



UKCC categories: Practice development and Reducing risk

Gladys Xavier RGN, Cert. Infection Control Nursing, Dip N, BSc(Hons), is Public Health Infection Control Nurse Specialist, Redbridge and Waltham Forest Health Authority.

# Asepsis

Article 495. Xavier G (1999) Asepsis. *Nursing Standard*. 13, 36, 49-53.

In this article Gladys Xavier describes the concept of asepsis and its application in nursing practice, to reduce infections in hospitals.

## Aims and intended learning outcomes

The aim of this article is to update nurses' knowledge in the principles that underpin asepsis and explore this concept in the prevention of infections in various healthcare settings. This article also attempts to raise nurses' awareness to assess individual patients' infection risk and to plan appropriate nursing care. After reading this article you should be able to:

- Define asepsis.
- Outline the infection risk of patients you encounter.
- Understand the rationale for the various methods taken to prevent infections.
- Differentiate between aseptic techniques and clean techniques.
- Analyse your own nursing practice in preventing infections in your area.

## Introduction

Asepsis is the prevention of microbial contamination of living tissue/fluid or sterile materials by excluding, removing or killing micro-organisms. The fundamental principle of asepsis is to prevent sepsis. Sepsis is defined as a toxic condition resulting from the multiplication of pathogenic bacteria and their products, or as a state of poisoning of tissues, or the bloodstream, carried by bacteria (Pritchard and Mallett 1992).

An infection is the result of interaction between two things, a host and a parasite. Aseptic technique is a collective term for methods used to bring about asepsis. The aim of any aseptic technique used is to prevent the spread of infection to susceptible patients' sites, by direct or indirect means. Although the principles of asepsis remain the same, the components of the technique will vary depending on the degree of risk. The prevention methods used for orthopaedic surgery will obviously be different for those used for dressing a recent surgical wound.

Within a healthcare setting, the following methods are used to prevent infection depending on the degree of risk:

- The use of antiseptics – chemical solutions which will reduce and prevent growth of some micro-organisms on skin.

- Cleaning – physical removal of soil and organic material from items/objects.
- Disinfection – removal of harmful micro-organisms, but not bacterial spores.
- Sterilisation – the complete destruction or removal of all living micro-organisms, including bacterial spores.

## Hospital-acquired infection

A significant number of patients acquire some type of infection during their stay in hospital, which is directly related to contamination at the time of their stay in hospital. This was confirmed by the recent report on Hospital-acquired Infection: Surveillance, Policies and Practice (Glynn *et al* 1997). This report was based on an audit project which examined hospital activities designed to control hospital acquired infections. During the course of this project, it became apparent that there was a need for some general accepted guidelines on the prevention of hospital-acquired infections.

Infections are generally classified by their site, for example, wound, urinary tract, enteric. It is important to remember that if a patient acquires an infection, it is likely to cause emotional as well as physical distress. For example, source isolation can be a frightening experience and it can have many negative psychological effects (Knowles 1993).

Many patients are admitted to hospital because they are suffering from an infectious disease and may then be the source of infection to others. This risk can be reduced by taking appropriate control measures: for example, handwashing or wearing appropriate protective clothing.

About one third of infections in hospitals are acquired in hospital and about 9 per cent of the hospital population have a nosocomial (hospital acquired) infection at any one time. Of these infections (Emmerson *et al* 1996):

- 23 per cent are urinary tract infections.
- 22 per cent are lower respiratory tract infections.
- 10 per cent are surgical wound infections.
- 9 per cent are skin infections.

Nosocomial infections and outbreaks are expensive, as well as being disruptive to patient care. It should

## key words

- Infection control
- Health promotion

These key words are based on subject headings from the British Nursing Index. This article has been subject to double-blind review.

be part of the nursing care plan to assess the infection risk of each individual patient. Risk assessment is a measure of the probability of a person becoming infected. The immunological competence of the patient, the medical condition and the procedures which can reasonably be expected to be carried out during the hospital stay, need to be taken into consideration. The environment in which these procedures will be carried out, and other individuals who will share the environment with the patient, are also at risk. Most hospital infections occur because the patients are exposed to micro-organisms when particularly vulnerable.

#### TIME OUT 1

Consider the infection risk of an 85-year-old woman admitted to an orthopaedic ward for a total hip replacement. Before reading any further, write down an infection risk assessment plan for this patient and refer to this when you have finished the article.



