



Guideline on infection control in anaesthesia

1. Purpose

The Australian and New Zealand College of Anaesthetists (ANZCA) aims to ensure that the practice of anaesthesia is as safe as possible for patients, anaesthetists and other healthcare workers. Infection control aimed at minimising risks of infection is central to this aim.

The goal of these guidelines is to assist practitioners and facilities to implement strategies that will reduce risks of transmission of infection, based on current evidence.

In certain clinical situations there may be a need to adopt more stringent practices. These guidelines should be considered with documents on this subject issued by other authorities, and in particular local infection control policies.

2. Scope of this document

This document is intended to apply in all areas where anaesthesia, including regional analgesia and sedation, are administered, and covers all associated activities and equipment.

3. Definitions

Asepsis: the prevention of microbial contamination of living tissues or sterile materials.

Disinfection: the inactivation of non-sporing organisms using either thermal or chemical means.

Sterilisation: complete destruction of all micro-organisms, including spores.

Equipment management is dependent on the site into which it comes into contact. This is often classified as non-critical, semi-critical or critical.¹

Critical: the device will penetrate skin or mucous membranes, enter the vascular system or a sterile space – these devices require sterilisation.

Semi-critical: the device will be in contact with intact mucous membranes or may become contaminated with readily transmissible organisms – these devices require high level disinfection or sterilisation.

Non-critical: the device contacts intact skin or does not contact patient directly – these devices require low level disinfection or cleaning.

For technical aspects of these procedures consult the Australian/New Zealand standard *AS/NZS 4187:2014 Reprocessing of reusable medical devices in health service organizations*² or equivalent protocol.

4. Prevention of infection

4.1 Healthcare associated infections

4.1.1 Standard precautions

Healthcare workers should protect themselves by wearing gloves, protective eyewear or face shields, masks, gowns and/or plastic aprons when there is the likelihood for splashing, splattering or spraying of blood or body fluids, even if not blood stained. Precautions should be implemented for all patients regardless of suspected or confirmed infectious risk.

4.1.2 Hand hygiene

Hand hygiene is the most important infection control measure. Hand washing with soap and water should be performed when hands are visibly dirty or contaminated with blood or other body fluids, or if exposed to potential spore forming organisms (for example, *Clostridium difficile*). Soap and water alone moves bacteria but is not effective at killing organisms. The term "hand hygiene" encompasses the use of soap/solution (non-antimicrobial or antimicrobial) and water, or a waterless antimicrobial agent to the surface of the hands. Effective hand hygiene should be performed before and after each patient contact. Antiseptic solutions with an alcohol component or alcohol solutions alone provide superior disinfection when compared with non-alcoholic antiseptics (4 per cent chlorhexidine, povidone iodine) or non-antimicrobial soaps. Alcohol is rapidly germicidal but when combined with antiseptic compounds, bacterial re-growth occurs at a significantly slower rate. Extended antimicrobial activity appears to be most effective for alcohol solutions containing 2-4 per cent chlorhexidine gluconate. Products containing between 60-95 per cent alcohol appear to be the most effective with the higher concentrations being less effective because protein denaturation requires water.

4.1.3 Gloves, facemasks and theatre caps

Non-sterile examination gloves should be worn when there is anticipated contact with blood or other potentially infectious body fluids. Gloves must be changed or removed when moving from a contaminated body site to a non-contaminated region. Hand hygiene should be performed before and after wearing of gloves. Specific care should be taken not to contaminate the patient care environment with gloves that have had previous patient contact.

Masks should be worn when carrying out sterile procedures under full aseptic conditions (see item 4.3.2). There is insufficient evidence to recommend the wearing of masks in the operating theatre for all operations however the use of masks for theatre personnel should be in accordance with local hospital policy. It should be remembered that face masks protect the wearer from contamination during procedures as well as potentially limiting spray contamination of sterile fields when in range. When masks are worn they should be worn to cover the nose

and mouth completely and be firmly secured by the upper and lower tapes. Masks should not be worn around the neck nor taken down to speak. Face masks should be removed immediately after use and replaced for fresh patient interaction. Following removal and disposal, hand hygiene should be performed.

