PG28BP Guideline on infection prevention and control in anaesthesia Background Paper 2025

Short title: Infection prevention and control BP

1. Purpose of review

This document, last reviewed in 2015, is being updated to incorporate recent evidence, clinical practice changes, and emerging environmental sustainability considerations that have become increasingly relevant to our field.

2. Scope

The principles contained within this guideline are intended to apply in all areas where anaesthesia, regional analgesia and sedation are administered including operating theatre suites, endoscopy units, radiology suites, intensive care units, labour and delivery areas, and interventional pain medicine procedures areas.

3. Background

Minimisation of the risks of infection plays a critical role in patient outcomes. Consequently, infection prevention and control aimed at minimising risks of infection related to anaesthesia practice is a significant contributory factor to patient safety.

During the evolution of infection control procedures, recommendations were made to cater for high-risk situations. However, as it became clear that many risks were unpredictable or unidentifiable, it was recommended that these procedures be adopted as routine practice and so are now established as “standard” precautions.

The goal of this document is to provide guidance for developing and implementing evidence-based strategies and protocols to minimise infection transmission risks in anaesthesia settings.

4. Literature and Evidence Search

The ANZCA Environmental Sustainability Network conducted a literature review and provided a detailed report to inform the document development group (DDG). Members of the DDG provided broad review as well as literature evidence in areas of their expertise. Current reviews and guidelines were evaluated from established bodies including the National Health and Medical Research Council (NHMRC), the Australian Commission on Safety and Quality in Health Care (ACSQHC), the New Zealand Te Tāhū Hauora Health Quality and Safety Commission, the American Society of Regional Anaesthesia (ASRA) and the Association of Anaesthetists (AA UK). Other standard and guideline recommending resources included Standards Australia and the Australian College of Perioperative Nurses (ACORN). Submissions and enquiries received by the college since PG28 was last revised were also considered.

5. Discussion of issues

In view of the specialised nature of infection prevention and control the DDG received ANZCA Safety and Quality committee approval to include in the DDG members who had specific expertise in infectious diseases, anaesthesia, pain medicine, perioperative nursing and sustainability.

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The basic principles applied to this guideline revolve around the two areas for potential infection in the setting of anaesthesia practice, consisting of healthcare associated infections and anaesthesia equipment related infections.

Details of disinfection and sterilisation are beyond the scope of this document and readers are directed to the relevant standards such as Australian Standard *AS 5369:2023 Reprocessing of reusable medical devices and other devices in health and non-health related facilities* (also accepted by HealthCERT New Zealand) for further information.

"Standard" precautions and hand hygiene are the two most important measures to protect workers and patients, respectively.

5.1 Hand hygiene in the anaesthesia environment.

The importance of effective hand hygiene by anaesthetists cannot be overstated.[1] Implementation is supported by the National Hand Hygiene Initiative (NHHI) from the ACSQHC.[2] However, many activities in the operating room do not fit into the WHO '5-moments' cycle, resulting in low compliance when monitored.[3, 4] Examples include during induction which may require moving from airway manipulation or instrumentation to ventilatory support to adjusting infusion pumps or the anaesthesia machine.[1] Strategies to improve safe practice and adherence include ready access to alcohol-based hand rubs (ABHR), timely removal of contaminated gloves, and even double-gloving during known contamination-prone procedures such as intubation. Any strategy should be targeted towards minimising over-use of non-sterile disposable gloves when non-contaminating activities are undertaken.[5]

It should be noted that alcohol-based hand rubs do not kill spores, such as *C. difficile*, or remove soil, which contains embedded microorganisms, therefore it is recommended that you use soap and water to remove spores or after using the toilet.

'Gloves off' campaigns have demonstrated benefits to staff and patients, including improved staff understanding and hand hygiene compliance rates, reduced glove purchasing, cost, carbon footprint and waste.[6]

5.2 Surgical Hand scrubbing.

5.2.1 Alcohol-based hand rubs (ABHR) with chlorhexidine components have evidence for at least non-inferior efficacy[7] and lower environmental impact than soap and water in terms of water per use and need for ancillary items such as sterile towels, scrub brushes and picks. In Australia in particular, water-saving practices may be of value.[8]

5.2.1.1 For maximum efficacy of ABHR surgical hand rubs, local protocols usually indicate that:

- Non-medicated soap and water be used for the first wash of the day to eliminate bacterial spores
- Hands be completely dried before applying hand rub as its activity may be impaired, and a sterile towel is not required for this

5.2.1.2 ABHR application technique is sometimes considered more prone to error compared to soap, possibly due to its transparent nature, however this is thought to improve with education and learning effects.

