



# **Guidelines On Infection Control In Anaesthesia**

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## **Table of Contents**

	Page
1. Introduction	3
2. Definitions	3
3. Prevention of healthcare associated infection	4
4. Minimisation of infection risk to patients	6
5. Prevention of infection of health care workers	11
6. References	12

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## **1. INTRODUCTION**

In order to ensure that the practice of anaesthesia is as safe as possible for patients, anaesthesiologists and other health care workers, it is imperative that infection risks to all parties to be minimised. It is impossible to issue a policy which, if observed, would ensure that cross infection between patients is never transmitted via anaesthetic apparatus. What follows is a guideline based on current understanding of the mechanisms and risks of such transmission. In certain clinical situations, there may be a need to adopt more stringent practices. This guideline should be considered with documents issued by other Authorities.

## **2. DEFINITIONS**

**Decontamination:** The process of removing infective and unwanted matter from the surface of an object, i.e. thorough cleaning.

**Disinfection:** A process, which eliminates most or all micro-organisms except spores or prions.

**Sterilisation:** A process, which leads to the complete destruction or elimination of all microorganisms.

**Asepsis:** The prevention of contact with micro-organisms.

For disinfection or sterilisation to occur there must have been previous thorough decontamination.

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

- **Critical:** the device will penetrate skin or mucous membranes, enter the vascular system or a sterile space- these devices require sterilization.
  - **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 sterilization.
  - **Non-critical:** the device contacts intact skin or does not contact patient directly- these devices require low level disinfection or cleaning
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### **3. PREVENTION OF HEALTHCARE ASSOCIATED INFECTION**

#### **3.1. Standard precautions**

Healthcare workers should protect themselves by wearing gloves, protective eyewear or face shields, masks, gowns and/or plastic aprons when there is a likelihood for slashing, 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.

#### **3.2. Hand hygiene**

Hand hygiene is the most important infection control measure. 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. 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.

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 removes bacteria but is not effective at killing organisms.

#### **Indications for hand hygiene include<sup>1</sup>**

- before and after direct patient contacts
  - before donning sterile gloves and after removal of gloves, face mask or PPE
  - after contact with body fluids, non-intact skin, mucous membranes, wound dressings
  - when hands that have contacted a contaminated body area will subsequently
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contact a clean site

-after contact with high-touch environmental surfaces in the vicinity of the patient

-before eating

-after using the restroom

The wearing of artificial nails during direct patient care is also discouraged in operating theatre or intensive care unit. <sup>2</sup> Artificial nails are defined as any fingernail enhancement, resin bonding, extensions, tips, gels, or acrylics. Studies have shown higher microbial counts under artificial nails than under natural nails before and after hand washing. Nail polish may be worn if it is not chipping or peeling. Rings should be removed prior to performing a surgical hand scrub.

### 3.3. 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, or after finishing care procedure with a patient. 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. 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.

### 3.4. 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<sup>7</sup>. Footwear should meet occupational health and safety standards and be kept clean. Overshoes are not

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necessary for clean shoes (those 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.

### 3.5. Operating Theatre ventilation

It is recommended to maintain positive-pressure ventilation in the operating room with respect to the corridors and adjacent areas as well as a minimum of 15 air changes per hour in the operating theatre, of which at least 3 should be fresh air. Both recirculated and fresh air should be filtered through appropriate filters (e.g. HEPA filter) while all air should be introduced at the ceiling, and exhaust near the floor.

### 3.6. 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.

### 3.7. 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, taking into consideration patient's allergy history.<sup>3</sup>

### 3.8. Patients with a Communicable Disease

When elective surgery is planned for a patient with a communicable disease or exposure to a communicable disease, the operation should be delayed until the patient is no longer infectious or the incubation period has elapsed. Examples of communicable disease include open pulmonary tuberculosis, laryngeal tuberculosis, varicella-zoster, measles, pertussis etc.

## **4. MINIMISATION OF INFECTION RISK TO PATIENTS**

Measures to protect patients against acquiring infections through anaesthesia procedures need to address (i) risks related to invasive procedures; (ii) risks or potential risks related to airway management.

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In both situations, appropriate levels of sterility, disinfection and decontamination are to be applied to all equipment used. A microbiologist or the Hospital Infection Control Team should be consulted about any matters requiring clarification with local application of this guideline.

Frequent hand washing by the anaesthesiologist and the anaesthetic assistant is a most important infection control measure. Hands should be washed before handling a new patient or an equipment to be used on a new patient, after leaving a patient, whenever they become contaminated and before any invasive procedure.

For the anaesthesiologist's protection, protective gloves are to be worn whenever the hands may contact blood, saliva or any other body fluid and are to be removed after such a procedure to minimise contamination of the work place.

#### 4.1. Invasive Procedures

Invasive procedures are to be performed with aseptic technique.

##### 4.1.1. Vascular Cannulation

The cannulation site is a potential portal of entry of micro-organisms into the subcutaneous tissues and circulation. The anaesthesiologist's hands must be washed and protective gloves should be worn. The skin should be disinfected with an appropriate preparation prior to cannulation, which is performed in a manner that ensures that the tip and shaft of the cannula remain sterile.

##### 4.1.2. Central Vascular Cannulation

Cannulation of central veins is to be performed using aseptic technique.

#### 4.2. Drip set and 2-ways/3 –ways stopcocks

Every drip set should be dedicated to one patient. The tip of the drip set and injection ports of the stopcocks should be kept clean all the time.

#### 4.3. Regional Anaesthesia

When regional blocks are being performed, the hands should be washed and gloves worn, the skin should be disinfected with a suitable preparation and the procedure done in such a way that the needle remains sterile. When a spinal or epidural block is being performed or a catheter is to be left indwelling, full aseptic technique including the wearing of sterile gown and gloves and the use of a field bordered by

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sterile drapes is recommended.

