

# ASEPTIC TECHNIQUE: A REVIEW OF THE LITERATURE

There is concern that aseptic technique is nothing more than ritual and that there is no clear standard. The introduction of the terms 'clean technique' and 'aseptic non-touch technique' may have contributed to confusion on what each procedure is and when it should be applied. This article explores the literature showing how aseptic technique has developed into clean technique, giving procedural steps accompanied by rationales.

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Humans have adapted over time to live in a microbially dominated world and developed the non-specific and specific immune systems required to cope with contamination by microorganisms. Sources of microbes for wound infection can be divided into endogenous and exogenous groups. The endogenous organisms already colonise the skin, orifices and cavities of the patient and their total on and in the body outnumber human cells by a factor of at least ten (Cooper, 2005). Microorganisms from beyond the patient's body, whether they are from another person, animals, equipment or the wider environment, are called exogenous organisms. Generally speaking, planned closed surgical wounds should be presumed to contain little or no contamination from either of these sources, but wounds healing by secondary intention will have a diverse colonisation of organisms, known as a bioburden. In these open wounds, if there is progression in the direction of healing, it is reasonable to presume that this bioburden is being kept in a suitably healthy balance by the immune system.



*Figure 1. Removing old dressing.*

Adding in further quantities of microbes or new species to any wound that is to heal open, or one that is to be closed, has the potential to alter this balance in favour of infection. Aseptic wound dressing techniques aim to prevent adding endogenous and exogenous microbes into the wound, whether or not it has a pre-existing bioburden, with the goal of preventing avoidable infection.

## **Aseptic technique**

This technique aims to produce an environment that is free of microbial contamination in order to protect patients from developing infections (Marcovitch, 2005). The development of the technique is attributed to the renowned

nineteenth century surgeon, Joseph Lister, through his use of carbolic acid (phenol) solution for the cleaning of surgical instruments and wounds. This idea was radical, given that at that time the germ theory, i.e. that microorganisms were the causative agents of infection, was in its infancy. Lister was influenced by the work of Louis Pasteur who was able to show that fermentation resulted from the presence of microbes and not oxygen, as was commonly thought to be the case until then. Lister also made surgeons wear clean gloves and use antiseptic solution as a handrub. In fact, the introduction of rubber surgical gloves stems from this time, although originally

reputedly for preventing contact dermatitis caused by the 5% carbolic solution.

Lister is considered a pioneer in infection control (Newsom, 2003), as he established the general principles of disinfected hands, instruments, surfaces and air, although his developments could be described as antiseptic, rather than aseptic as practised in operating theatres today, given the methods used to achieve his goals. The aseptic technique was developed in operating theatres, particularly in the Second World War (Bree-Williams and Waterman, 1996), and subsequently evolved through surgical practice where sterile body tissues need to be accessed through intact skin.

Asepsis aims to reduce to the minimum amount possible the introduction of microbes from any source into these sterile tissues, and it requires disinfecting the skin pre-incision, use of sterile instruments, antiseptic hand hygiene, sterile gloves, screening the operating site with sterile drapes, use of sterile clothing and clean air technology. The level of clothing and clean air required will vary depending on the nature of the surgery, with greater attention being paid where infection would cause a potentially disastrous outcome for the patient.

Common examples are the use of total body exhaust suits which completely enclose the operators preventing the natural shedding of their endogenous microorganisms over the patient, and laminar flow submicron filtered air systems to reduce bacterial air counts more effectively than conventional operating theatre set-ups for the

implantation of orthopaedic joints. Aseptic technique can thus be adjusted upwards when required to protect the patient in particularly vulnerable situations. Equally, it can be adjusted downwards, while still maintaining most of the key principles for greater practicality providing there is no real loss of safety when the risks of infection by a particular procedure and situation are less.

