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Review
Infection prevention

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In this article...

- The importance of asepsis to prevent healthcare-associated infections
- Difference between medical and surgical asepsis
- The underpinning principles of asepsis

Principles of asepsis 1: the rationale for using aseptic technique



Key points

The term asepsis means the absence of potentially pathogenic micro-organisms

Aseptic technique is used to achieve asepsis in order to prevent the transfer of potentially pathogenic micro-organisms to a susceptible site

Medical asepsis aims to reduce the number of organisms and prevent their spread by use of standard principles of infection prevention

An aseptic technique is required for many clinical interventions including wound dressing, peripheral cannula or other vascular access device insertion

Prevention of infection can help to reduce the requirement for antimicrobial prescribing

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Abstract Aseptic technique is a core competency for many nurses. This article, the first in a two-part series, describes the principles of asepsis and part 2 will describe the procedure for changing a simple wound dressing.

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It is estimated that 300,000 patients each year in England will develop a healthcare-associated infection (HCAI) (National Institute for Health and Care Excellence, 2012). These infections are more likely to occur in patients with invasive devices, such as peripheral canulas, vascular access devices or urinary catheters in situ, or after invasive procedures (NICE, 2012).

To reduce patients' risk of developing a HCAI, it is vital to prevent the transmission of micro-organisms between staff and patients when undertaking any invasive procedure (Loveday et al, 2014); this can be achieved by asepsis. The term asepsis means "the absence of potentially pathogenic micro-organisms" (Loveday et al, 2014). It could be suggested that understanding the principles of asepsis goes back as far as Florence Nightingale, who made the links between good hand hygiene and reduction in wound infections in 1855 (Rowley et al, 2010). Indeed, as far back as the mid-1800s, the association between good hand hygiene and reduced infection rates was identified by Ignaz Semmelweis (Wilson, 2019). With the increased focus on antimicrobial resistance (AMR) there is also a need to carefully consider antibiotic usage, and prevention of infection can help to reduce the need for antimicrobials in the first place (HM Government, 2019).

What is asepsis?

Aseptic technique is a process or procedure used to achieve asepsis to prevent the transfer of potentially pathogenic micro-organisms to a susceptible site that may result in the development of infection (Wilson, 2019). An aseptic technique is required for many clinical interventions including wound dressing and insertion of invasive devices, as well as the maintenance of these devices (Loveday et al, 2014). Healthcare workers who perform an aseptic technique should receive training in how to correctly perform the procedure; this should include a competency assessment (Loveday et al, 2014).

A variety of terms are used to refer to aseptic technique; this can be confusing for frontline healthcare staff (Loveday et al, 2014). Medical asepsis – sometimes referred to as standard aseptic technique (Association of Safe Aseptic Practice, 2015) – aims to reduce the number of organisms and prevents their spread by use of standard principles of infection prevention (Loveday et al, 2014). Surgical asepsis includes procedures to eliminate, rather than reduce, micro-organisms from an area and is practised by surgical teams and nurses in operating theatres and procedure areas, including interventional radiology (NICE, 2012). The term 'clean

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technique' is often used to describe the procedure for dressing chronic wounds; it includes hand hygiene, preparation of a clean area with use of clean gloves and sterile instruments, such as scissors and forceps (Wound, Ostomy and Continence Nursing Society, 2012). A 'clean technique' can be classed as medical asepsis or standard aseptic technique, as it uses the same principles.

Rowley et al (2010) recognised the need for a systematic and robust approach to aseptic technique that aims to prevent the contamination of wounds or other susceptible sites by removing variation in practice (Rowley et al, 2010). The ANTT® (aseptic non-touch technique) framework was developed to provide consistent step-by-step guidance for an aseptic non-touch technique that can be applied to several invasive procedures, including insertion of urinary catheters and peripheral cannulas, phlebotomy and administration of intravenous drugs (Box 1) (Rowley et al, 2010). It provides a comprehensive set of principles including ANTT, which aims to achieve surgical asepsis; the ANTT approach is widely used in hospitals and community settings (NICE, 2012).