#### Assessment of infection risk

Some patients are more vulnerable to infection than others. Immunology is complex and an individual's response to invading organisms can be influenced by a range of factors. The risk of infection is increased if a patient is immunocompromised by:

- Age – neonates and older people are more at risk due to their less efficient immune system.
- Underlying disease – patients with debilitating or malignant disease.
- Prior drug therapy – for example, use of immunosuppressive drugs or the use of broad spectrum antimicrobials.
- Patients – undergoing surgery or instrumentation.

Infection control practices need to be integrated into the nursing procedures of each hospital or department. This ensures that the problems of infection control identified in each clinical area are integrated into individual patients' care plans. The equipment and procedures used will vary from one department to another, and will need to be critically assessed to ensure that infection risks, which vary in relative importance, have been minimised. Methods should be sufficiently flexible to adapt to patient needs without increasing that risk.

#### Methods to prevent infections

Infection control procedures are governed by generalised guidelines or policy decisions that may be either: non-clinical – catering, linen, clinical waste; or clinical – policies for handwashing, or the use of protective clothing. Flexibility should allow policies to be adapted for individualised patient care as required.

In many cases, infection control measures appropriate to a clinical situation are straightforward. The scope of the infection control measures taken depends largely on the nature of the unit involved. It is known that different specialties are associated with different infection risks. Operating theatres, for example, have some of the most stringent infection control methods, in recognition of the susceptibility of people undergoing major invasive procedures.

#### TIME OUT 2

Write a care plan with infection control precautions required for a patient with methicillin-resistant *Staphylococcus aureus* (MRSA) nasal colonisation admitted to a long stay ward. Compare this with infection control precautions required for a patient in the intensive care unit with MRSA wound infection.



#### Techniques for invasive procedures

Correct aseptic technique is a long recognised method for preventing infection during invasive procedures. Aseptic technique applies to procedures such as urinary catheterisation, the insertion of vascular lines, and chest and peritoneal drains on the ward, as well as in operating theatres.

Urinary catheters are a source of considerable morbidity, accounting for a large number of nosocomial urinary tract infection (Emmerson *et al* 1996). The use of closed sterile drainage systems inserted and maintained with an aseptic technique has been shown to have distinct advantages in the reduction of infection rates.

Sterilisation is often described as a process designed to destroy all living things, so microbiological sterility is the total absence of microbes, parts of them or their products (pyrogens).

This definition of sterilisation breaks down because, in practice, absolute and total destruction, ultimately is unattainable (Kelsey 1972). This is also further confirmed in that the sterilisation process of an autoclave does not destroy the infective materials containing the agents of the spongiform encephalopathies of which Creutzfeldt-Jakob disease is a human variety (Meers *et al* 1997).

#### TIME OUT 3

Consider the difference between sterilisation and disinfection.



#### Principles of asepsis

Many procedures are undertaken using aseptic techniques – for example, catheterisation, tracheal

suction, and wound dressing. Usually this implies the use of sterile equipment, avoidance of direct contact with the susceptible site, and other measures to reduce the probability of introducing potential pathogens into a susceptible site. Procedures may vary from one hospital to another. Attempts are being made by health professionals to standardise their procedures. This also gives the flexibility for financial restraint and personal preference. The principle that underpins these standardised procedures should be justifiable and techniques should also be kept up to date, taking full account of recent, relevant research.

**Definition of an aseptic technique** Aseptic technique is a method used to prevent contamination of wounds and other susceptible sites by potentially pathogenic organisms. This can be achieved by ensuring that clinical staff understand the principles, follow the recommended protocols, and that only sterile equipment and fluids are used during invasive procedures.

An aseptic technique should be used during any invasive procedure which breaches the body's natural defences, for example the skin, mucous membranes, or when handling equipment which will enter a normally sterile area, such as urinary catheters or intravenous cannulae.

### Asepsis and wound care

Traditionally, nurses have used aseptic technique in wound care. However, recent research has raised the question of whether this practice has become ritualistic. (Hollingworth 1998). Ensuring effective infection control measures in wound care forms a significant part of nursing practice.

The use of an aseptic technique when changing a wound dressing is generally accepted, and is usually a standard recommended practice. However, some clinical staff suggest that a clean technique may be suitable in certain circumstances, for example, the dressing of a sutured wound (Meers *et al* 1997). However, the general consensus is that a sterile technique should be used to dress open wounds.

Contamination is most likely to occur in large open wounds in an environment of high activity where there are high numbers of airborne bacteria. It is, therefore, important that aseptic techniques should be carried out in a properly ventilated room.