Wilson (2001) says that, 'The aseptic technique has become incorporated into nursing ritual and is often based more on tradition than on rational reason or research evidence.' Wilson (2001) advocated a clean technique suitable for suture removal, care of dry surgical wounds after 48 hours and the care of wounds healing by secondary intention, plus the dressing of intravenous lines, removal of drains, endotracheal suction and dressing tracheostomy sites. Her version of clean technique allows non-sterile gloves and tap water. Equally it should not be forgotten that aseptic technique is about prevention of contamination of healthcare personnel, equipment, and the wider environment from the patient's own colonising microbes, so the technique is a two-way infection control street. Bree-Williams and Waterman (1996), on the basis that nurses were unable to demonstrate practice uniformity, concluded that aseptic technique was complex and that it had become ritualistic, noting that simpler practices were easier, cheaper and not detrimental to patients. However, they decided that there was no evidence available at the time not to engage in aseptic technique for chronic wounds in hospital. Briggs

et al (1996) concluded that there were major gaps in the research on the application of aseptic technique in wound care, and this position appears not to have changed by the end of 2007.

The infection control *Winning Ways* document (Department of Health [DoH], 2003) says: 'No single factor explains the growth in the number of patients who acquire infections during the course of their treatment and care by the NHS or other healthcare systems around the world...Some are behavioural — poor compliance with handwashing and other hygienic practices by health staff.' This latter comment may be what Preston (2005) refers to in the statement: 'The fact there is a relationship between the standards of aseptic technique performance and rise in hospital infection rates has been suggested by the Department of Health *Winning Ways* document'. However, aseptic technique here refers to application in multiple types of procedures not just for wound care, and, in fact, the DoH (2003) do not make the link explicit in their document. They do, though, specify the use of strict aseptic technique when dealing with urinary and intravenous catheters. The DoH (2003) go on to include unhygienic wound care in the post-operative period as one of the main sources of surgical site infection, but do not provide any supporting evidence for this statement. In their subsequent *Saving Lives* action plan document (DoH, 2007), the specified interventions to prevent surgical site infection give no instruction for the post-operative period and do not mention aseptic technique at all in relation to post-operative surgical wound care. There is a general

requirement to demonstrate consistently high standards of aseptic technique but nothing is made specific for wound care interventions.

In the past, community nurses have been uncertain of what could be achieved in terms of infection control by the use of aseptic technique in community settings (Hallett, 2000). The DoH (2006) document *Essential Steps to Safe Clean Care* does provide at least some guidance: 'A clean and safe (aseptic/aseptic non-touch) technique as appropriate: sterile equipment should be used; staff should always wear apron and sterile gloves for invasive devices and wound care (as appropriate)'. This advice though is clearly ambiguous and the term 'aseptic/aseptic non-touch' is not defined, thus it could be argued that there may be something in the assertion made by Preston (2005) that the widely used clean technique confuses the aseptic theory-practice gap.

Hart (2007) says that aseptic technique is divided into two processes called surgical aseptic technique and aseptic non-touch technique (ANTT), both processes aiming for the same objectives with the differences taking into account the location and procedure being undertaken. Aseptic non-touch technique is emphasised for many hospital and community procedures that do not require a surgical aseptic technique, such as administration of intravenous drugs and wound care (Hart, 2007). However, Hart (2007) does cause some confusion by introducing another term 'clean non-touch technique' for which boxed clean gloves are apparently

suitable except for surgical wound dressings. The term 'clean non-touch technique' is not defined and so it is unclear if this is the same as ANTT. The steps of a general rather than specific wound care ANTT procedure are given with the only apparent difference to a full aseptic technique as described by Dougherty and Lister (2004) in *The Royal Marsden Hospital Manual of Clinical Nursing Procedures* appearing to be that a choice is given to the operator to 'put on the sterile or boxed clean gloves as appropriate'.

**Clean technique aims primarily to avoid the further introduction of wound infection pathogens from exogenous sources, such as the healthcare worker's hands and clothing and the equipment that they use.**

Clean means free from dirt, unsoiled, and unstained (Anon, 2007). In the infection control context cleaning comes under the umbrella of decontamination. Cleaning is the first level of decontamination and may be sufficient on its own for certain items. The higher levels of decontamination are disinfection and sterilisation, for which cleaning remains an essential prerequisite (Finn, 2000). Parker (2000) explains that the aseptic method is frequently mentioned in the literature and is considered the standard recommended practice, but clean technique is becoming advocated as an alternative approach for certain wounds and involves use of non-sterile gloves and tap water. The term 'clean technique' is applied to a

less strict version of the operating theatre-based discipline of aseptic (also known as sterile technique [Doughty, 2001]) technique used for situations where the latter is unachievable, impractical or is unlikely to achieve any greater degree of safety for the patient. However, clean technique remains a rigorous infection control exercise, it just accepts that open wounds healing by secondary intention, such as pressure and leg ulcers already contain an established bioburden sourced from the patient's endogenous flora and potentially from their immediate living environment. Clean technique aims primarily to avoid the further introduction of wound infection pathogens from exogenous sources, such as the healthcare worker's hands and clothing and the equipment that they use.