5.3 Theatre caps, face masks and overshoes

Reusable theatre caps are encouraged, and their use is supported by a number of organisations. They provide additional advantages such as personalisation and communication by labelling with staff name and role. Further information is available in an ANZCA Library Guide.[9-11] If reusable

theatre caps are not washed using hospital laundry facilities, then a hot machine wash with detergent is recommended.

It has been recommended that staff not actively engaged in an aseptic procedure in the operating room wear a splash-resistant mask appropriate to the risk of contamination, in particular to reduce the risk of microorganisms issued from the oropharynx or the nose.[10] Many operating suites apply principles similar to those of ACORN which state that face masks should be worn during procedures, when proximal to open sterile or aseptic clinical supplies, and when there is a risk of blood or body fluid splash.[11]

The use of Powered Air Purifying Respirators (PAPR) may be considered for caring for patients on Airborne precautions for extended periods, but users must be educated and deemed competent in its use and maintenance.

Dedicated shoes for use in theatre areas should be used, or overshoes if required. The use of overshoes is less preferable because of cost, waste, and hand contamination on placement and removal.[12] There is limited evidence that plastic overshoes do not reduce bacterial colony counts of theatre floors compared to 'street' shoes provided floors are cleaned regularly.[10, 13]

5.4 Theatre traffic and airflow

There is evidence that traffic flow has a strong negative impact on the OR environment, and door openings should be minimised as they disrupt airflow.[12, 14] Although the United States Centre for Disease Control provides useful information and specifies minimum requirements for air exchanges per hour[15], the Australasian Health Infrastructure Alliance (AHIA) recommends a minimum of 20 air exchanges per hour, based on designed to AS1668.2.[16]

The AHIA suggests that for non-24-hour operating suites, implementing a setback mode when not in use can provide significant energy savings, however consideration must be given where emergency access is required.[16]

5.5 Breathing circuits.

The duration of use of anaesthetic breathing circuits varies between countries, with the German Society of Anesthesiologists for example recommending that one week's use is suitable.[17] There is now good evidence that breathing circuits can be safely used for up to 7 days.[17-19] Practice guidelines and resources for 'disposable' and 'reusable' circuits have been published.[20] The exceptions to re-use should be carefully followed and in all cases it is vital to use unique breathing Heat Moisture Exchange (HME) filters for each patient.

5.6 Other precautionary measures:

Avoiding hypothermia [21, 22]

Antibiotic prophylaxis – guidelines include the Therapeutic Guidelines (available through the ANZCA library here).[23]

Prophylactic steroids. The results of the PADDI study (8725 patients) demonstrated no difference in surgical site infections in patients receiving dexamethasone for anti-emesis (4 or 8 mg) versus placebo. This was similar for diabetic patients.[24]

Blood transfusion thresholds. A meta-analysis of hospital associated infections identified a lower rate overall with restrictive versus liberal transfusion thresholds (medical and surgical), and in particular in orthopaedic surgery (RR 0.72 (95%CI, 0.53-0.97)).[25] In cardiac surgery, no difference in hospital associated infections or surgical site infections was identified.[25, 26]

5.7 Ultrasound

5.7.1 With the expanding use of ultrasound in anaesthesia for vascular access, regional analgesia and transoesophageal echocardiography, this guideline addresses specific measures for both techniques and equipment. Special attention is given to recommendations for proper handling and disinfection of ultrasound transducers.

