and to avoid contact with staff clothing
- wear appropriate personal protective equipment during handling of linen soiled with body substances
- 'bag' used linen at location of use into an appropriate laundry receptacle
- linen soiled with body fluids or substances should be placed into leak-proof laundry bags for safe transport
- perform hand hygiene following handling of used linen
- refer to 'laundry management'

Waste handling and disposal

- manual handling of waste should be avoided
- apply standard precautions to protect against exposure to blood and body fluids during handling of waste; wash hands following procedure
- clinical waste must be contained in leak-proof bags or containers. These must not be over-filled or compacted by hand
- waste should be contained in the appropriate receptacle (identified by colour and label) and disposed of according to the facility waste management plan

4. Additional precautions

Overview

Additional precautions are measures used in addition to standard precautions when extra barriers are required to prevent transmission of specific infectious diseases. They require:

- 'isolation' of the infectious source to prevent transmission of the infectious agent to susceptible people in the health care setting
- a means for alerting people entering an isolation area of the need to wear appropriate personal protective equipment to prevent disease transmission

Patients with Controlled Notifiable Diseases may be required to be isolated under the Public Health Act 2005

Additional precautions: categories

The following categories of additional precautions are based on three routes (i.e. contact, droplet and airborne) of infection transmission in health care settings:

- contact precautions
- droplet precautions
- airborne precautions

A list of the isolation categories for infectious conditions and diseases is included in Appendix D. Some diseases require observation of more than one category of additional precautions to prevent transmission (eg chickenpox requires both airborne and contact precautions).

Additional precautions apply in cases of suspected or confirmed infection; they should be commenced empirically (refer Appendix C).

5. Contact precautions

Infection transmission in healthcare settings may occur via direct or indirect contact with contaminated animate and inanimate surfaces. Staff may acquire organisms on their hands during patient contact or contact with contaminated objects in the environment, and subsequently transfer the organisms to a susceptible patient or client.

Contact transmission may also occur when people come into contact with contaminated items.

In the case of specific infectious diseases spread by the contact route, measures to prevent contact transmission must be observed in addition to standard precautions. Examples of conditions that require contact precautions include (refer to complete list in Appendix D):

ELEMENTS OF INFECTION CONTROL

- colonisation or infection with multi-resistant organisms (MRO) of epidemiological significance (eg MRSA, ESBL, VRE, *Acinetobacter* spp.)
- enteric diseases (eg faecally incontinent patients and children)
- respiratory viruses (eg RSV, influenza)
- chickenpox, shingles

Management of contact precautions

- single room accommodation with ensuite is preferable to reduce contact with other people. If a single room is not available, place people who have the same infection together (cohort), or place the person with uninfected people who are at low risk of infection or in whom the consequences are unlikely to be severe. This should be done in consultation with infection control personnel
- don gloves prior to contact with the infectious person or their environment
- wear a gown to minimise organism carriage on clothing if contact with the person or environment will occur remove gloves, gown and clean hands just before leaving the room

6. Droplet precautions

Large-particle droplets are generated from the source person during coughing, sneezing, talking or during procedures such as suctioning and bronchoscopy. Transmission occurs when the droplets are propelled through the air and make contact with the mucous membranes of a susceptible person (nose, eyes, mouth).

Close proximity (eg within one metre) is required for transmission to occur, as the droplets do not stay suspended in the air.

In the case of specific infectious diseases transmitted by this route, measures to prevent droplet transmission must be observed in addition to standard precautions. Examples of conditions that require droplet precautions include (refer to complete list in Appendix D):

- meningitis (*Neisseria meningitidis* and *Haemophilus influenzae* type b)
- pertussis
- viral infections including rubella, mumps, influenza, adenoviruses and Hendra virus

Management of droplet precautions

- single room accommodation with ensuite is preferable. If a single room is not available place people who have the same infection together (cohort), or place the infectious person with uninfected people who are at low risk of infection or in whom the consequences are unlikely to be severe and who are not in close proximity (i.e. within one metre) to the infectious person. This should be done in consultation with infection control personnel
- wear a surgical mask when providing care to people requiring droplet precautions. It may be practical to don a mask when entering the isolation area
- place a surgical mask on the infectious person during transport
- remove mask and perform hand hygiene following completion of care

7. Airborne precautions

Diseases transmitted via the airborne route involve small (5µm or smaller) airborne droplets that can remain suspended in the air for long periods. They are easily dispersed in air currents and transmitted when susceptible people inhale contaminated air.

There are a number of infectious diseases that can be spread by the airborne route, these include:

- varicella (chickenpox or disseminated varicella)
- measles (rubeola)
- pulmonary tuberculosis

Certain procedures may cause aerosols to be produced resulting in risk of airborne spread of infection. Procedures that are associated with increased small particle aerosol generation include:

- ⇒ endotracheal intubation
- ⇒ bronchoscopy
- ⇒ nebuliser treatment
- ⇒ airway suctioning; and
- ⇒ sputum induction

All staff undertaking aerosol producing procedures or entering a room where aerosol producing procedures are being conducted on a person with an infectious respiratory disease, *must* wear a P2 (N95) respirator or PAPR.

Management of airborne precautions

- Measures to prevent airborne transmission must be observed in addition to standard precautions
- Type 5 (Respiratory isolation- negative pressure) room - single room including ensuite with monitored negative airflow, and direct exhaust to the outside or high-efficiency particulate air (HEPA) filtration if the exhaust is recirculated. The door should be kept closed to maintain the pressure gradient and the patient should leave the room for essential purposes only (refer Standards Australia Handbook HB 260-2003 “Hospital acquired infections – Engineering down the risk”).
- in the event that there are a number of persons requiring airborne or droplet precautions and only a limited number of Type 5 rooms (negative pressure) are available, the CHRISP Expert Advisory Group (CEAG) has identified an order of priority for the placement of persons with the following confirmed or suspected respiratory diseases:
 1. Avian Influenza/Pandemic Human Influenza
 2. Severe Acute Respiratory Syndrome (SARS)
 3. Measles
 4. Varicella (chickenpox and disseminated varicella) and varicella pneumonia
 5. Pulmonary tuberculosis
 6. Influenza A
- if a Type 5 room (negative pressure) is unavailable, place the person in a single room with ensuite and keep the door closed during the infectious phase. Following discharge from a non-negative pressure room, avoid entering the room for at least two hours, or wear a P2/N95 respirator.
- all non-immune people working with patients requiring airborne precautions should don a P2/N95 respirator prior to entering the room. The respirator (and protective eyewear, if worn) should remain on until after exiting the room to prevent exposure to contaminated room air
- staff members with no evidence of immunity to measles or chickenpox should avoid caring for people with these infections if immune caregivers are available
- during transportation or when outside the negative pressure room, the infected person should wear a surgical mask

ELEMENTS OF INFECTION CONTROL

- these measures should be in place when infection is suspected or confirmed (refer to 'tuberculosis', 'measles', 'varicella zoster virus' for additional information)

P2 (N95) Particulate Filter Respirator

For diseases transmitted by the airborne route, a disposable P2 (N95) particulate filter respirator capable of filtering 95% of particles 0.3µm in size must be worn by non-immune people to prevent inhalation of contaminated air. Masks with this capability are designed with 'N95' certification. The respirator should be worn when airborne transmitted diseases are suspected or confirmed. A 'fit check' must be undertaken each and every time a respirator is worn according to the manufacturer's instructions. For further information on fit checking and fit testing, refer to the Queensland Health Pandemic Influenza Plan 2006.

For facial protection against splash/spray during care of patients requiring airborne precautions, a fluid resistant version of the N95 respirator is available.

Safe use of respiratory protective equipment

All staff who are required to wear P2 (N95) respirators should be correctly 'fit-tested' prior to initial use and should be competent in 'fit-checking'. Staff need to fit-check their respirator each time a new respirator is donned and during use as required.

Queensland Health's Legal and Administrative Law Unit advises that if a good facial seal with a P2 (N95) respirator cannot be achieved due to the presence of facial hair such as beard or long moustache, staff should be asked to consider removing the excess hair to enable the seal to be achieved. If the staff member does not wish to remove the excess hair and a suitable powered air-purifying respirator (PAPR) is available and practical for use, this alternative should be offered. Where PAPR is not available or practical, the staff member should either be removed from duties requiring the use of a P2 (N95) respirator or, in circumstances where this is not possible, *directed* to remove the excess hair.

Fit-testing is defined as the process to identify the best fit P2 (N95) respirator to ensure an effective respirator face seal, using AS/NZ Standard 1715 approved methods.

Fit-checking is defined as performing a self check to ensure an effective P2 (N95) respirator face seal each time a respirator is donned.

Where staff are not able to achieve a good facial seal with a P2 (N95) respirator due to facial features and PAPR is not available or practical, the staff member should be allocated to duties that do not require the use of a respirator. All staff required to use PAPR must be trained in its use, including pre-wear inspection in accordance with the manufacturer's instructions. It is the responsibility of the facility offering PAPR to ensure staff using this equipment are trained in its use.