Principles of asepsis

The fundamental principle of an aseptic technique/ANTT incorporates protecting key elements of the equipment that should remain free from micro-organisms, for example, the inside of a sterile dressing or the barrel of a sterile needle (NICE, 2012). These 'key parts' or 'key sites' are crucial components of any invasive procedure. If they become contaminated, this can result in the patient acquiring a preventable infection. Key parts are defined as the parts of the equipment used in the procedure that come into direct or indirect contact with another key part or site. Key sites are defined as open wounds, including insertion sites and puncture sites. Both key parts and key sites always need to be protected (Rowley et al, 2010), which can be achieved by not touching the key part and by using caps and covers, such as the sterile wrapper of a syringe to protect the key part of the syringe before use.

Risk assessment before the procedure will direct the practitioner as to whether the key parts and key sites can be protected by non-touch or whether the procedure will require the use of sterile gloves, such as for the insertion of a urinary catheter or for taking blood when the re-palpation of the puncture site is required (ASAP, 2015).

Medical asepsis can be used in procedures that:

- Are considered technically simple;
- Are short in duration (usually less than 20 minutes);
- Involve small sites such as puncture sites;
- Have a minimal numbers of key parts (usually considered to be less than five although there is no evidence to support this).

Surgical aseptic technique should be used when procedures are technically complex and invasive, involve extended procedure time (more than 20 minutes) or a large, open key site and large or numerous key parts. The main aseptic field needs to be managed as a critical aseptic field (a controlled working space that ensures asepsis by providing protection from the procedure environment – typically by using a sterilised drape), using sterile gloves and often with full barrier precautions to include sterile gown, mask and cap (ASAP, 2015). For the purpose of this article all references to aseptic technique refer to medical/standard aseptic technique.

Box 1. Examples of when to use a medical aseptic technique

- Dressing a leg ulcer
- Dressing a surgical wound
- Inserting a peripheral cannula
- Redressing of vascular access devices
- Venepuncture
- Inserting a urinary catheter
- Administrating intravenous drugs
- Administrating of enteral feeds

Stages of medical aseptic technique

Hand hygiene

There are a number of stages and principles for aseptic technique (Table 1); the fundamental initial stage is hand hygiene, which must be performed before any aseptic technique (World Health Organization, 2019; Loveday et al, 2014). Hands can be decontaminated by washing with soap and water or by use of alcohol-based handrub (Loveday et al, 2014). Hand hygiene must be performed before preparation of the sterile equipment to avoid contamination of the equipment, and may need to be repeated immediately before the procedure if the hands have become contaminated (Loveday et al, 2014). It must also be performed after the procedure (WHO, 2019).

Storage of equipment

All sterile equipment should be stored in a clean and dry environment (National Health and Medical Research Council, 2019). The sterile packages should not be allowed to become wet or damaged as this affects the sterility of the equipment inside. Ideally the equipment should be kept out of direct sunlight as this could also affect the packaging, as well as the quality of the sterile products of the equipment. It is also sensible to store the equipment in a manner that enables staff to locate it easily, preventing wasted time.

Preparing equipment

Preparation of aseptic technique equipment before performing a procedure should be done in a clean area. A suitable surface should be prepared, such as a dressing trolley or a procedure tray, by cleaning it with a detergent wipe or according to local policy (Loveday et al, 2014). Ideally, preparation should be undertaken far enough away from hand washbasins to prevent droplets from the sink outlet contaminating the prepared equipment (Centers for Disease Control and Prevention, 2019). Each sterile package should be inspected to ensure the packaging is still intact with no visible damage; the expiry date must be checked to ensure the equipment is still in date (Lloyd Jones, 2014). All equipment required should be gathered at this point and laid out in a manner to protect key parts using sterile packets, covers and caps (Rowley et al, 2010). Alternatively, a sterile field can be created using a sterile dressing pack (Lloyd Jones, 2014).

Consent

It is important to inform the patient before undertaking any procedure and to obtain consent, allowing time to explain the specific procedure and to help reduce any anxieties the patient may have (Royal College of Nursing, 2017). Where the patient has capacity, this can usually be done verbally and then documented in the patient's record (RCN, 2017). A best-interest decision may need to be made for a patient who is unable to give consent and this decision needs to be clearly documented in the patient's record (NHS, 2018).