### Evidence

Evidence surrounding key components of aseptic and clean technique for wound dressing, such as glove and irrigant sterility, is limited. One review concluded there was lack of evidence to justify a change in practice from sterile to non-sterile gloves for post-operative dressing changes (St Clair and Larrabee, 2002) but, in general, authors tend to leave conclusions about how to proceed in clinical practice open for interpretation. A systematic review by Fernandez et al (2002) acknowledged that although tap water was commonly used in the community because of its accessibility, efficiency and cost-effectiveness, an unresolved debate over its use remained. They found one trial providing limited evidence that tap water for acute wound cleansing reduced infection rates, but could find no outcome

differences in the literature they had reviewed for infection rates and wound healing for chronic wounds cleaned with tap water or saline. Equally interesting was their conclusion that tap water cleansing was no more beneficial than not cleansing at all in infection rate terms, however, this conclusion does not account for the other valuable aspects of cleaning such as odour reduction and reduction of irritation on surrounding skin that would apply to many open wounds on which this element of practice is applied.

Moore and Cowman (2005) found insufficient evidence in their review to recommend any particular wound cleansing solution or technique for pressure ulcers. Systematic review by the Joanna Briggs Institute (2006) gave support, although qualified by certain caveats, to the use of tap water. Reviews by Towler (2001) and Whaley (2004) concluded that tap water irrigation appeared not to increase wound infection risks over sterile normal saline in traumatic wounds, as did research by Bansal et al (2002) and Valente et al (2003) for lacerations in children, and a review by Hall (2007) for irrigation of acute traumatic wounds in the community.

A double blind randomised controlled trial examined the safety of tap water for acute and chronic wound irrigation in the community and again found no evidence of difference in healing rates or infection outcomes between water and sterile normal saline groups (Griffiths et al, 2001). A pilot study by Bansal et al (2002) randomised 46 children with lacerations into two groups and found that tap water did not result in the growth

of unusual microorganisms or increased colony counts. A recent multi-centre prospective randomised trial on 634 patients found no evidence of difference in infection rates in simple acute lacerations when saline or tap water were the irrigants, which supports the results from other smaller single institution studies (Moscati et al, 2007).

Lawson et al (2003) observed inconsistencies in the care of acute surgical wounds left open to heal which prompted them to study infection rates after implementing a standardised clean wound care technique. However, little information on the technique was specified except to report that clean reusable scissors and clean gloves were used, and that a sterile bowl was not used. The non-sterile wound care procedure used for these secondary healing wounds did not change any outcomes over those achieved prior to the technique standardisation, except the lowering of costs. As a result of the study, clean technique was adopted into policies and procedures for open surgical wound care. Stotts et al (1997) ran a small pilot study that randomised 30 patients with gastrointestinal surgery wounds left open to heal by secondary intention and found those receiving clean rather than sterile dressings produced lower costs without impacting on the healing rate. Clean technique was described as medical asepsis with clean supplies, which is not specific enough for replication in practice, but standardisation of technique was assured for the study by observed practice using a checklist. Perelman et al (2004) conducted a multi-centre randomised controlled trial to

determine if use of non-sterile gloves for uncomplicated laceration repair affected the infection rate and found no difference in outcomes to closure with the use of sterile gloves. Rossoff et al (1993) found that non-sterile boxed gloves were microbiologically safe. On a different front, Chrintz et al (1989) investigated the need for post-operative dressing and found that removal on the first post-operative day did not affect infection rates and also facilitated personal hygiene, which means that tap water from showering, permissible from the first post-operative day, would have touched the undressed wounds. Heal et al (2006) explored whether allowing simple skin excision wounds to be left undressed and wetted in the first 48 hours made a difference and found none.