8. Additional precautions: general information

Patient equipment

- equipment should be allocated to patients on additional precautions when possible
- limit the amount of equipment and furniture in isolation rooms
- reusable equipment should be cleaned with detergent and water (or wiped with alcohol wipes if not soap and water compatible) prior to reuse on other patients. If the item normally requires disinfection or sterilisation, usual procedures apply

Cleaning of isolation rooms

- housekeeping personnel are to comply with relevant additional (and standard) precautions

- an isolation area is to be cleaned after non-isolation areas have been attended to ('clean to dirty' work flow), or, using cleaning equipment allocated for use in the isolation area. If there are a number of isolation areas, each should be treated separately and cleaning materials changed between each area/room
- mop heads should be laundered following use in each isolation area
- daily cleaning of isolation areas involves the use of detergent and water. Disinfectants should only be used on advice of infection control personnel
- cleaning following discharge includes changing of screens if this is indicated, use of detergent and water, careful attention to cleaning of all items and surfaces (particularly areas in contact with hands of the patient and staff), and continued observation of the relevant additional precautions until the room is cleaned.
In the case of patients on airborne precautions who were not accommodated in a negative pressure room, observe airborne precautions for at least two hours following patient discharge

Linen

- minimise contact with and agitation of all used linen in patient care areas
- place linen into a laundry bag/skip, located in isolation area
- linen from isolation rooms is to be handled and laundered in the same manner as linen from non-infectious patients (refer 'laundry management'). There are no special requirements

Crockery and utensils

- disposable crockery and utensils are unnecessary
- items used by patients on additional precautions do not require containment, and are to be treated in the same manner as those used by non-infectious people (ie washed in a dishwasher)

ELEMENTS OF INFECTION CONTROL

Waste

- waste in an isolation area is to be treated in the same manner as that in non-isolation areas, and segregated into clinical and related waste, and general waste streams (refer 'waste management')
- handle waste using standard precautions
- there is no requirement for special waste disposal bags to be used in isolation rooms
- the decision to treat all waste from people with communicable diseases as clinical waste should be made by clinicians on the basis of the mode of disease transmission and infection potential of the waste

Patient movement and transfers

- additional precautions should be observed and maintained throughout any patient transfers within or between healthcare facilities
- limit movement and transportation of the patient to essential purposes only (this is desirable practice for all patients regardless of infectious status)
- inform receiving area of required precautions prior to patient transportation
- minimise 'traffic' in isolation areas

Education

- educate staff regarding prevention of transmission
- develop a system to inform all those entering the isolation area of the required additional precautions (eg signage)
- educate the patient and their visitors regarding measures to prevent transmission

Employee health

- where possible, non-immune staff should avoid caring for patients with those communicable diseases to which they are susceptible, however adherence to standard and additional precautions reduces the risk of infection transmission
- follow up of health care workers exposed to infectious diseases may be indicated

Outbreaks

- for information on outbreak management refer to Appendix P5

9. Queensland Health policy and guidelines

Compliance

Queensland Health policies and guidelines apply to all employees of Queensland Health as well as students completing clinical placements and contractors working in Queensland Health facilities.

Management of blood and body fluid exposure (Appendix P3)

Queensland Health has disseminated Guidelines for the Management of Occupational and Non-occupational Exposures to Blood and Body Fluids (Appendix P3). This document provides a generic template for the management of exposures to blood and body fluids occurring in health care settings and in the general community. The guideline includes:

- information on risk reduction strategies, eg compliance with standard precautions and immunisation for vaccine preventable diseases
- guidelines for immediate care and treatment of exposed people
- information on risk stratification of exposures and post exposure prophylaxis
- contact details for the Expert Information Network

General points

- all health care facilities and providers must have a process in place to manage, monitor and evaluate blood and body fluid exposures. Confidentiality of the exposed individual must be assured
- in relation to occupational exposures, policy design should promote reporting of occupational exposures, and a means for monitoring the incidence and prevalence of such exposures. It is recommended that health care facilities consider enrolling in an available state or national monitoring project. Information can be obtained from the Infection Control Practitioner, Queensland Health Communicable Diseases Unit

Immunisation of health care workers (Appendix P2)

Queensland Health has previously disseminated the Queensland Health Policy for Hepatitis B Immunisation Related to Health Care Workers. This document states that hepatitis B immunisation is mandatory (i.e. a condition of employment) for all health care workers in Queensland Health establishments.

The Guidelines for Implementation of Queensland Health Policy for Hepatitis B (HBV) Immunisation in Relation to Health Care Workers (refer Appendix P2) aids the interpretation of the hepatitis B immunisation policy and provides recommendations for post exposure prophylaxis. This guideline is currently under review at the time of writing and has been temporarily removed from the CHRISP website.

Guidelines for the vaccination of health care workers in Queensland Health facilities are under review at the time of writing and will be made available on QHEPS.

Health care workers infected with blood borne viruses (Appendix P4)

Queensland Health has developed a policy document entitled Management of Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) Infected Health Care Workers. This has been developed to protect patients from the risk of transmission of blood borne viruses from infected health care workers and to provide health care workers with a safe working environment.

The policy (refer Appendix P4) recommends that all new and existing health care workers within Queensland Health facilities be advised of the content of this policy, particularly those performing exposure prone procedures.

The document addresses the following:

- hepatitis B immunisation
- serological testing of health care workers for HIV, HBV and HCV
- management of occupational exposures to HIV, HBV and HCV
- responsibilities of HIV, HBV, HCV infected health care workers
- responsibilities of health facilities

ELEMENTS OF INFECTION CONTROL

Suppression of serological results after occupational exposure and/or in monitoring of infected health care workers is recommended by Queensland Health.

Critical incidents resulting in blood borne virus transmission (Appendix P1)

The Queensland Health Guideline for Investigation of Critical Incidents Resulting in Suspected/Potential Health Facility Acquired Blood Borne Virus Infection aims to provide guidance to health care facilities in the event of actual or potential transmission of a blood borne virus to a person in their care.

The guideline (refer Appendix P1) provides a framework to guide the investigation of such an event.

Outbreak management (Appendix P5)

Queensland Health has produced the Queensland Health Guideline for the Management of Outbreaks of Communicable Disease in Health Facilities (Appendix P5). The policy provides a framework for the management of outbreaks of notifiable and non-notifiable communicable diseases. Public health authorities require involvement to manage situations arising in health care settings that are of public health significance.

A list of notifiable diseases and non-notifiable diseases of public health importance is included in the policy. For public health unit contact details, refer Appendix J.

10. Infection control and employee health

Role of infection control

Infection control programs play a role in reducing the susceptibility of healthcare workers to occupationally acquired infectious diseases, and in ensuring that infectious healthcare workers do not place patients at risk. Screening for evidence of immunity, instituting preventative measures, and managing situations involving infectious employees and occupational exposures to infectious diseases are the main objective.

The organisation of an employee health service will be influenced by the size of the institution, number of personnel, and the service offered. In cases where the occupational health service exists separately to the infection control service, the activities of occupational health must be coordinated with those of infection control to ensure objectives of the infection control program are achieved.

Coordination will ensure adequate surveillance of occupational infections, establishment of preventative strategies and effective coordination of exposure investigations and outbreaks.

Healthcare worker screening

Screening for evidence of immunity to the diseases listed below provides baseline information on the risk of occupational acquisition of infectious diseases and guides infection management strategies. A pre-employment screening form should be developed if not already provided as part of the Queensland Health Immunisation of Healthcare Workers policy.

Screening for pre-employment immune status or evidence of vaccination for the following diseases is recommended:

ELEMENTS OF INFECTION CONTROL

- hepatitis B, exposure or immunisation status (evidence of vaccination is a condition of employment in Queensland Health facilities)
- measles, mumps and rubella
- tuberculosis (Mantoux test or chest x-ray)
- varicella zoster virus (chickenpox)

Healthcare workers performing exposure prone procedures should be advised of their responsibilities in relation to the Queensland Health policy on healthcare workers infected with human immunodeficiency virus, hepatitis B virus, and hepatitis C virus (refer Appendix P4). In addition to immunity to infectious diseases, general immunological status and history of exfoliative or weeping skin conditions may affect work placement.

Preventing infection in healthcare workers

- the facility infection control manual should outline specific infection control and employee health guidelines, including standard and additional precautions
- education of healthcare workers (eg infection control information provided upon entry to the organisation, ongoing training and education, access to an infection control manual and other resources) should be undertaken to promote compliance with infection prevention strategies
- the health care facility is responsible for provision of and ready access to personal protective equipment compliant with Australian Standards. Education on how and when to use such equipment should be provided
- a procedure for the management of occupational exposure to blood and body fluid is to be evident, and staff are to be aware of the procedure in each healthcare facility (refer Appendix P3).
- optimal use of vaccines can prevent acquisition and transmission of vaccine preventable diseases and eliminate unnecessary work restriction. Administration of vaccines will be dependent on the service provision of the healthcare facility. A record of vaccination is to be kept. Refusals should be documented.

Management of occupational exposures and infected healthcare workers

- all occupational exposures to communicable diseases and blood and body fluids are to be coordinated by, or in conjunction with, staff with expertise in infection control, or by an Infectious Diseases physician (refer Appendix P3)
- policy design and reporting systems should encourage all healthcare workers to report potentially communicable illnesses, and blood and body fluid exposures
- the health care facility is responsible for implementing measures to prevent further transmission of infection. This may warrant exclusion of staff from specific work practices or departments. Exclusion policies are to be enforceable and known to all healthcare workers.