5.7.2 Ultrasonography by anaesthetists presents distinct infection control challenges as these devices frequently move between operating room and, in some cases, between different healthcare facilities when practitioners transport their personal equipment. This mobility creates potential pathways for cross-contamination. Recognising this risk, healthcare organisations worldwide have implemented policies and guidelines relating to the prevention and control of infection in ultrasonography. For example, in Australia the Australasian Society for Ultrasound in Medicine and National Health and Medical Research Council have issued guidance. Their recommendations are based on Spaulding's classification.[27]

5.7.3 Ultrasound equipment can be categorised into non-critical (contact only with intact skin), semi-critical (contact with mucous membranes or non-intact skin) and critical (contact with internal organs or body cavities). Policies state that medical equipment with critical and semi-critical exposure (transoesophageal and transrectal probes) require sterilisation or high-level disinfection (eg thorough cleaning followed by immersion in chlorine dioxide or ortho-phthalaldehyde and then rinsing, or using UV light sterilisation). Non-critical exposure requires only low-level disinfection (removal of ultrasound gel and then cleaning of the transducer). When using the transducer in a semi-critical or critical environment, a sterile protective probe cover (sheath) should be used and the transducer and cable can subsequently be managed as non-critical equipment.[28] This in obviates the need for high level disinfection unless an inadvertent sheath breach occurs, potentially resulting in probe contamination. This may occur for example if a needle penetrates the sheath during a regional block or percutaneous vascular access.

5.7.4 General hygiene during scanning is of paramount importance and should include hand hygiene prior to applying gloves and commencing scanning.[28] When performing a percutaneous procedure a sterile probe cover should be used, as noted. Cross infection of the device keyboard is prevented by using a dedicated hand to interact with the keyboard or by using a disposable keyboard cover or by using an assistant. Gel contamination can be minimised by using single-use sterile gel sachets for all except non-critical uses, although single-use gel containers/packets are recommended even in non-critical applications. On completion of the procedure, the operator should remove the transducer cover (without contaminating it) and then his or her gloves. Gel and debris are removed from the probe with a dry towel and then the probe is cleaned with detergent-impregnated wipes or washed with soap and water. Application of a disinfectant spray/wipe to the probe can be considered (70 per cent isopropyl alcohol or 17.2 per cent isopropanol). Some manufacturers may recommend a non-alcohol based disinfectant. This cleaning process is an effective way of removing bacterial and preventing nosocomial infection. The ultrasound machine should be stored in a dry, clean room. If the probe has been contaminated with blood or body fluids high level disinfection should be performed.

5.7.5 While implementing these infection control recommendations requires investment in training and materials, this expenditure is significantly outweighed by the economic benefits of reducing healthcare-associated infections, which pose a substantial financial burden to healthcare systems globally .

5.7.6 The exact steps that should be taken to both protect the ultrasound transducer and cable and clean/sterilise it for use in a subsequent patient have been described in the literature.[29]

5.8 Regional anaesthesia

The DDG considered the infection prevention and control precautions for regional anaesthesia techniques in some depth. Detailed submissions were received from the Environmental Sustainability Network, as were a number of published sources including the American Society for Regional Anesthesia consensus practice infection control guidelines for regional anesthesia and pain medicine.[22, 30]

For single-shot regional and pain medicine techniques, there is not good evidence to support the mandatory use of a sterile gown in the context of an otherwise complete aseptic technique. None-the less, the proceduralist may elect to wear a sterile gown including in a teaching environment or where a long or difficult procedure is anticipated.

For catheter-based techniques, the DDG noted that the ASRA consensus guidelines suggest a sterile gown may not be needed if the anticipated duration of infusion is less than 4 days (Provenzano, Evidence grade B).[22] However, noting the uncertainty of duration of some catheter infusions, the fact that catheters are foreign bodies, the mobile nature of a catheter in a sterile field, and the consequences to the patient should an infection occur, the DDG maintains a recommendation for sterile gown use in addition to other aseptic precautions where catheters (or other implanted devices) are being placed. The use of a sterile gown in labour ward epidurals is recommended but remains controversial, with limited evidence for benefit, and wide variation in practice.[31, 32]

5.9 Chlorhexidine

5.9.1 Chlorhexidine has been encouraged as the antiseptic preparation of choice from the infection control perspective. The properties that make it highly effective are a strong affinity for binding to the skin, high antibacterial activity and a prolonged residual effect delaying bacterial re-growth. Compared with iodine preparations, chlorhexidine has a longer residual effect, is more effective at reducing bacterial skin counts and is less affected by body fluids.[33]