If procedures are carried out at a patient's bedside in a multiply occupied room or open ward, the following general principles apply:

- The dressing trolley should be cleaned with detergent and water daily, and whenever it becomes physically contaminated. Alcohol wipes may be used between use.
- The sterile field will normally protect the trolley from contamination. Sticky tape residues should be removed from the trolley rails. These trolleys should not be used for other purposes.
- Ward cleaning and bedmaking should have ceased at least 30 minutes beforehand.
- Bed curtains should be closed at least ten minutes before the procedure.

- Wounds should be exposed for the shortest time possible.
- Dirty dressings must be placed into an impervious disposal bag, which is sealed before leaving the bedside.
- Clean wounds should be dressed before dirty wounds. Colostomies and infected wounds should be left until last.
- Air movement should be kept to a minimum with closed windows and reduced local activity.

### TIME OUT 4

Plan a general guideline on wound care for a patient admitted with an infected abdominal wound.



**Clean technique** A clean technique adopts the same control of infection principles to prevent the transmission of a pathogen, but clean (rather than sterile) single use gloves and/or tap water that is safe to drink may be used. A clean technique may be suitable in certain instances, for example the irrigation of chronic wounds (Morison 1992).

**Handwashing and asepsis** Handwashing is the single most important procedure in preventing infection, as hands have been shown as an important route of transmission of infection. The spread of infection via hands is well established (Ayliffe *et al* 1990, Larson 1981). Handwashing is an infection control practice with a clearly demonstrated efficacy, and remains the cornerstone of efforts to reduce the spread of infection. Hands must be washed to remove or destroy transient micro-organisms and reduce detachable resident micro-organisms.

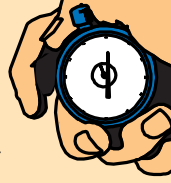
Gould (1997) observed that nurses frequently forgot to wash their hands even after performing procedures where contamination was likely. Transient micro-organisms are readily removed by thorough hand washing and drying with absorbent paper towels.

Ayliffe *et al* (1992) stated that it is not possible to lay down explicit handwashing rules in preventing sepsis, however, the frequency of handwashing during aseptic procedures should be based on individual circumstances. Nurses should wash their hands if they become contaminated at any stage of wound care. Non-touch technique is also essential to ensure that hands, even though they have been washed, do not contaminate the patient or sterile equipment. This can usually be achieved by wearing sterile gloves, or using forceps. However, it must be remembered that gloves can become damaged and allow passage of bacteria, while forceps may damage tissues (David 1991).

Hand hygiene should have similar status to other health and safety policies where individuals are accountable for day-to-day operational policies. Hand washing should be regarded as part of the normal duty of care.

#### TIME OUT 5

Compare the variety of ways you wash your hands in different situations. When you have an opportunity, observe the hand washing techniques of your colleagues.



#### The use of gloves

It has become accepted practice for gloves to be worn for all aseptic techniques. However, provided hand-washing is performed effectively, some procedures, such as the removal of a dressing from a sutured wound after 24 hours, where the wound is superficially scaled, could be undertaken without wearing gloves.

Thomlinson (1987) suggests that even superficial discharging wounds can be safely cleaned using materials held by the fingertips of a non-gloved hand. However, with the adoption of universal infection control precautions, it is recommended that healthcare staff should wear gloves when handling blood or body substances.

It is still necessary for nurses to wash their hands after wearing gloves, because bacterial growth on hands increases in the moisture which accumulates under gloves, and tears in the gloves may provide a route for transmission. Gloves play an important role in preventing cross infection. In the healthcare setting, two main types of gloves are used – sterile and clean. Sterile gloves are required when the hands are going to come into contact with normally sterile body areas, for example, during surgical procedures and urinary catheterisation. Clean gloves should be used at all other times.

#### Asepsis and inanimate objects

Bacteria that settle on inanimate surfaces usually adhere to them firmly, so unless the surface itself comes into contact with exposed tissue, they are harmless. Moreover, these are only a minor infection risk.

All instruments, fluids and materials that come into contact with exposed tissue must be sterile if the risk of contamination is to be reduced. Any equipment that becomes contaminated during a procedure must be discarded. Care should be taken to ensure that equipment and lotions are sterile, and that packaging is undamaged before use.

The infection risk of equipment and their decontamination methods may be classified as high, intermediate and low (Table 1).

#### TIME OUT 6

Locate your infection control manual and familiarise yourself with the local disinfection policy.