11. Employee health: infectious diseases and conditions

Relevant Queensland Health policy

This section is to be read in conjunction with the following Queensland Health policy and guidelines:

- Guidelines for Implementation of Queensland Health Policy for Hepatitis B (HBV) Immunisation in Relation to Healthcare Workers (Appendix P2)
- Guidelines for the Management of Occupational and Non-Occupational Exposures to Blood and Body Fluids (Appendix P3)

ELEMENTS OF INFECTION CONTROL

- Management of Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) Infected Healthcare Workers (Appendix P4)

Cytomegalovirus (CMV)

- staff working with infants and young children and immunocompromised patients are at risk of exposure to CMV. However, there is no evidence that increased exposure correlates with increased risk of primary infection or reinfection (both of which are usually sub-clinical in healthy adults)
- the virus is intermittently shed (mainly in urine and saliva)
- seropositivity does not ensure complete protection against maternal re-infection or reactivation (and subsequent foetal infection)
- there is no treatment or vaccine for CMV
- all healthcare workers should adhere to standard precautions, particularly hand hygiene, to prevent transmission

Gastrointestinal illness

- defined as vomiting and/or diarrhoea (>3 loose stools in a 24 hour period) with or without associated symptoms of fever, nausea etc. These people are likely to be excreting high concentrations of the infecting agent
- determine the aetiology of the gastrointestinal illness, if possible, and initiate appropriate treatment interventions

12. Infection control in pregnancy

- in general, pregnant health care personnel do not have an increased risk of acquiring infections in the workplace
- female personnel of childbearing age should be encouraged to discuss immunisation for vaccine preventable diseases with their general practitioner prior to pregnancy
- consistent application of standard and additional precautions will further reduce any potential risk

13. Skin conditions (hand dermatitis)

- occupationally acquired dermatitis is most commonly caused by incorrect hand washing technique, use of harsh hand soaps or chemicals, and use of gloves
- staff should be encouraged to report hand dermatitis and skin conditions
- cracked, dry skin or weeping dermatitis deters health care workers from washing their hands. When hand hygiene is performed, non-intact, rough skin prevents the removal of transient microorganisms, posing an infection risk to staff members and those in their care
- education on correct handwashing and drying technique, advice on alternative handwashing products, avoiding scrub brushes and encouraging use of appropriate skin moisturising lotions particularly during winter months can reduce dermatitis related to handwashing
- reducing the use of gloves where possible, avoiding latex products, changing gloves frequently to prevent moisture build up, removing gloves as soon as practicable, washing hands after glove use and avoiding powdered gloves can reduce skin problems associated with glove use

14. Surveillance for healthcare associated infection

Quality improvement through surveillance

Surveillance for health care associated infection provides a means for evaluating the quality of health care provision. A reduction in infection rates has been demonstrated when interventions are developed in response to surveillance results.

It is essential that the surveillance methodology provides reliable, useful data to guide interventions.

Surveillance: minimum requirements

As a minimum, health care facilities should have a means to:

- seek and identify health care associated infections in a timely manner
- take appropriate corrective actions to prevent recurrence or transmission
- evaluate the outcome of the interventions
- document and report the process to the responsible delegated authority

Planning a surveillance program

A successful infection surveillance program requires:

- a written plan, endorsed by facility management, documenting the objectives of surveillance (processes and outcomes) and resource requirements
- allocation of adequate resources (trained infection control personnel, infrastructure, support)
- consistency in application of surveillance definitions, and consistency of surveillance intensity over time
- regular program review to ensure the design meets the specified objectives

Surveillance objectives may include:

- demonstrating clinical governance/accountability for service quality
- reducing infection rates
- establishing baseline endemic infection rates
- identifying infection clusters, outbreaks, trends
- evaluating procedures, measures, interventions
- providing information for decision-making
- meeting accreditation requirements
- benchmarking with similar facilities

It is essential that the goals and objectives of surveillance are clear, specific and prioritised to ensure that surveillance efforts achieve the desired result. It is recommended that infection surveillance be limited to specific populations, pathogens or infections rather than using a continuous, hospital-wide approach.

To improve efficiency, surveillance programs should target those areas posing the highest risk of mortality, morbidity and cost. The program should focus on monitoring for infections that are preventable and health care associated.

A prospective approach is recommended where possible to identify and manage incidents or clusters of infection within a suitable time frame.

ELEMENTS OF INFECTION CONTROL

Resources for surveillance

A practitioner appropriately trained in infection control will be required in order to collect accurate data. The level of human resources required for this activity will depend on the method of surveillance chosen by the facility. Adequate administrative and computer support are required.

The amount and type of data collected depends on the objectives of the surveillance program. Data may be collected manually or may involve information technology, such as hand-held computers, to improve efficiency. The use of computers and appropriate software is advantageous in facilitating data storage, retrieval and analysis functions. Software (eICAT) specifically designed to facilitate these functions is available. Contact CHRISP at <http://www.health.qld.gov.au/chrisp>

CHRISP program

The Queensland Health Centre for Healthcare Related Infection Surveillance and Prevention (CHRISP) program has been established to develop and oversee a standard system of surveillance in Queensland health care facilities with the aim of providing:

- guidance and support to Queensland Health facilities in developing standardised surveillance and data analysis methods that facilitate recognition of infection problems and timely intervention
- an estimate of the magnitude of health care associated infection in participating hospitals
- information on trends related to infection rates and pathogens
- information on health care worker exposure to blood and body fluids

The information collected will assist with the promotion of procedural changes and facilitate benchmarking between similar facilities.

CHRISP: contact details

To obtain information on the CHRISP program and download the CHRISP manual, visit the website at <http://www.health.qld.gov.au/chrisp>.

Surveillance methods

The surveillance method(s) chosen should be tailored to the specific needs of each facility, taking into consideration:

- the goals and objectives of the surveillance program;
- available resources;
- facility characteristics (size, service type, population, treatments and procedures offered); and
- organisational objectives

The following surveillance methodologies, infection rate calculation, 'signal infection' surveillance, control charts and prevalence surveys may be used in conjunction with the data collection tools, or to conduct surveillance on other issues relevant to the service.

Incidence surveys (infection rate calculation)

- infection rates indicate the incidence of new cases of infection in a population with similar intrinsic infection risks who are exposed to similar extrinsic risks in a designated time period. This method requires the collection of sufficient numerator and denominator data to enable risk adjustment and thus may not be appropriate in some facilities. It is not recommended as a

means for external comparison unless standard surveillance definitions and methods are used, and the data has been risk adjusted

- the Australian Standard Definitions for BSI and SSI rates are available at the Australian Infection Control Association website (<http://www.aica.org.au>)

Signal infection surveillance

- 'signal infection' surveillance involves viewing all preventable health care associated infections as a 'signal' to review associated processes and procedures. This entails retrospective review of the details of the event, the factors involved, review of systems and processes that underlie identified factors and development of a plan of corrective action where indicated.
- Signal infection surveillance is simple to conduct, does not rely on large data sets, and is recommended for all health care facilities. Refer to Appendix F.

Control charts

- control charts identify variation in infection frequency related to systems and processes, and in the way processes are implemented. Control charts do not rely on large data sets and thus enable timely analysis of data and rapid response to problem areas. Access to e-ICAT software is required. Contact CHRISP.

Prevalence surveys

- prevalence surveys enable identification of all active (i.e. existing plus new) cases of infection in a defined population on a single day ('point prevalence'), or over several days ('period prevalence'). This entails review of each individual in the setting, with data collected through direct assessment, chart review and discussion with caregivers. This is a rapid means for identifying the range and number of infections present in facility occupants

Choosing a surveillance method

Depending on facility-specific surveillance objectives and the resources available, prevalence surveys and control charts may be used to detect infection. Signal infection surveillance is recommended in the case of small data sets, and in all health care facilities regardless of size and throughput for review of serious (i.e. causing significant mortality, morbidity and cost), infrequently occurring health care associated infections.

The calculation of infection rates is not appropriate for all health care settings. For instance, in facilities with fewer than two blood stream infections (BSI) per month on average and low (or no) usage of central intravenous lines, calculation of BSI rates is not a reliable indicator of service quality (refer to the Australian Standard Definition for BSI). Similarly, in facilities with low numbers (eg <100 per year) of surgical procedures performed, or low numbers of surgical site infections (SSI), calculation of SSI rates is not statistically valid.

ELEMENTS OF INFECTION CONTROL

Data collection tools

Standardised data collection tools guide data collection activities for a range of health care associated infections in all facility types. Tools are available for:

- surgical site infection (SSI)*
- blood stream infection (BSI)*
- occupational exposure to blood and body fluids*
- device-related infection (eg IDC, intravenous line, ventilator)**
- multi-resistant organisms (MRO)**
- rotavirus**
- respiratory syncytial virus (RSV)**
- infection in aged care and long term care settings#

*available via 'Surveillance', 'Downloads' at the CHRISP website www.health.qld.gov.au/chrisp

**available in the e-ICAT manual; contact CHRISP

#available in Appendix B of these Guidelines

Data collection techniques

- direct observation
- chart review
- review of microbiology reports
- discussion with carers, health care staff
- review of medication records for evidence of antibiotic use
- clinical surveillance
- ward rounds
- screening admission records to identify patients re-admitted with infection
- use of DRGs
- post-discharge surveillance

Data dissemination

To facilitate the identification and implementation of measures to improve health outcomes, surveillance results (signal infection surveillance, control charts, results of incidence and prevalence surveys) must be provided to the relevant people, including clinicians and facility management.

The sensitive nature of surveillance data should be noted and the information managed accordingly. Refer to the section on Legislation in these Guidelines for information on freedom of information legislation.

15. Surveillance of healthcare associated blood stream infection

Blood stream infections (BSI) are associated with high morbidity, mortality and cost. Patients can present to hospital with a BSI or may develop a BSI as a result of health care interventions. Health care associated BSI may or may not be preventable. Surveillance is a useful tool in identifying significant breakdowns in infection control procedures that may lead to BSI.

Identifying BSI

Data for BSI surveillance are dependent upon the reporting of positive blood culture results by the microbiology laboratory. It is essential to establish a system for rapid notification of positive blood cultures to infection control staff.

Following a positive blood culture report, review of the incident is required to determine whether the event meets the Australian standard definition of health care associated BSI. The standard definition is available on the AICA website (<http://www.aica.org.au>) or via a link to the AICA site in the CHRISP website. The data collection tool for BSI is available at www.health.qld.gov.au/chrisp

Surveillance methodology

It is recommended that health care associated BSI be regarded as a signal infection in all types and sizes of health care facilities and followed appropriately. Prevalence surveys of patients managed with peripheral lines may be used to assess compliance with line management policies.