The majority of evidence for the aseptic or clean debate comes from acute traumatic injuries and post-operative surgical wounds, rather than directly from the care of pressure ulcers, leg ulcers and other open wounds on which the techniques are then widely applied. A valuable starting point for this continuing debate would be to specify the procedural differences between aseptic and clean techniques (*Table 1*), the latter being proposed for use specifically in wounds healing by secondary intention, traumatic wounds, and primary closed surgical wounds older than 24 hours. Clean techniques for other aspects of healthcare should be defined separately.

## Conclusion

In the absence of evidence to the contrary, clean technique for wound care of traumatic wounds,

Table 1

## Comparing aseptic and clean techniques

<b>Aseptic technique</b> (adapted from Dougherty and Lister, 2004, <i>Royal Marsden Manual of Clinical Nursing Procedures</i> )	<b>Aseptic rationale</b> (adapted/extended from Dougherty and Lister, 2004, <i>Royal Marsden Manual of Clinical Nursing Procedures</i> )	<b>Clean technique variance from aseptic version</b> (for use with wounds healing by secondary intention, traumatic wounds, and surgical wounds older than 24 hours)	<b>Clean rationale</b>
Explain procedure, check analgesia and toileting needs	Lower anxiety, improve comfort, control pain		
Handwash or use alcohol handrub/gel	Prevent cross-contamination		
Disinfect trolley with 70% alcohol wipe or chlorhexidine in 70% spirit with a paper towel	Ensure hygienic working surface	Find the cleanest surface that is dry and close to the patient on which to set out your sterile field such as a bedside table; or lay down clean plastic, such as a disposable apron, onto other less desirable surfaces on which to set out the sterile field; or use a dressing pack with a waterproof-backed sterile field	In the patient's home a suitable working surface may not be available or capable of being cleaned — measures are aimed at preventing microbial contamination of sterile field from wicking through from underlying surfaces in the event of the field being accidentally wetted from spillage of wound cleaning fluid during the procedure, or pre-existing dampness being present from the household surface under the field
Gather equipment, e.g. dressing pack, dressings, other equipment. If using a trolley, place all items on bottom shelf	Ensure uninterrupted procedure		
Put on disposable plastic apron (unless you are using a pack which contains one) and go to the patient	Prevent cross-contamination		
Position the patient, cover and screen by closing door or curtains	Position for access to wound, cover for warmth/dignity and screen for privacy		
Loosen dressing tapes or lift edges of self-adhesive dressing	Make it easier for subsequent removal of dressing	This step is not mandatory	For many situations in open wound care, dressings will be more complicated on removal, for example, involving bandages and tubing, and sometimes there may be gross contamination from faeces or exudate on the outer parts of the dressing requiring the healthcare worker to wear gloves for personal protection from contamination
Use alcohol handrub/gel	Prevent cross-contamination from microbes acquired during the last phase of care		
Check for damage of the dressing pack and use by date, open pack if satisfactory and spread out sterile field using the corners only (for apron containing packs apply the apron now)	Ensure pack sterility prior to use and prevent subsequent contamination of the main working part of the sterile field from the skin of the healthcare worker's hands		