5.9.2 Although chlorhexidine in alcohol is the recommended skin preparation solution for most invasive procedures, it is neurotoxic, and so specific precautions must be taken with its use, especially in perineural and neuraxial procedures.[22, 34, 35] This includes allowing the skin surface to dry (which also maximises the effectiveness of the alcohol component), avoiding pooling, and not allowing chlorhexidine to contact the equipment prep area including needles, catheters and syringes. The recommended concentration of chlorhexidine in 70% alcohol-based skin preparation fluids is 0.5% to 2%.[33] Concentrations of 0.5% chlorhexidine in alcohol have been stated as preferred for perineural or neuraxial procedures, however 2% is an alternative, and is recommended for central line insertion and other percutaneous procedures.[12] A retrospective study found similar rates of neurological complications after spinal anaesthesia using chlorhexidine-based skin preparation solutions compared to other rates published in the literature.[36]

5.9.3 The flammability of alcohol-based skin preparation solutions must be kept in mind. Residual pooling of alcohol-based solutions or soaked drapes or hair must be avoided, especially when there is a nearby ignition source (eg diathermy) and supplemental oxygen.

5.9.4 The Australian and New Zealand Anaesthetic Allergy Group and ANZCA Anaesthetic Allergy Sub-committee have alerted ANZCA to the increasing incidence of significant allergic reactions to chlorhexidine, some of which have been delayed reactions occurring in the post anaesthesia care unit (see *PG69 Perioperative hypersensitivity reactions*). Consequently, this guideline provides for alternatives to chlorhexidine where relevant.

5.10 Antibiotics

5.10.1 The inclusion of the reference to perioperative antibiotics recognises that there is a subtle distinction between "prevention of infection" versus "prevention of transmission of infection" however, since postoperative wound infections do not only contain the patient's own bacteria, it was viewed that perioperative antibiotics may contribute to reducing transmission as well.

5.10.2 The view was expressed that references to compliance with local policy may detract from this guideline; however, the consensus was that local policies are invariably more stringent.

5.11 Ampoule splitting

5.11.1 The issue of "ampoule splitting" was considered, especially with respect to cost and waste. While this practice may not be uncommon, in addition to risks of contamination, the potential for error may be compounded. It was agreed that the College should not support practices that expose patients to increased risk. In an attempt to reconcile *PS64(G) Position statement on environmental sustainability in anaesthesia and pain medicine practice* and ANZCA professional document *PG51(A) Guideline for the safe management and use of medications in anaesthesia* guidance is provided where splitting of ampoules is undertaken (see PG51(A) item 5.5.6 and PG51(A)BP item 3.8).

5.11.2 Wastage of expensive medications is a burden on the community. However, the principle of dividing ampoules is unsustainable in the current clinical practice environment and potentially difficult to defend should contamination result in infection or cross-infection, or should mis-dosing occur. Contamination from the environment can occur during preparation and so the "shelf-life" of such syringes is usually limited to the day of preparation and unless the labelling is comprehensive (including the name of the preparer and date/time of preparation) use is limited to the preparer. The cost of some drugs has led many hospitals to have their pharmacies prepare sealed pre-filled syringes using fractions of ampoules. This is the ideal solution to the problem as strict labelling, laminar flow preparation and a long shelf-life means less wastage than dilutions made in the operating room which must be discarded, used or not, by the end of the day.

5.12 Single use equipment

5.12.1 Single use disposable equipment may be used again with the *same patient* during the same treatment episode, *provided they remain fit for purpose*. This applies for example to face masks, laryngoscope blades, tourniquets, and also syringes for drug administration provided that for the latter, sterility has been maintained, and they are otherwise uncontaminated.

Reusable (silicon) tourniquets have been advocated over single use items. There is conflicting evidence regarding their use, and if used, effective cleaning and disinfection practices must be applied.[37, 38]

5.12.2 In certain circumstances, reprocessing or the remanufacturing of 'non-critical medical device(s)' that are designated single-use may be approved where the reprocessor becomes the manufacturer of record. For example, calf compression sleeves and patient transfer mattresses. This should be clarified on a jurisdictional basis.

6. Summary

PG28 has been reviewed as part of ANZCA's role in supporting continuing improvement in patient safety. Infection prevention and control is a major contributory factor to patient outcomes and the goal of this revised document is to support implementation of uniform standards for infection control wherever anaesthesia, in its broadest sense, is administered. Practices that are sustainable and minimise environmental contamination and cost have been considered throughout.

In addition to ensuring that this document is consistent with contemporary knowledge, it also addresses issues related to the use of ultrasound.

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