Targeted surveillance involving units where central intravenous lines are used is recommended for facilities collecting data for BSI rates in order to benchmark against similar facilities.

Facilities where central lines are infrequently used and there are no designated specialty units may elect to collect hospital-wide BSI surveillance data and produce BSI rates. However, rates calculated in this manner should not be compared between institutions due to their statistical limitations. Control charts may be useful to demonstrate variance and provide more timely feedback regarding problem areas.

16. Surveillance of surgical site infection (SSI)

The purpose of surgical site surveillance is to monitor patient outcomes in relation to surgical procedures undertaken within health care facilities. Surveillance of surgical sites comprises regular, controlled surveillance using standard definitions of surgical site infection (SSI) to determine the presence of post operative infection.

Pathogens that cause SSI are acquired either endogenously or exogenously. It is believed that endogenous sources account for the majority of SSI, and that most pathogens are implanted at the time of surgery. Therefore, measures taken during the intra-operative phase may reduce the risk of SSI (refer to 'surgical settings').

Identifying SSI

Surgical site infection is identified on the basis of anatomical site (superficial incisional, deep incisional, or organ/space), and described according to host and procedure-related risk factors (ASA, duration of surgery and wound class) to enable statistical adjustment for differences. Each event should be reviewed to determine whether it meets the Australian standard definition of SSI. The standard definition is available on the AICA website (<http://www.aica.org.au>) or via a link to the AICA site in the CHRISP website. The data collection tool for SSI is available at <http://www.health.qld.gov.au/chrisp> 'Downloads'

Surveillance methodology

It is recommended that a minimum of 100 surgical cases be undertaken per year in a particular surgical specialty to warrant SSI rate calculation. Facilities conducting low numbers of surgical procedures or with low numbers of infections are encouraged to perform SSI surveillance

ELEMENTS OF INFECTION CONTROL

aimed at monitoring preventable infection. Signal infection surveillance, with or without the use of control charts, is recommended.

In all facilities, 'clean' surgical procedures should be followed as a priority, as SSI following a clean surgical procedure is more likely to indicate a health care associated (ie potentially preventable) cause. Resources should be targeted towards monitoring preventable infection.

Post-discharge surgical site surveillance

Health care facilities should consider the feasibility of identifying SSI post discharge. Various methods may be used to obtain this information:

- questionnaires (posted to patient and/or to the surgeon/general practitioner)
- telephone survey (involving patient and/or surgeon/general practitioner)
- monitoring outpatient clinics/re-admissions/DRGs
- linking to pathology laboratories
- linking with general practitioners, domiciliary, home care service providers

The accuracy of post-discharge surveillance data is an area of debate in the literature however, it has been shown to identify a significant proportion of SSI. This proportion is expected to increase as post-operative length of stay decreases.

It is recommended that post-discharge surveillance be performed within 30 days of the operative procedure. Twelve-month follow-up of deep incisional or organ space surgery involving an implant has not yet been validated and therefore, for the purposes of this document, is not recommended.

17. Antisepsis

Definition

Skin antisepsis follows the general principles of disinfection: cleaning of the skin followed by application of an antiseptic agent reduces the number of potentially pathogenic microorganisms. Antiseptics may be bactericidal or bacteriostatic. They are designed to be used on the skin or mucous membranes, not for use on inanimate surfaces.

Antisepsis is chiefly used in the following situations:

- skin preparation prior to venepuncture
- pre-operative skin preparation
- surgical scrub
- may be used for pre-operative showering
- may be used for aseptic/clinical hand hygiene

Skin preparation prior to injection or venipuncture

Alcohol wipes have traditionally been used to disinfect skin prior to subcutaneous or intramuscular injection. Provided the skin is visibly clean, there is no need to wipe it with an antiseptic (eg. alcohol wipe) prior to injection. If the clinician decides to clean the skin, or if the skin is visibly not clean, alcohol and other disinfecting agents must be allowed to dry before injection.

Prior to venipuncture the skin must be cleansed using antiseptic (eg. Persist Plus™) swabs and allowed to dry for two minutes.

Pre-operative skin preparation

Following cleaning, the application of an appropriate antiseptic agent for an appropriate contact time to ‘prep’ the skin around the operative site reduces the microbial load on the skin. In theory, this action reduces the risk of introducing endogenous microorganisms at the incision site. Pre-operative skin antiseptics is a [recommended practice](#). Chlorhexidine and iodine-containing preparations are commonly used for skin antiseptics prior to surgery.

Surgical scrub

Applying an antiseptic during surgical scrubbing reduces the number of microorganisms on the hands of surgical personnel, subsequently reducing the number of microorganisms released into the operative site in the event of glove puncture.

Chlorhexidine and iodine-containing preparations are commonly used for hand antiseptics. The practice of ‘scrubbing’ the hands requires use of an appropriate antiseptic agent, technique, and contact time (i.e. 3-5 minutes).

Pre-operative showering

The literature remains inconclusive regarding the relationship between pre-operative showering and a reduction in surgical site infection (SSI). However, studies show that pre-operative antiseptic showers reduce the microbial load on the skin.

The Centres for Disease Control and Prevention (1999) recommend at least one pre-operative shower using an antiseptic to reduce the risk of SSI. An antiseptic with residual activity may offer additional benefit.

Selection of antiseptics

Antiseptics used within a health care facility should be selected in consultation with infection control personnel. Consideration of the antimicrobial cover needed (i.e. type of procedures undertaken); product efficacy; personnel acceptance; and cost are required.

Skin antiseptics: comparison

The following table is adapted from the CDC Guideline for the Prevention of Surgical Site Infection (1999):

| Antiseptic Agent | Spectrum of activity | Residual effect | Contact time and use | Comments |
|------------------|--|-----------------|---|---|
| Iodophor | Broad. Ineffective against enteroviruses | Minimal | 3-5 minutes Use for pre-op prep and surgical scrub | <ul style="list-style-type: none"> inactivated in the presence of blood non-staining avoid use in neonates and on mucous membranes |
| Chlorhexidine | Broad. Good Gram positive activity | Excellent | 3-5 minutes Use for pre-op prep and surgical scrub | <ul style="list-style-type: none"> safe for neonates and on mucous membranes ototoxicity if instilled into middle ear |

ELEMENTS OF INFECTION CONTROL

| | | | | |
|-----------|---|-----------|---|--|
| Triclosan | Broad. Ineffective against <i>P. aeruginosa</i> | Excellent | 3-5 minutes Used for antibacterial hand hygiene only | <ul style="list-style-type: none"> slow to become effective non-toxic is not indicated nor suitable for use as a surgical scrub |
| Alcohol | Broad | None | Rapid activity May be used for skin prep prior to injection; can be used for surgical scrub | <ul style="list-style-type: none"> allow to dry effect diminishes quickly following drying non-toxic flammable therefore unsuitable for use in operating rooms |

18. Healthcare environment

The role of the environment in infection

Environmental sources and reservoirs of potentially pathogenic microorganisms exist in all settings, including health care facilities. Microorganisms may be transmitted to people through exposure to contaminated air, water and aqueous solutions, or environmental surfaces. However, infection from such exposure is rare.

Reducing the risk of infection

A risk of infection exists when potentially pathogenic organisms exist in sufficient numbers in environmental sources or reservoirs *and* they have the means to gain entry to a susceptible host. Infection control involves ensuring that practices are in place to reduce this risk through:

Minimising environmental sources and reservoirs:

- maintenance of ventilation systems
- maintenance and minimisation of aqueous reservoirs
- cleaning/general housekeeping

Minimising opportunities for organisms to gain entry to a host:

- performing hand hygiene prior to contact with each patient and between procedures
- following the principles of asepsis, including the practice of skin antisepsis prior to invasive procedures in health care settings
- use of negative pressure and protective environments where indicated

Practices to limit environmental contamination should be undertaken on the basis of scientific evidence, logic and cost-effectiveness.

Environmental sampling

Routine sampling of the environment (air, water and environmental/inanimate surfaces) is neither cost effective nor supported in the literature. Targeted environmental sampling may be performed for a defined purpose, however it should be outcome focused and planned in consultation with the

infection control team. The difficulty in interpreting the results of environmental sampling is a recognised limitation of this practice.

Environmental sampling may be appropriate in the following situations:

- investigation of an outbreak to identify an epidemiological link between environmental sampling results and clinical isolates
- conducting research
- quality assurance purposes, such as evaluating the effect of a change in infection control practice or to ensure that systems and processes are functioning according to specifications and expectations (eg air quality monitoring during construction)

Continued monitoring for the purposes of quality assurance in the absence of an adverse outcome is unjustified.

19. Airborne microorganisms

Infection risk

Aerial environments have been implicated in health care associated infection involving *Aspergillus* spp., *M. tuberculosis*, and viruses such as measles and varicella zoster virus. In addition, air may become contaminated with aerosolised water-borne bacteria such as *Legionella* spp. Transmission involves inhalation of contaminated air.

Infection prevention

Practices to prevent infection should be directed towards limiting the numbers (reservoirs and sources) of airborne microorganisms in the health care environment and limiting opportunities for their entry into a susceptible host.

Refer to Standards Australia Handbook [HB260:2003](#) Hospital acquired infections – Engineering down the risk for building and refurbishment design recommendations in relation to air-handling and special ventilation systems.