Table 1

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Aseptic technique	Aseptic rationale	Clean technique variance from aseptic version	Clean rationale
Check pack integrity and use by dates of other required dressings and instruments and, if satisfactory, open packs by peeling apart and allowing them to fall untouched onto the middle of the sterile field without obscuring the waste bag packed at the top of the dressing pack contents	To ensure sterility of pack prior to use. To prevent contamination of dressings and instruments with microorganisms from the skin of the healthcare worker's hands		
Use alcohol handrub/gel	Disinfect hands that may have become contaminated by opening dressing containers and other packs	This step is not mandatory	Contamination from this source is likely to be minor and inconsequential, and further safety will be provided by the next hand-in-bag arrangement technique and subsequently enhanced by application of gloves for the wound care phase of the procedure
Pick up waste bag, put hand inside and arrange items on sterile field	Maintain sterility of field and arrange contents for convenience	Pick up waste bag, put hand inside and arrange items on sterile field, and with hand still in bag (and if required) grasp and fill container with tap water	Minimise contamination of field and arrange contents for convenience. Be ready to perform procedure uninterrupted. Tap water is convenient, cost-effective and safe for the wounds specified as suitable for this procedure
With hand still in bag remove old dressing (alternatively use sterile gloves from pack if use of bag is difficult for complex bandaging and dressings removal)	Prevent environmental contamination from soiled dressings	Miss out this step	Gloved hands will be used for this procedure later on
Invert and attach waste bag or place conveniently for waste disposal, so that soiled swabs and dressings are not taken across the sterile field	Convenient containment of soiled materials and prevention of contamination of sterile field		
Fill tray or gallipot with suitable sterile cleaning fluid — disinfect sachet tear strip or ampoule twist with alcohol wipe before opening	To minimise the risk of contamination of the lotion	If a larger volume of tap water is required than can be provided by a container on the sterile field, for example, for leg/foot ulcer care, line a clean dry bucket with a clean plastic bag and fill sufficiently to complete the task	A large volume may be required for certain activities, and some wound dressing situations require removal of product in the bath or shower
Apply sterile gloves by picking up the first glove using the folded-over cuff and apply without touching the outer surface. Insert index and middle fingers of the gloved hand under the cuff of the second glove and put on without touching the skin with the gloved hand (if the pack's sterile gloves have already been used to remove old dressings open and wear a new pair of sterile gloves)	Prevent contamination of the sterile glove with skin micro-organisms	Apply sterile gloves from the pack and remove bandages and dressings (non-sterile gloves from a box may be applied as an alternative at this stage). Dispose old dressings to waste bag	Use of gloves provides greater dexterity than plastic waste bags when removing anything other than a simple self-adhesive dressing. Gloves, whether sterile or non-sterile, will perform the same safety functions for both patient and clinician in the wounds for which this procedure may be applied.
			On occasions, glove size in the pack will not be suitable or gloves may break when being put on requiring use of an additional pair and non-sterile gloves are acceptable

Table 1

Continued...

Aseptic technique	Aseptic rationale	Variance	Clean rationale
Clean and dress the wound as appropriate		Clean the wound surface and surrounding skin gently if there is exudate, slough, unattached necrotic tissue, faecal or other detrimental body fluid contamination, or residual dressing product to remove. Change gloves if visibly soiled with blood or body fluids and redress the wound	Remove factors detrimental for healing without harming the wound bed. For cases where there is gross blood or body fluid contamination that visibly soils the gloves during dressing removal, the gloves must be changed to prevent transfer of this contamination to the outer aspect of the new dressings from where that contamination could be transferred into the wider environment. Glove changing will also ensure that body fluids will not interfere with adhesion of the new dressing
Remove gloves without contaminating skin with outer used glove surface and drop into waste bag	Prevent environmental contamination and contamination of healthcare worker's skin from soiled gloves		
Check patient is comfortable and draw back curtains. Dispose of sharps to sharps bin, repack and return re-usables to sterile supply department, fold up field and remaining disposable contents into bag, tie and discard to relevant waste stream depending on location. If trolley remained clean and dry during the procedure return it to storage, but if not, wash and dry it first with detergent and water and dry with paper towel	Prevent sharps injury, environmental contamination and reprocesses instruments ready for the next usage		
Wash hands or use alcohol rub/gel	Prevent cross-contamination to next client/patient		

wounds healing by secondary intention and closed surgical wounds older than 24 hours is a legitimate procedure. It is part of the spectrum of aseptic practice used in different healthcare settings. Clean technique is a considered approach and not just poor practice, as it balances achieving maximum safety for the patient with what is microbiologically achievable in the practice setting, while at the organisational level making it practical and cost-effective to apply. Specifying what is clean technique and when it can be used will also prevent confusion for clinicians and patients by keeping consistent practice when undertaking wound

cleansing and personal hygiene activities in a bath or shower or when doing wound care at the bedside. **WE**

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## Key Points

- ▶ Sources of microbes for wound infection can be divided into endogenous and exogenous groups.
- ▶ Aseptic technique aims to produce an environment that is free of microbial contamination in order to protect patients from developing infections (Marcovitch, 2005).
- ▶ Cleaning is the first level of decontamination and may be sufficient on its own for certain items.
- ▶ Parker (2000) explains that the aseptic method is frequently mentioned in the literature and is considered the standard recommended practice, but clean technique is becoming advocated as an alternative approach for certain wounds and involves use of non-sterile gloves and tap water.
- ▶ Clean technique is a considered approach and not just poor practice, as it balances achieving maximum safety for the patient with what is microbiologically achievable in the practice setting.

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