Hair should be completely covered with a disposable theatre cap or a freshly laundered lint free hat.

4.1.4 Theatre attire

All personnel entering a theatre suite should wear the freshly laundered suits, gowns and overshoes provided for use within the suite. Theatre attire should be changed daily. During the shift any visually soiled attire should be changed as soon as possible.

Dedicated footwear is preferred for restricted areas. Footwear should meet occupational health and safety standards and be kept clean. Overshoes are not necessary for clean shoes (that are specially kept for use in theatre). Overshoes should be worn if there is any possibility that dirt may be on the shoes. If overshoes are used, hand hygiene should be performed after donning and removing them.

4.1.5 Flow through theatre

Opening operating room doors disrupts airflow within the room, which potentially increases the risk of wound contamination. General traffic and superfluous personnel within the operating room should be minimised and doors should remain closed.

4.1.6 Sharps

Sharps should be handled with care at all times, disposed of safely immediately following use, and not be resheathed, bent, broken or manipulated in any way. The use of needle-free injection systems and cannulae with needle protection systems (for example, needle retraction) is encouraged.

Any person exposed to a needlestick or other blood or body fluid incident should follow the protocol provided by the institution in which it occurs. This includes having a medical evaluation with particular reference to the risk of infection with human immunodeficiency virus, hepatitis B virus or hepatitis C virus. The National Health and Medical Research Council has published extensive guidelines³ on the prevention and control of infection in healthcare including the management of exposure to blood and body fluids contaminated with blood, such as needlestick/sharp injuries.

4.1.7 Antibiotic chemoprophylaxis

Timely antibiotic chemoprophylaxis is an important strategy to reduce surgical site infections and is the responsibility of the whole surgical team. Indication and agent choice should be in accordance with local surgical prophylaxis guidelines and therapeutic guidelines.⁴

4.1.8 Maintenance of normothermia

Perioperative hypothermia has been associated with adverse outcomes, including infectious complications.⁵

4.1.9 Restrictive transfusion strategies

Despite the widespread use of leucodepletion, liberal transfusion strategies have been shown to be associated with infectious complications in a variety of healthcare settings, including major orthopaedic and cardiac surgery.⁶

4.1.10 Vaccination of the healthcare worker

Healthcare facilities should provide a screening and vaccination program for their workers. It is the responsibility of individual practitioners to avail themselves of health resources and ensure their immunisation is up to date.

4.2 Anaesthetic apparatus

4.2.1 Disposable Items

Single use items are not designed for easy cleaning, decontamination or repeated sterilisation. Australian/New Zealand standard *AS/NZS 4187:2014 Reprocessing of reusable medical devices in health service organizations*² universally condemns the practice of re-use of single use items and states that they should be discarded at the point of use.

4.2.2 Devices to be sited in the upper airway

4.2.2.1 Anaesthetic face masks

Normally in contact with intact skin, these items are frequently contaminated by secretions and would be considered semi-critical, requiring cleaning and thermal disinfection after use.

4.2.2.2 Laryngoscopes

Laryngoscope blades are considered critical equipment because they may penetrate skin or mucous membranes, and as such, require sterilisation. Laryngoscope handles, being non-critical devices, should be cleaned with detergent and water between each patient use. If contaminated with blood, they should be washed and disinfected.

4.2.2.3 Bougies

Re-use of these items has been associated with cross-infection. It is preferable that alternative single-use intubation aids are employed when possible.

4.2.3 Anaesthetic breathing systems

In practice, most departments of anaesthesia use these circuits for more than one patient or for more than one operating session in

conjunction with the use of a new bacterial filter for each patient. Departments should comply with local policy. If visibly internally or externally contaminated, or used for known high-risk infectious cases, for example, open tuberculosis, the circuits should be changed between patients unless a heat moisture exchange bacterial filter is used.^{7,8} The breathing bag is easily contaminated by hand contact during induction and emergence from anaesthesia. Breathing bags should be cleaned with detergent and water between each patient use or replaced if single use.