Air-handling systems

- a properly installed, maintained and functioning heating, ventilation and air conditioning system (HVAC) removes airborne particles and moisture, reducing the infection risk
- appropriate air intake/outlet location, humidity controls and preventative duct and filter maintenance help to ensure optimal HVAC performance

Special ventilation systems

Infectious disease isolation rooms (negative pressure room)

- negative air pressure ventilation rooms are required to accommodate patients with infectious diseases transmitted via the airborne route (tuberculosis, chickenpox and disseminated varicella zoster virus, and measles)
- a sufficient number of negative pressure ventilation rooms should be provided based on the needs of the facility
- 12 cycles of air exchange per hour are required; pressure should be monitored and the door kept closed

ELEMENTS OF INFECTION CONTROL

- air is to be ventilated to the outside; a HEPA filter reduces contamination if air is recirculated from these rooms
- anterooms are to be included when new negative pressure rooms are constructed
- refer to Queensland Health Capital Works Guidelines for detailed information

Operating rooms (positive pressure room)

- operating room air contains items such as skin squames, microorganisms shed by people in the room, lint, dust, respiratory droplets and aerosols
- the number of microorganisms in the operating room is directly proportional to the number of people in the room. Every effort should be made to reduce traffic in this area, and keep movement and talking to a minimum
- operating room air should be maintained at positive pressure with respect to corridors and adjacent areas. Doors should remain closed
- there should be at least 20 cycles of air exchange per hour
- air should be introduced at the ceiling and exhausted near the floor
- the use of laminar air flow and ultra clean air environments have not been conclusively shown to decrease the risk of surgical site infection
- refer to Queensland Health Capital Works Guidelines for detailed information

Protective environments (positive pressure room)

- the ability of protective environments to reduce infection has not been clearly demonstrated
- immunocompromised people at extreme risk of infection (ie allogeneic transplant patients) may benefit from placement in positive pressure rooms to reduce the potential for exposure to airborne spores

Construction projects

- during construction and renovation, patients who are severely immunocompromised may be at risk from infection due to aerosolised environmental organisms such as *Aspergillus* spp.
- review the need for barrier containment to control dust and debris, ventilation and filtration requirements, air quality monitoring, relocation of susceptible patients and other measures to reduce infection risk during construction, renovation, repair and demolition activities
- concurrent surveillance for airborne infections is recommended
- infection control staff should be involved in risk assessment and planning prior to commencement of building activities

20. Water-borne microorganisms

Infection risk

Water, aqueous solutions and areas that remain damp are reservoirs for clinically significant organisms such as *Legionella* spp., *Pseudomonas aeruginosa* and *Pseudomonas* spp., *Acinetobacter* spp., and other microorganisms. Generally, water-borne organisms do not survive in dry environments.

Transmission may involve direct contact (eg hydrotherapy), ingestion (potable water, ice) and indirect contact (eg via improperly reprocessed medical devices, such as respiratory equipment). In the case of *Legionella* spp., transmission requires inhalation of contaminated water droplets.

Infection prevention

Practices to prevent infection with water-borne microorganisms should be directed towards removing reservoirs and sources supporting their survival and proliferation. This involves:

- maintaining a clean, dry environment (eg avoiding porous surfaces, removing items that remain damp, disposing of stagnant fluids or solutions, cleaning and drying fluid containers between uses); and
- ensuring that water reservoirs are properly maintained through chemical or thermal means

Water systems including cooling water towers

Hot water systems and cooling towers are a primary source of concern in health care facilities. If they are contaminated with *Legionella* spp., Legionellosis may occur if the aerosolised *Legionella*-contaminated water is inhaled (aerosols are generated and inhaled during use of showers and faucets; mist generated in cooling towers may enter the building via air intakes or windows).

Measures such as proper design of piping/water systems to prevent stagnation, periodic elevation of water temperature, monitoring of chlorine levels, and routine cleaning and maintenance of water storage tanks to reduce water contamination are needed. The requirements of different facilities vary; each should have a documented water treatment program and a means for demonstrating compliance.

Refer to AS/NZS 3666:1995 Air-handling and Water Systems of Buildings – Microbial Control Part 1 & 2, and AS/NZS 3666.3 (Int):1998: Performance-based Maintenance of Cooling Water Systems, and AS/NZS 3896:1998 Waters – Examination for legionellae including *Legionella pneumophila* for information on maintaining cooling water systems. The AS/NZS Handbook, Control of Microbial Growth in Air-handling and Water Systems may be referred to when consulting AS/NZS 3666 Parts 1, 2, 3.

Queensland Health recommendations and workplace health and safety legislation

In relation to the risk of health care associated Legionellosis, Public Health Services classifies air conditioning systems as:

- high risk – cooling towers and evaporative condensers
- medium risk – evaporative coolers
- low risk – reverse cycle units, refrigeration units, wall units and like systems

Workplace Health and Safety legislation requires that high risk systems be maintained to prevent outbreaks of disease. Health Service Districts should ensure that all high risk systems are designed, commissioned and maintained at least in accordance with Workplace Health and Safety Queensland Guide to Legionella Control in Cooling Water Systems, including Cooling Towers v2.06-08 available at <http://www.deir.qld.gov.au/pdf/whs/legionellaguide.pdf> or to AS 3666.

Legionellosis: case follow up

- clinical staff need to maintain a high index of suspicion for the diagnosis of Legionellosis
- where at least one case of confirmed health care associated Legionellosis has occurred, or two or more cases have occurred which may be health care associated, a thorough epidemiological and environmental investigation is warranted

ELEMENTS OF INFECTION CONTROL

Water baths

Water baths are predominantly used to thaw fresh plasma, cryoprecipitate or to heat dialysate before use. They are a potential source of microbial contamination (eg *Acinetobacter* spp., *Pseudomonas aeruginosa*) if the water in the bath results in subsequent contamination of medication ports, splashes or hand transmission. To minimise this risk:

- have a policy in place to routinely empty, clean and dry the bath
- keep the administration bags dry by enclosing them in an impermeable plastic wrap
- dry any immersed object prior to use
- wash hands after contact with water baths

Sinks and hand basins

Sinks are a reservoir for Gram negative bacteria however, they are rarely implicated as a source of infection in health care facilities as microorganisms are removed by routine cleaning. Some issues include:

- handwashing sinks should not be used for disposal of body fluids or contaminated water such as mop or flower water
- faucet (rose) aerators have been identified as a reservoir for pathogenic bacteria. These need to be cleaned at the time of sink cleaning
- purging by running hot water once or twice daily is indicated in areas such as endoscopy suites and units accommodating immunocompromised patients
- recommended sink and hand basin design is outlined in the Queensland Health Capital Works Guidelines and AS/NZS 1730

Hospital toilets

Although aerosols are produced with flushing, there is no evidence to suggest any infection risk. Routine cleaning is sufficient to remove microorganisms; there is no requirement for disinfectants to be poured into the toilet bowl.

Hydrotherapy pools

Tub immersion used for physical therapy, burns management, dermatological conditions etc, has been associated with transmission of skin infections. To avoid this:

- cleaning protocols are to be documented; ideally all tanks, tubs and pools should be drained, cleaned (and disinfected if required) and dried after each patient use
- hydrotherapy pools should be chemically treated and maintained in the same manner as indoor public pools (refer to 'hydrotherapy pools')
- patients who are incontinent, have draining wounds or an indwelling device should not use shared facilities
- jacuzzis, whirlpools and spa baths/pools are to be avoided in health care settings
- refer to Queensland Health Swimming and Spa Pool Water Quality and Operational Guidelines (October 2004) accessed at <http://www.health.qld.gov.au/ph/documents/cdb/24690.pdf>

Ice machines and ice

- ice “machines have been a source of infection due to deficient plumbing, irregular cleaning, and handling with contaminated hands.
- ice intended for human consumption should be obtained from self-dispensing ‘on demand’ ice machines rather than from a trough reservoir. Ice intended for receptacles for therapeutic use or donor organs can be obtained from an ice-making machine located in a clean area – a clean utility will not be suitable for storage of such a machine. Routine cleaning and maintenance should be incorporated into the equipment surveillance program.
- microorganisms in ice can contaminate clinical specimens and medical solutions that require ice for transport; sterile ice should be used for this purpose

Aqueous solutions and gels

To reduce the proliferation of Gram negative bacteria in hand washing solutions, antiseptics, disinfectants, conductive gel and other aqueous solutions:

- it is preferable to use disposable containers and dispensers of aqueous solutions/gels
- if dispensers are to be re-used, do not ‘top up’, but clean and allow to dry prior to re-filling

Flowers and plants

Stagnant vase water contains high numbers of Gram negative bacteria, and plants and soil may serve as a reservoir for *Aspergillus* spp. and other fungi, however there is little evidence to suggest that their presence in health care facilities has resulted in infection. However, measures should be taken to reduce the numbers of microorganisms present and minimise the opportunity for contact with susceptible people:

- exclude flowers and plants from areas where immunocompromised patients are accommodated
- limit care and handling of flowers/plants to staff with no direct patient contact, or staff to wear gloves for this purpose
- change vase water at least every two days; do not dispose of vase water in hand washing basins
- clean vases following use and store dry
- wash hands following handling

21. Environmental surfaces

Infection risk

The inanimate environment poses minimal risk to occupants. Microorganisms are unable to multiply on clean, dry, inanimate surfaces. Transmission may occur when the hands of patients or staff come into contact with contaminated surfaces. Measures to reduce this involve:

- hand hygiene
- regular cleaning of environmental surfaces to reduce the number of microorganisms

22. Environmental cleaning

ELEMENTS OF INFECTION CONTROL

A guide to the frequency of hospital cleaning entitled Queensland Health Cleaning Services Policy, Guidelines and Standards 1999, can be obtained from Queensland Health Corporate Support Services, and is available at http://qheps.health.qld.gov.au/betterworkplaces/documents/leadership/hstp/cleaning_services.pdf

Cleaning – definition and general principles

The term 'cleaning' refers to the use of mechanical action, detergent and warm water, followed by rinsing and drying, with the aim of removing organic matter, visible soils, and salts from a surface. Cleaning removes the bulk of microorganisms from surfaces; microorganisms are unable to multiply on clean, dry, inanimate surfaces.