Environment

The procedure should be carried out in a location that maintains the patient's privacy and dignity, such as a treatment room, at the bedside with the curtains drawn or in the patient's own home (Lloyd Jones, 2014). To reduce the risk from airborne dispersal of micro-organisms, the procedure area should be prepared by closing windows, turning off any fans that are in use and avoiding any bed making being undertaken in close proximity (Lloyd Jones, 2014).

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Table 1. **Principles of aseptic technique**

Action	Rationale
Hand hygiene	Remove transient micro-organisms from the hands
Safe storage of equipment	Prevent damage to the sterile equipment, preserve sterility of the equipment and prevent microbial contamination
Cleaning of the procedure trolley or tray	Reduce microbial contamination
Preparation of equipment	Prevent microbial contamination of sterile equipment
Personal protective equipment (PPE)	Aprons provide protection from potential contamination from the healthcare worker's (HCW) uniform and the procedure and also protects the HCW from potential contamination from the procedure Non-sterile gloves provide protection for the HCW from contamination from blood and body fluids that may contaminated the hands Sterile gloves protect key sites from potential microbial contamination from the HCW's hands
Preparation of the environment	Reduce microbial contamination during the procedure
Preparation of the patient	Gain informed consent and reduce anxiety
Waste disposal	Prevent contamination of the environment
Documentation	Provide essential communication and meet the standards in the NMC Code (2015)

Use of gloves and aprons

A clean disposable apron provides an ideal barrier between potentially contaminated uniforms and the procedure, reducing any contamination that may arise from the procedure. The decision as to whether single-use sterile or single-use non-sterile examination gloves should be worn, or whether gloves are required at all, should be based on a risk assessment (NHMRC, 2019; Loveday et al, 2014). Single-use non-sterile gloves should be worn to protect the healthcare worker when there is a risk of contact with blood or body fluids during any procedure (Loveday et al, 2014). Where there is a risk that key parts or key sites cannot be protected, for example, during urinary catheter insertion, sterile gloves should be worn (NHMRC, 2019; Rowley et al, 2010). It is important to remember that the single-use gloves, whether sterile or non-sterile, should be applied immediately before beginning the procedure; applying them before this point is likely to contaminate sterile gloves and/or prevent an opportunity for hand hygiene (NICE, 2012).

Maintaining a sterile field

During the procedure, the sterile field needs to be maintained; this can be achieved by careful opening of the sterile packets to avoid contamination of the sterile equipment and the sterile surfaces of the inside packaging. If a sterile dressing pack is being used, care should be taken to ensure that only the corners are used when opening out the sterile field. Carefully open any other sterile equipment and gently place it onto the sterile field, avoiding any contamination of the sterile surfaces of the equipment (Lloyd Jones, 2014).

Equipment disposal

At the end of the procedure, all waste must be disposed of in the appropriate waste stream bin, such as a healthcare waste bin. Sharps, including needles, suture cutters, scissors and blades must be disposed of at the point of use in an approved sharps container (Loveday et al, 2014). The remaining waste, including aprons and gloves, should be disposed of according to local policy (Loveday et al, 2014). When all the waste has been disposed of safely and apron and gloves, if worn, have been removed hands should be decontaminated (Loveday et al, 2014). Once you have clean hands, the procedure should be clearly documented in the patient's records (Nursing and Midwifery Council, 2018).

Conclusion

Asepsis is an essential component of infection prevention and control practice to protect patients from potential HCAIs (Loveday et al, 2014). All steps in a non-touch aseptic technique should be seen as an opportunity to reduce the transfer of pathogenic organisms. Healthcare workers should be educated and trained in an aseptic technique that should include competency assessment (Loveday et al, 2014) and should be considered a core competency for many nurses. NICE guidance (2012) suggests that the ANTT framework provides a possible approach to standardised aseptic technique removing ambiguity and variance that allows a process for audit and assurance. It is vitally important that nurses understand the principles of asepsis, and the ANTT framework may provide a way of implementing the principles. **NT**

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