4.2.4 Sampling lines for side stream gas analysis

These need not ordinarily be sterilised before reuse. Sampled gas should not be returned to the anaesthetic circuit unless it is first passed through a viral filter (0.2 µm mesh).

4.2.5 Anaesthetic machines

Routine daily sterilisation or disinfection of internal components of the anaesthetic machine is not necessary if a bacterial/viral filter is used between patient and circuit. However, cleaning and maintenance policies should be followed and bellows, unidirectional valves and carbon dioxide absorbers should be cleaned and disinfected periodically.

4.2.6 Surfaces and monitors

The surface of the anaesthetic machine and monitoring equipment should be cleaned between each patient with detergent and water. This includes non-invasive blood pressure cuffs and tubing, pulse oximeter probes and cables, stethoscopes, electrocardiographic cables, blood warmers etc, and the exterior of anaesthetic machines and monitors. Items such as temperature probes should be single patient use. Touch screens and control knobs should also be cleaned.

4.2.7 Flexible laryngoscopes and bronchoscopes

These are considered semi-critical and require careful cleaning, including of any open suction or biopsy channel, followed by high level disinfection or sterilisation.

4.2.8 Ultrasound probes

4.2.8.1 Surface probes

Non-critical use. Following non-invasive procedures (for example, scanning over intact skin, TTE) the ultrasound transducer should be disinfected in accordance with the manufacturer's recommendations. This is a three-stage process: removal of gel and debris with a dry towel, wiping with a moist detergent cloth followed by spraying or wiping with an approved (usually alcohol-based) disinfectant solution.⁹ The ultrasound gel used should ideally be sterile or supplied from a single-use package.

Semi-critical use. For invasive procedures (for example, ultrasound guided regional blocks vascular access), the probe and cable should be protected from contamination by use of a sterile cover and be prepared in such a way as to maintain the sterility of the procedural region. This particularly applies to the placement of central venous or perineural catheters. Any conducting medium (for example, ultrasound gel) between the probe cover and the skin must be sterile. Following use, the transducer covering should be removed without contaminating the surface of the transducer or the ultrasound machine. The probe should now be processed as for a non-invasive procedure.

The cleaning procedure for both non-invasive and invasive procedures should also include the entire cable from the transducer to the machine and extend to the surface of the machine.

Any probe that is contaminated with blood or other biological fluid should be cleaned as for *critical use* and undergo high-level disinfection with chemicals such as ortho-phthalaldehyde. Recommendations are available from Queensland Health.¹⁰

4.2.8.2 Internal probes – Semi-Critical/Critical use

Transoesophageal echocardiography (TOE) probes require management as semi-critical devices because they contact gastrointestinal mucosa and potentially infectious bodily fluids. When cleaning TOE probes it is important to ensure that disinfection and sterilisation is undertaken of the probe tip and insertion shaft and also that the handle, cable, and external parts of the socket are decontaminated and disinfected, for example, by wiping over with water/detergent and a non-alcohol disinfectant. It is important to ensure that manufacturer's instructions are strictly adhered to. Guidelines have been developed for the cleaning of TOE probes.¹¹ Once sterilised, the TOE probe should be stored in a clean non-contaminated environment.

Care should also be taken when using the TOE probe to avoid cross-contamination between the hand manipulating the probe shaft and the probe controls and ultrasound machine controls.

4.2.8.3 Resuscitation equipment

Reusable items must be sterilised between patients.

4.3 Invasive procedures

Invasive procedures are to be performed with aseptic technique.

4.3.1 Vascular cannulation

The cannulation site is a potential portal of entry for micro-organisms into the subcutaneous tissues and circulation. The anaesthetist should observe strict hand hygiene and should wear protective gloves. The skin should be disinfected with an appropriate antiseptic preparation (70 per cent alcohol, tincture of iodine, an iodophor or chlorhexidine gluconate) prior to cannulation being performed in a manner that ensures the tip and shaft of the cannula remain sterile. Seventy per cent alcohol solution alone is only suitable for short-term cannulation (<24 hours). There is no evidence for the routine replacement of peripheral intravenous cannulae, although local institutional guidelines should be followed.