Cleaning is facilitated by the presence of smooth, non-textured, impervious, seamless surfaces that are easily accessible and in good repair, and by limiting unnecessary horizontal surfaces, furnishings and other items in the health care environment.

Cleaning routine and frequency

Cleaning should be performed on a routine basis by trained staff using a standard method. Tasks should follow a logical order from 'clean' to 'dirty'. A means for evaluating the quality of cleaning practice is recommended.

The number of people, activity level, amount of moisture, presence of material capable of supporting microbial growth and type of surfaces (horizontal or vertical) present in the facility will influence the amount of cleaning required.

Cleaning equipment

Cleaning equipment used in health care facilities should be cleaned and stored to dry between uses, well maintained, and designed to minimise dispersion of dust during use. Appropriate equipment includes mops with detachable heads, laundered or single-use cloths, and vacuums (central or portable) fitted with appropriate filters.

Cleaning methods

Dust minimisation is important; damp dusting, vacuuming and wet mopping are the preferred cleaning methods. Emphasis should be placed on horizontal surfaces and frequently accessed fittings. Periodic cleaning of high areas, ceiling vents and infrequently accessed fixtures is also required.

Bed screens and window coverings/curtains

Bed screens may be changed between patients depending on facility policy, and should be changed when visibly soiled.

Window coverings are an unlikely source or reservoir of infection, however they should be washed or dry-cleaned routinely according to the facility schedule to remove dust, and when visibly soiled.

Carpeting

Studies have shown that bacteria and fungi 'colonise' carpeting, that their levels remain stable over time and that their presence poses little risk of infection. However, the method of carpet cleaning may pose a risk as vacuuming and carpet cleaning may disperse microorganisms into the environment:

ELEMENTS OF INFECTION CONTROL

- carpets should be wet vacuumed
- equipment should be clean, maintained and equipped with appropriate filters
- it is recommended that carpet be used in areas where blood and body fluid spills and other spills of liquid are unlikely to occur or that carpet tiles be used and replaced when soiled or damp
- carpets that remain wet or damp should be removed

Furniture

- furnishings should be kept to a minimum (particularly in areas housing immunocompromised people) to reduce dust accumulation
- vacuum cloth furnishing regularly to reduce dust
- recommend vinyl coverings for ease of cleaning

23. Blood and body fluid spills management

Infection risks from blood spills include penetrating injury from contact with blood-contaminated sharp objects in the spill area (eg glass, needles), and splash exposure during cleaning.

To reduce these risks and facilitate cleaning of the spill, health care facilities should have a procedure in place to manage spills. Prior assembly of items required for the safe cleaning of a blood spill is recommended.

Blood spill cleaning procedure

- minimise traffic in the spill area
- use personal protective equipment, including suitable gloves, plastic apron, face shield, or goggles and fluid repellent mask, when cleaning the spill
- use an appropriate device to remove broken glass/sharps to prevent injury during spill cleaning. Staff must avoid using their hands directly for this purpose
- contain and absorb the spill using disposable towels
- dispose of blood contaminated waste into clinical waste and contain blood soaked laundry items in a leak proof bag
- clean the blood spill area using standard cleaning equipment, detergent and warm water, followed by drying. Send contaminated cleaning articles for reprocessing or dispose

Surface disinfection following blood spills

For environmental surfaces likely to come in contact with mucosal surfaces or non-intact skin, facilities may disinfect a clean, dry, smooth, non-porous surface using sodium hypochlorite (bleach), diluted with water to deliver a concentration of 1000 parts per million available chlorine.

The bleach solution must only be applied to a clean surface, is to be freshly prepared, and remain in contact with the surface for 10 minutes.

| Available chlorine % | 1000 ppm available chlorine | Solution examples |
|------------------------|-----------------------------|--|
| Sodium Hypochlorite 1% | 1:10 | 100 ml bleach in 1 L water |
| Sodium Hypochlorite 5% | 1:50 | 100 ml bleach in 5 L water or 10 ml bleach in 500 ml water |

ELEMENTS OF INFECTION CONTROL

Sodium hypochlorite is effective against HIV, HBV and HCV. However, it is toxic, denatures rubber and plastic materials, corrodes metal, bleaches fabric and is inactivated in the presence of organic matter.

Blood spill kits/chlorine granules

Facilities may use a commercially available spill kit; however, the blood spill cleaning procedure must still be followed when cleaning the spill.

Body fluid spill cleaning procedure

- wear personal protective equipment
- contain spill and remove spill contents with disposable paper towels
- clean surface with detergent and warm water, and allow to dry

24. Antibiotic use

The need for discriminating use of antibiotics in all settings is essential to prevent selection of multi-resistant organisms. Injudicious antibiotic prescribing plays a key role in the development and extension of outbreaks involving multi-resistant organisms.

The risk of acquiring multi-resistant organisms is amplified in in-patient health care settings because:

- high use of antibiotics promotes and supports colonisation with multi-resistant organisms
- close proximity of patients and the nature of care provides greater opportunity for transmission of resistant organisms

Mechanisms to encourage optimal use of antibiotics should be encouraged in all health care settings. These include:

- educating prescribers
- developing hospital policies for antibiotic use
- limiting the agents available on the facility formulary
- conservation of new agents through restricted access
- optimising [surgical antibiotic prophylaxis](#)
- optimising choice and duration of empiric therapy
- surveillance of antibiotic utilisation with feedback of results
- monitoring trends in the incidence of multi-resistant organisms
- use of antibiograms to illustrate resistance patterns and trends
- community education related to the appropriate use of antimicrobials

Measures to optimise the use of antibiotics should be encouraged and supported by the infection control committee and senior management of the health care facility.

25. Biological terrorism event

Queensland Health has developed a 'Biological Incident/Disaster Plan' which describes the emergency response arrangements to a biological terrorism event. The Plan details the response to a deliberate biological emergency affecting human health and well being in Queensland.

ELEMENTS OF INFECTION CONTROL

The Director-General, Queensland Health, is responsible for the development and implementation of this plan. Contact the Communicable Diseases Unit, Queensland Health for further information (07 3234 1152).

The precautions required to prevent transmission of biological agents are outlined in Appendix D.

26. Pest control

Pests may infect patients with vector-borne diseases in health care facilities and may mechanically transmit microorganisms. However, the risk is low and pests are an unlikely source of health care associated infection in developed countries. However, from a public health, hygiene and aesthetic perspective, it is prudent to control pests in health care facilities.

Pest habitats include areas providing a food source, warmth or moisture. Pest control strategies should focus on kitchens, cafeterias, laundries, sterile supply departments, operating rooms, loading docks, waste holding areas and other areas prone to infestation.

27. Animals in health care settings

Hospital setting

The major risk of infection related to pet-assisted therapy (PAT) programs relates to animal bites. Animals participating in these programs should be obedient and under supervision at all times. Dogs and cats generally pose the least risk; however it is essential to ensure that patients or their carers have consented to pet visitation and are aware of the risks.

There is also a risk of transmission of zoonotic diseases such as parasitic diseases, and bacterial, fungal and viral infections. Measures to reduce this include:

- animals should be routinely screened for ectoparasites (fleas, ticks), have evidence of recent anthelmintic treatment, have evidence of current immunisation, no obvious skin lesions, and appear to be in good health
- animals should be clean and well groomed prior to visiting
- the visits should be supervised and the area cleaned afterwards
- patients and staff should avoid contact with animal urine and faeces. The carer should clean any animal waste and the animal should be toileted just prior to the visit
- patients and staff in contact with visiting animals should be instructed to wash their hands routinely following contact
- pet visitation is not suitable in areas housing severely immunocompromised patients and such patients may be excluded from PAT programs
- the question of whether family pets can visit severely ill patients should be decided by the facility infection control staff on a case by case basis
- restrict animal access to sterile supply departments, operating rooms, isolation rooms, sterile stock storage areas, medication preparation areas, food preparation and eating areas
- refer to IRM 3.2-14 Animals in Health Facilities accessed at <http://qheps.health.qld.gov.au/hrbranch/circulars/2005/ER05.05.pdf>

Residential setting

The same general animal behavioural and health precautions apply as per PAT in the hospital setting, however, in areas where residents are generally healthy, there is no more risk of infection

ELEMENTS OF INFECTION CONTROL

in the residential setting than in the general community (particularly if it is their own pet). Recommend:

- restricting animals from visiting kitchen areas, laundries, storage areas for clean and sterile supplies, medication preparation areas, kitchens and eating areas
- practicing routine/social hand hygiene after contact

Guide dogs

Guide dogs have a legislated right to enter any health care facility without undergoing screening for zoonoses. However they are restricted from access to sterile supply areas, operating rooms, labour wards, in-patient wards, sterile stock storage areas, food preparation and eating areas, and ambulances.

28. Food safety

Relevant legislation and guidelines

Environmental Health Officers have a legislative responsibility in matters of food safety. For advice regarding food safety, contact a Public Health Unit, or the Communicable Diseases Unit, Queensland Health (Appendix J).

Food preparation and handling in health care (and other) facilities must comply with the Food Safety Standards introduced in Queensland in July 2001. Sections of these Standards are being progressively introduced and are based on national food safety standards recently developed by the Australia New Zealand Food Authority. Copies of the standards, guides and fact sheets are available at <http://www.health.qld.gov.au/industry/food/>

Food safety program

Facilities should have a program in place to achieve safe outcomes through the identification and control of hazards in the production, manufacturing and handling of food.