#### 4.4. Anaesthetic Apparatus

The following measures are intended to minimise the risk of transmission of infection in the respiratory tract via anaesthetic equipment. This guideline does not address the processing of equipment during long term ventilation.

##### 4.4.1. Devices to be sited in the upper airway

Devices passing through the mouth or nose will become contaminated in the upper airway. Endotracheal tubes, nasal and pharyngeal airways should be kept sterile until used.

Reusable face masks must be thoroughly decontaminated and then undergo disinfection prior to each use. Items to be placed in the upper airway which may cause bleeding e.g. laryngoscope blades and temperature probes, must be sterilized before reuse. It is not ordinarily necessary to package these items separately while they await their next use. Where the manufacturer advises that a particular piece of equipment is to be sterilised before use, e.g. the laryngeal mask, that advice is to be followed. Laryngoscope handles should be decontaminated between uses.

Endotracheal cuff pressure should be  $>20$  cm H<sub>2</sub>O to limit micro-aspiration but  $<30$  cm H<sub>2</sub>O to limit mucosal ischemia<sup>1</sup>.

There should be separation of unused items and soiled items during use.

##### 4.4.2. The Breathing Circuit

For each patient the Breathing Circuit should have been sterilised, or decontaminated and disinfected, or protected by the use of appropriately positioned new filters. A bacterial filter with an efficiency rating of  $>95\%$  for particle sizes of  $0.3 \mu\text{m}$  should be routinely placed in the anesthesia circuit where it will protect the machine from contamination with airborne infectious diseases. When a filter is used, it is recommended that disposable items between the patient and the filter be disposed of and non-disposable items, including in-line measurement devices, be decontaminated and disinfected prior to reuse. Any condensate collected in the tubing of a breathing circuit should be

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periodically drained and discarded, taking precautions not to allow condensate to drain towards the patient. Hands should be washed after handling the fluid.

#### 4.4.3. Sampling Lines for Side Stream Gas Analysis

These need not ordinarily be sterilised before reuse because of the one way flow of gas through them. Sampled gas from a capnograph or other such measurement devices should not be returned to the anaesthetic circuit unless it is first passed through a viral filter.

#### 4.4.4. Carbon Dioxide Absorbers

When a filter is used in the circuit as describes in 4.4.2 above, sterilisation of the carbon dioxide absorber prior to every case is not necessary nor, with most models, practicable although disposable versions and models capable of being sterilised are available. The device including the unidirectional valves should be disinfected regularly.

#### 4.4.5. Ventilator Circuits and Bellows

These items should be cleaned and disinfected regularly.

#### 4.4.6. Anaesthetic Machine

Routine sterilisation or high-level disinfection of the internal machinery of anaesthetic machines is considered unnecessary.

#### 4.4.7. 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.

#### 4.4.8. Surfaces and monitors

The surface of the anaesthetic machine and monitoring equipment should be cleaned between patients 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. Item such as temperature probes used on patient surfaces should get high level disinfection and those items intended for single use should follow

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manufacturer's recommendations. Touch screens and control knobs should also be cleaned.

#### 4.5. Ultrasound probes

##### 4.5.1. Surface probes

**Non-critical use.** Following non-invasive procedures (for example, scanning over intact skin) the ultrasound transducer, following decontamination should be disinfected with a cloth soaked in alcohol based solution (either alcohol alone or alcohol combined with antiseptic).

**Semi-critical use.** For invasive procedures (for example, ultrasound guided nerve block or central venous catheterization), the probe and cable ideally should be covered with a long sterile sheath 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. Following use, the transducer cover 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. In this setting, decontamination includes removal of any gel remaining on the transducer and an alcohol soaked cloth should then be used to disinfect the probe.

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.

##### 4.5.2. 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 sterilization 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

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wiping over with water/ detergent or alcohol. It is important to ensure that manufacturer's instructions are strictly adhered to. Once sterilized, 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.

#### 4.6. Presentation of drugs for injection

Because of the potential for cross infection, the use of the contents of multiple dose vials and ampoules for more than one patient is not recommended except in a dispensing situation where different doses are drawn up before administration of first dose to a patient. Likewise it is recommended that any infusion should be prepared and used for one patient only.

#### 4.7. Patient Factors

In immunosuppressed or immune deficient patients to whom infection poses a particular threat, there may be reasons to apply more stringent practices than those outlined.

### **5. PREVENTION OF INFECTION OF HEALTH CARE WORKERS**

5.1. Health care workers are recommended to follow the standard precautions. They should protect themselves from exposure to blood or body substances by wearing gloves, protective eyewear or face shields, masks, gowns and/or plastic aprons when there is potential for splashing, or splattering of blood or body substances.

5.2. Sharps must be handled with care at all times, disposed of safely immediately following use and not be resheathed, bent, broken or manipulated by hand. The same also applied to drug ampoules made of glass, which may produce sharp edges and cause skin injuries to the HCW during breaking open of the ampoule or afterwards.

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

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evaluation with particular reference to the risk of infection with human immunodeficiency virus, hepatitis B virus or hepatitis C virus. The local guidelines<sup>4</sup> 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 should be noted.

5.3. Vaccinations recommendations, include those against HBV, seasonal influenza guidelines from CHP, Department of Health, Hong Kong<sup>5,6</sup> should be taken notice of.

5.4. Healthcare workers are required to put on appropriate Personal Protection Equipment (PPE) (e.g. N95, face shield, gloves, and water resistant apron) for their own protection in the handling of patients with infectious risk. Particular attention is to be paid to patients with airborne infections, such as open pulmonary tuberculosis, influenza (including avian, human or swine) or SARS pneumonia.

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