4.3.2 Central vascular cannulation

A central line is defined as an intravascular device that terminates at or close to the heart or in one of the great vessels. The Australian and New Zealand Intensive Care Society guidelines¹² for central line insertion and maintenance aim to assist in the prevention of central line associated bloodstream infections. The guidelines stress the importance of aseptic technique and maximal barrier precautions, including full body draping and the wearing of hat, facemask, gown and sterile gloves. The skin should be disinfected with 0.5 per cent or 2 per cent chlorhexidine preparation with alcohol. If there is a contraindication to chlorhexidine, tincture of iodine, an iodophor or 70 per cent alcohol can be used as alternatives. Use of surface ultrasound must not compromise the aseptic technique (see item 4.2.8.1). The use of a checklist to confirm compliance with aseptic technique is recommended.

4.3.3 Vascular access ports

Injection ports of intravascular devices and attached lines and tubing are potential sources of introduction of bacterial contamination. Proper aseptic technique must be strictly followed when accessing injection ports. This includes wiping the outer surface of the rubber stopper and its injection site with a 70% isopropyl alcohol wipe/swab and allowing it to dry before inserting any injection device.

4.3.4 Regional anaesthesia

When single-shot non-neuraxial regional blocks are performed, aseptic precautions should consist of skin preparation, clean hands and gloves, a single-use needle and syringe and a no-touch technique. When ultrasound is used, the probe and cable should be protected from contamination and be prepared in such a way as to maintain the sterility of the procedural region. Any conducting medium (for example, ultrasound gel) between the probe cover and the skin should be sterile. Any probe that is contaminated with fluid or biological material should be fully cleaned and disinfected.

When a spinal or epidural block is being performed, or when a regional anaesthesia catheter is to be left indwelling, full aseptic technique and maximal barrier precautions are required as described for central vascular cannulation (see item 4.3.2). For skin preparation, 0.5 per cent

chlorhexidine in alcohol, where available, is recommended for neuraxial techniques although it should be noted that very small quantities of neuraxial chlorhexidine have been implicated in cases of severe neurotoxicity. Contamination of the sterile setup with disinfectant solutions must be avoided and appropriate procedures must be in place to prevent cross-contamination of solutions intended for neuraxial injection with disinfectant preparations.

Use of surface ultrasound must not compromise the aseptic technique.

4.3.5 Chlorhexidine gluconate

As the use of chlorhexidine has increased, so have reported incidences of allergic reactions. Indiscriminate use should be avoided. Adequate alternatives to chlorhexidine should be stocked such that a chlorhexidine-free procedure can be performed in patients with known or suspected allergy.

4.4 Presentation of drugs for injection

Contamination of the drugs should be avoided. Particular caution should be exercised with drugs that are free of preservatives. To minimise the risk of cross-infection between patients the contents of any one ampoule should be administered to only one patient (see ANZCA professional document *PS51 Guidelines for the Safe Administration of Injectible Drugs in Anaesthesia*).

Care should be taken with glass ampoules as small cuts reduce the barriers between the bloodstreams of the healthcare worker and the patient.

Care should be taken to avoid contamination of drugs being drawn up into a sterile field from ampoules or vials which are not in sterile outer packs. It should be recognised that filter needles need to have a 0.2 micron filter grade to be effective in excluding micro-organisms.

The external surfaces of injection vials, including the outer surface of the 'rubber' stopper and the inner surface of the vial lid, are not required to be sterile and so might not be free from microbial contamination. Lids are intended to act as a shield for the rubber stopper and to keep dust and other physical contaminants away from it. Proper aseptic technique must be strictly followed when administering intravenous injections to a patient. This includes wiping the outer surface of the rubber stopper and its injection site with a suitable disinfectant wipe/swab and allowing it to dry before inserting any device into the vial.

This document is accompanied by a background paper (PS28BP) which provides more detailed information regarding the rationale and interpretation of the Guideline.

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Further reading

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