Food safety programs comprise:

- identification of potential hazards (biological, chemical, physical) that may occur during food handling
- identification of where in the food handling process hazards are likely to occur (HACCP: Hazard Analysis and Critical Control Points) and the means of control at each point in the process
- provision for the systematic monitoring of these controls
- provision for appropriate corrective action when applicable
- provision for the regular review of the program
- provision for appropriate record keeping to demonstrate actions taken to comply with the food safety program

Control requirements relate to the following areas:

- issues relating to the purchase, receipt, storage, preparation and serving of food
- the need for appropriately skilled and knowledgeable food handlers and supervisors
- the health and hygiene of food handlers, including accessible hand washing facilities and use of single-use towels for drying; staff encouraged to report illness and to avoid handling food if they have active diarrhoea, uncovered skin lesions, discharges from the eye, nose, ear; and staff compliance with hygiene requirements when handling food

- the cleaning, sanitising and maintenance of premises and equipment. This includes such things as: routine cleaning of the premises; maintenance of food temperature measuring devices; appropriate waste disposal; a program to control pests; and a means to appropriately clean eating and drinking utensils
- a system for surveillance to evaluate the program. Contact Queensland Health Environmental Health Officers (Appendix J) for information.

29. Product evaluation and purchasing

To minimise the risk of health care associated infection in patients and staff, it is important to consider the infection control implications of medical products and devices prior to product purchase.

Purchasing decisions requiring input from infection control personnel include: consumables, patient care equipment, personal protective equipment, hand hygiene agents, sterilising and disinfection systems, furnishings, medical devices, agents used for cleaning and disinfection and other relevant purchases.

It is recommended that facilities have a Product Evaluation or Standardisation Committee comprised of relevant personnel to perform this decision making function.

Evaluation criteria

The following criteria are among the most important to be applied in the evaluation of a product:

Quality

The extent to which the product performs its defined function and contributes to desired patient outcomes without contributing to patient infections.

Efficacy

Product performance and ability to achieve stated function. Review TGA approval, product research, experience of other users.

Safety

Determine whether the product poses a health risk, including the ability to appropriately clean, disinfect or sterilise the item. Check manufacturer safety data, the experiences of other users, product instructions for clarity and completeness.

Cost and standardisation

Cost analysis to include equipment, compatibility with other products, existence of purchasing agreements, related supplies (consumables). Hidden expenses such as time and other resources (eg disinfection and sterilisation requirements) needed to support the new product should be considered.

Serviceability and availability

Availability/supply chain issues, ease of use, maintenance requirements, service agreement, warranty, user acceptability and durability when compared with similar products.

Suggested product evaluation committee members

- supply/materials manager
- hospital administrator
- infection control practitioner
- manager sterilising services
- manager, workplace health and safety
- representatives from purchasing/logistics; nursing; operating suite; medicine; biomedical engineering; housekeeping
- ad hoc members for specialised items

30. Laundry management

Infection risk and prevention

It is recognised that used linen is contaminated with bacteria; however, when handled to avoid dispersion of microorganisms that may contaminate air, surfaces or persons, it poses minimal risk to staff and patients.

Staff exposure to blood and body fluids during soiled linen handling is minimised through compliance with standard precautions. Laundry services staff should be fully trained in all aspects of infection control related to linen services in health care facilities. Refer to AS 4146:2000 Laundry Practice.

Handling, sorting and separation of used linen

- standard precautions apply
- handle used linen with care, avoid shaking and throwing in patient care areas and minimise this activity in laundry processing areas
- place used linen in a laundry bag at the point of generation
- linen soiled with blood or body fluids should be placed into a leak proof laundry bag identifiable to laundry staff
- avoid sorting used linen in patient care areas

Transportation, processing and storage of linen

- separate clean and dirty linen during transportation, processing and storage
- clean and dirty linen should not be transported together unless there is a suitable barrier preventing direct contact. Vehicle compartments are to be cleaned regularly and before the transportation of clean linen if previously used for dirty linen. Cover clean and sterile linen for transportation
- storage area for clean linen to be clean, dry and dust free
- clean linen storage area should be separate from soiled linen area
- clean linen should be used on a rotational basis

Laundry facility design and maintenance

- refer to the Queensland Health Capital Works Guidelines and AS 4146 for guidance on facility design
- laundry facilities should be designed to keep clean and dirty linen separate, and promote air movement from clean to dirty areas

- routine cleaning, pest and maintenance programs are to be in place and evidence of compliance sought through audits of the facility

Laundering

- water temperature and detergent to meet current standard to ensure adequate cleaning and thermal disinfection
- care must be taken to avoid overloading laundry machines
- laundry machines are to be maintained
- items that are heat sensitive may be disinfected using chemical means (eg sheepskins, woollen clothing)

Patient laundry items

- patient items (personal effects) should be sent home for laundering
- hospitalised patients with access to common laundry facilities may use common machines if the items suggested in 'Residential settings' are satisfied
- people with communicable diseases should avoid using shared laundry facilities directly, however, their clothes can be laundered in common facilities following the points in 'Residential settings'

Perioperative Attire

The ACORN Standards, 2008, requires all perioperative attire be laundered by the health care facility or its contractor. This laundering process will ensure the cleanliness of the attire meets a consistent standard. Water temperature and timing for appropriate laundering is stated in AS/NZS 4146:2000 Laundry Practice.

Other references are AS/NZS 4146:2000 Laundry Practice and AS 3789.3-1994 Textiles for health care facilities and institutions – Apparel for operating theatre staff.

Residential settings

Queensland Health is responsible for the provision of a laundry service for long stay patients in public sector aged care, mental health and disabled facilities.

For residential settings where residents have access to common laundry machines and the capacity to use such facilities, it is recommended to:

- educate residents on the correct use of laundry machines, or supervise use
- remove bulk solids prior to placement in washing machine
- do not overfill washing machines as this will compromise rinsing
- designate 'clean' and 'dirty' areas; clean the area daily and when soiled
- use detergent, combined with water that achieves temperatures required for thermal disinfection (refer 'thermal disinfection')
- maintain washing machines

31. Waste management

Waste legislation

ELEMENTS OF INFECTION CONTROL

The Environmental Protection Act, 1994, requires all organisations, including health care facilities, to take appropriate measures to ensure the minimisation and or elimination of environmental hazards, including waste.

The Environmental Protection (Waste Management) Regulation, 2000, contains specific provisions in relation to the management of clinical and related wastes. Other references are AS/NZS 3816:1998 Management of Clinical and Related Wastes and NHMRC National Guidelines for Waste Management in the Health Care Industry (1999).

Waste management involves waste minimisation as well as waste disposal. Waste disposal comprises the proper segregation, storage and eventual disposal of waste in a manner that does not pose a hazard to people and the environment.

Specified health care facilities are responsible under the Environmental Protection (Waste Management) Regulation, 2000, for preparing a clinical and related waste management plan. All facilities generating clinical and related waste must ensure that waste is appropriately segregated for the disposal method used.

Clinical waste

Previously referred to as pathological, bio-hazardous, contaminated, infectious or medical waste, clinical waste comprises waste with the potential to cause disease, including for example:

- discarded sharps
- human tissue waste (including items containing free-flowing or expressible blood. Excluding faeces, urine, teeth, hair, nails)
- laboratory and specimen waste
- animal carcasses

Related waste

- cytotoxic drugs
- pharmaceutical products
- chemical
- radioactive substances

General waste

Includes such items as paper, plastic, food and other items uncontaminated with large quantities of free-flowing or expressible blood.

General waste may include sanitary hygiene waste (disposable nappies, sanitary napkins and incontinence waste products). See Notes below.

Notes

- if the waste cannot be classified under any of these criteria, it may be disposed of as general waste
- the NHMRC 'National Guidelines for Waste Management in the Health Care Industry' (1999) state that the decision to treat all waste from patients known, or suspected of having a communicable disease as clinical waste should be made by clinicians on the basis of the mode of transmission of the particular infection and the infection potential of such waste
- local governments have the right to determine which wastes can be disposed of to landfills operated by them. This can impact on segregation practices in health care facilities. For

instance, some local governments may determine that disposable nappies cannot be disposed of to their landfills as general waste without being treated, while others accept this waste without prior treatment

- where possible, recycling strategies should be encouraged to assist in waste reduction, and environmental best practice
- in community settings, contact the Environmental Protection Agency at <http://www.env.qld.gov.au> for additional information

Waste management plan

Facilities must have a clinical and related waste management plan, reviewed at least every five years, that considers the following areas:

- measures to collate and annually review the waste categories, volumes, weights and frequency of waste removal
- education and training of personnel involved in waste management to minimise risk of injury and facilitate efficient disposal (eg safe waste handling procedures, standard precautions)
- risk management strategies, including spill management
- waste segregation procedures
- requirements for waste containers (in compliance with existing legislation, standards or guidelines for design, colour, symbols)
- designated waste storage facilities (including a means to secure clinical waste)
- arrangements for transportation, treatment and disposal procedures
- waste minimisation strategy, including recycling
- baseline waste auditing and monitoring, goals to reduce waste generation, and a plan for achieving these goals within a timeframe

An approved Waste Management Plan will apply to all employees and other people who are on a health care establishment, such as service providers and visitors. This document should be made available to all employees, with promotional strategies in place and mechanisms for staff feedback.

Queensland Health waste management plan

A Queensland Health Generic and Clinical and Related Waste Management Plan template is available on QHEPS. Further information can be obtained by contacting the Communicable Diseases Unit or Environmental Waste Management Coordinator in the Environmental Health Services sections of the southern, tropical and central public health units (Appendix J).

32. Building and refurbishment projects

Infection control issues

Involvement of infection control professionals in building and refurbishment projects ensures that relevant epidemiological issues in the design and layout of health care facilities have been considered, and incorporated into building plans. In addition, infection risks related to construction can be identified and managed.

Facility design

Consultation with infection control personnel ensures that health care facilities are designed to minimise infection risks. Issues including the number and location of hand basins, air handling system design, negative pressure rooms, design of interior surfaces and storage areas to facilitate

ELEMENTS OF INFECTION CONTROL

cleaning, patient accommodation and waiting area design, work flow issues and transportation routes require infection control input.

Construction, renovation, demolition works

Infection control involvement prior to construction, renovation or demolition work is essential to ensure that infection risks are identified and appropriate measures put in place to reduce such risks.

Potential problems during this phase in an occupied health care facility include exposure to airborne contaminants in dust, water entry and absorption into building materials, pests, an increase in traffic through the facility, and maintaining patient care areas in a clean state. Measures to minimise the risk of infection include:

- relocation of susceptible patients
- increased cleaning frequency to control dust and debris
- moisture containment
- adequate sealing of the building
- containment of airborne contamination via use of physical barriers, and
- temporary exhaust ventilation to isolate work areas

Monitoring of the above systems to ensure compliance and function is essential. In addition, staff awareness of infection caused by airborne microorganisms should be heightened.

Refer to the [Australasian Health Facility Guidelines \(2008\)](#) for detailed information.

References

AS 4187:2003. Code of Practice for Cleaning, Disinfecting and Sterilising Reusable Medical and Surgical Instruments and Equipment, and Maintenance of Associated Environments in Healthcare Facilities. Standards Australia, Sydney.

AS/NZS 3816:1998 Management of Clinical and Related Wastes. Standards Australia, Sydney.

AS 4146:2000. Laundry Practice. Standards Australia, Sydney.

Australia New Zealand Food Authority. The *Australia New Zealand Food Standards Code*. Available at http://www.foodstandards.gov.au/the_code/foodstandardscode.cfm and <http://www.anstat.com.au/legislation/modules.php?name=Content&pa=showpage&pid=40>

Australian College of Operating Room Nurses. ACORN Standards for Perioperative Nursing 2008: including Nursing Roles, Guidelines and Position Statements. South Australia: The Australian College of Operating Room Nurses Ltd Adelaide; 2008.

Ayliffe GAJ, Lowbury EJJ, Geddes AM, Williams JD. Control of Hospital Infection: a Practical Handbook. 4th ed., 2000. London.

Bennett JV, Brachmann PS. Hospital Infections. 5th ed., 2007. Lippincott-Raven: Philadelphia.

CDNANZ. Infection Control Guidelines for the Prevention of Transmission of Infectious Diseases in the Health Care Setting. Jan 2004 accessed at <http://www.health.gov.au/internet/main/publishing.nsf/Content/icg-guidelines-index.htm>.

Centers for Disease Control and Prevention. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) 2003. Available at http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Enviro_guide_03.pdf

Chin J. Control of Communicable Diseases Manual. 19th ed., 2008. American Public Health Association: Washington.

CHRISP Surveillance User Manual. 2001. Queensland Health. Available at <http://www.health.qld.gov.au/chrisp>

Commonwealth of Australia. Hand Hygiene Australia 5 Moments for Hand Hygiene. [Online] 2009 Jul [cited 2010 October 1]; Available from: URL: [http://www.hha.org.au/UserFiles/file/Manual/ManualJuly2009v2\(Nov09\).pdf](http://www.hha.org.au/UserFiles/file/Manual/ManualJuly2009v2(Nov09).pdf)

Communicable Diseases Intelligence. Guidelines for the Control of Measles Outbreaks in Australia. July 2000. Commonwealth Department of Health and Aged Care.

Environmental Protection Act. Waste Management Regulation 2000. Available at <http://www.legislation.qld.gov.au>

Falk PS. Infection control and the employee health service. In: Hospital Epidemiology and Infection Control 3rd ed. Mayhall CG (ed). 2004. Lippincott, Williams and Wilkins: Philadelphia.

Gaynes RP and Horan TC. Surveillance of nosocomial infections. In: Hospital Epidemiology and Infection Control, 3rd ed., Mayhall CG (ed) 2004. Lippincott, Williams and Wilkins: Philadelphia.

Guide Dogs Act 1972 (Qld). Available at <http://www.legislation.qld.gov.au>

Hierholzer WJ, Archibald LK. Principles of infectious disease. In: Hospital Epidemiology and Infection Control, 3rd ed., Mayhall CG (ed). 2004. Lippincott, Williams & Wilkins: Philadelphia.

Hopkins CC. Pharmacy service. In: Hospital Epidemiology and Infection Control, 3rd ed., Mayhall CG (ed). 2004. Lippincott, Williams & Wilkins: Philadelphia.

Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR) Report. Available at <http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-jetacar-index.htm>

Karanfil LV and Gershon RRM. Evaluating and selecting products that have infection control implications. In: Hospital Epidemiology and Infection Control, 3rd ed., Mayhall CG. 2004. Lippincott, Williams & Wilkins: Philadelphia.

Larson EL. APIC guideline for handwashing and hand antisepsis in health care settings. *American Journal of Infection Control* 1995; 23:251-69.

Larson EL. Skin hygiene and infection prevention: more of the same or different approaches? *Clinical Infectious Diseases* 1999 Nov; 29:1287-94.

Lee TB, Baker OG, Lee JT, Scheckler WE, Steele L, Laxton CE. Recommended practices for surveillance. *American Journal of Infection Control* 1998;26:277-88.

Manian F. Surveillance of surgical site infections in alternative settings: exploring the current options, *American Journal of Infection Control* 1997;25(2):102-105.

Mangram AG, Horan TC, Pearson ML et al. CDC guideline for the prevention of surgical site infection. *Infection Control and Hospital Epidemiology* 1999;20:250-278.

McLaws M-L. Risk adjusted infection rates. Part 1: what is risk adjustment and when should infection rates be risk adjusted. *Australian Infection Control* 2001;6:55-58.

Morton A, Curtis M. Control charts for nosocomial infection surveillance. *Australian Infection Control* 2001;6:61-65.

NHMRC. The Australian Immunisation Handbook, 9th ed., 2008. NHMRC: Canberra.

Noy D, Creedy D, Purcell C. Post discharge surveillance methods: a critique. *Australian Infection Control* 2001;6:81-88.

Patterson JE. Isolation of patients with communicable diseases. In: Hospital Epidemiology and Infection Control 3rd ed., Mayhall CG (ed). 2004. Lippincott, Williams and Wilkins: Philadelphia.

Pittet D, Boyce JM. Hand hygiene and patient care: pursuing the Semmelweis legacy. *Lancet Infectious Diseases* 2001; April: 9-20.

Pittet D, Dharan S, Touveneau S, Sauvan V, Perneger TV. Bacterial contamination of the hands of hospital staff during routine patient care. *Archives of Internal Medicine* 1999;159:821-826.

Pottinger JM, Herwaldt LA, Perl TM. Basics of surveillance: an overview. *Infection Control and Hospital Epidemiology* 1997;18:513-27.

ELEMENTS OF INFECTION CONTROL

Queensland Health. Capital Works Guidelines, Building and Refurbishment: Infection Control Guidelines January 2002 accessed at <http://www.health.qld.gov.au/cwamb/cwguide/InfectionGuide.pdf>

Queensland Health. Guidelines for the Management of Occupational and Non-occupational Exposures to Blood and Body Fluids. Revised 2008 accessed at http://www.health.qld.gov.au/chrisp/ic_guidelines/appendix3_04_08.pdf

Queensland Health. Management of Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) Infected Health Care Workers. Revised 2004 accessed at http://www.health.qld.gov.au/chrisp/ic_guidelines/appendix_P4.pdf

Queensland Health. Policy for Vaccination of Health Care Workers, 2004 accessed at http://www.health.qld.gov.au/chrisp/ic_guidelines/23563.pdf

Queensland Health. Queensland Health Guideline for the Management of Outbreaks of Communicable Disease in Health Facilities, 2001 accessed at http://www.health.qld.gov.au/chrisp/ic_guidelines/appendix_P5.pdf

Queensland Health. Cleaning Services Policy, Guidelines and Standards. 1999.

Queensland Health. Linen Services Policy and Standards for Public Sector Health Care Facilities. 1999.

Rotter ML. Hand washing and hand disinfection. In: Hospital Epidemiology and Infection Control, 3rd ed., Mayhall CG (ed). 2004. Lippincott, Williams & Wilkins: Philadelphia

Rutala WR. APIC Guideline for selection and use of disinfectants. *American Journal of Infection Control* 1996; 24:313-342

Standards Australia. Australian Handbook. Hospital Acquired Infections: Engineering Down the Risk, 2003.

Therapeutic Guidelines. Therapeutic Guidelines: Antibiotic. Version 13. 2006. TGL: Victoria.

Turnidge J. Antibiotic use or misuse? *Medical Journal of Australia* 1997;167:116-117.

Vesley D, Streifel AJ. Environmental services. In: Hospital Epidemiology and Infection Control, 3rd ed., Mayhall CG (ed). 2004. Lippincott, Williams & Wilkins: Philadelphia.

Weber DJ, Barbee SL, Sobsey MD, Rutala WA. The effect of blood on the antiviral activity of sodium hypochlorite, a phenolic, and a quaternary ammonium compound. *Infection Control and Hospital Epidemiology* 1999;20:821-827.

Weber DJ, Rutala WA. Epidemiology and prevention of nosocomial infections associated with animals in the hospital. In: Hospital Epidemiology and Infection Control, 3rd ed. Mayhall CG (ed). 2004. Lippincott, Williams & Wilkins: Philadelphia.

Wenzell RP. Prevention and Control of Nosocomial Infections, 4th ed. 2003. Williams and Wilkins: Baltimore.