#### Protective clothing and asepsis

Transmission of micro-organisms from clothing is possible but it is not a major source of infections. The rationale for wearing protective clothing is to protect uniforms when infected materials are being handled. Wearing plastic aprons during direct patient contact would significantly reduce the number of bacteria carried on staff uniforms. This would reduce the probability of nosocomial infections (Callaghan 1998). An impermeable plastic apron offers better protection than a cotton gown.

Generally protective clothing is worn to:

- Prevent nurses' clothing becoming contaminated with pathogenic micro-organisms which may subsequently be transferred to other patients in their care.
  - Prevent nurses' clothing becoming soiled, wet or stained during the course of their duties.
  - Prevent the transfer of potentially pathogenic micro-organisms from nurse to patient.
  - Prevent nurses acquiring infection from patients.
- Aprons should be changed between procedures and patients.

#### Masks and asepsis

Masks were introduced into surgery at the end of the 19th century, seemingly intuitively rather than for scientific reasons. From operating theatres their use has spread to many other areas of healthcare.

Several studies show that wearing masks made no difference to rates of post-operative sepsis. It has also been found that infection rates are unchanged whether or not masks are worn when dressing wounds. Very few bacteria are shed from the mouth and nose when breathing and talking normally.

The rubbing of masks on the face releases potentially harmful skin flakes which can be transferred into open wounds. The improper use of masks in preventing sepsis can, in fact, be a hazard. There is evidence to indicate that, when masks are not worn, infections among patients do not increase in number (Meers *et al* 1997)

#### TIME OUT 7

Discuss with your colleagues the use and abuse of masks in preventing infection in your area.



#### Isolation nursing and asepsis

Many regard isolation nursing as central to the control of infection. The use of separation and physical barriers to prevent the spread of infection dates back to Florence Nightingale. In hospitals, patients may be isolated from other patients and staff, either because their condition renders them at risk of infection from others, the term

Table 1. Infection risk and decontamination methods

RISK	ITEMS OF EQUIPMENT	REQUIRED METHOD OF DECONTAMINATION
High risk	Surgical instruments Arthroscopes Surgical dressings Intravenous infusions Laparoscopes (Items that come into contact with exposed tissue)	High level decontamination Cleaning and sterilisation
Intermediate risk	Respiratory and anaesthetic equipment Endoscopes Bronchoscopes Vaginal speculae (Items that come into contact with mucous membranes)	Sterilise or disinfect
Low risk	Trolley tops Floors Furniture Wash bowls	Cleaning with warm detergent and thorough drying is adequate

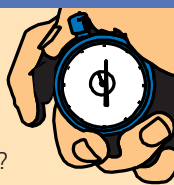
(Ayliffe *et al* 1993)

generally used is 'protective isolation', or because they themselves are potentially a source of infection. This is often referred to as 'barrier nursing' or 'source isolation'.

Isolation is expensive and disruptive. However, there are occasions when patients acquire infections and, because they present a risk to others, have to be isolated in single rooms during their stay in hospital (Knowles 1993). The studies that examined the psychological effects on patients in isolation describe patients' feelings of confinement, imprisonment, stigmatisation, anger, depression, anxiety and lack of control (Gammon 1999). Nurses should be sensitive to the needs of the patient in isolation and the effect isolation may have on them and their families.

#### TIME OUT 8

Recall the last time you cared for a patient in isolation. What infection control precautions were taken? How were the patient's psychological needs met?



#### Conclusion

Controlling the spread of infection is critically important in all healthcare settings, a fact highlighted in recent years by costly epidemics of drug resistant organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA). Nurses are personally accountable for their practice (UKCC 1996) and should be empowered to make decisions based on sound evidence and on an individual's risk of infection.

Some patients are more vulnerable to infection than others and it is important for nurses to recognise those patients at increased risk of infection, so that measures can be taken to enhance infection control precautions. Individualised assessment of infection risk is a critical issue whenever planning nursing care. The immunological competence of the patient, the underlying medical condition and the procedures and treatment they will undergo during their hospital stay should also be taken into consideration.

The cost of infection is high, both to the patient and to healthcare organisations. The patient may be inconvenienced by a prolonged period of hospitalisation, which can cause economic and social hardships to the whole community. It is therefore essential when concepts of asepsis are used as a method of preventing infection that procedures are sound in theory, and are carried out correctly ■

#### REFERENCES

- Ayliffe GAJ *et al* (1993) *Chemical Disinfection in Hospitals*. London, Public Health Laboratory Service.
- Ayliffe GAJ *et al* (1992) *Control of Hospital Infection. A Practical Handbook* (Third edition) London, Chapman & Hall Medical.
- Ayliffe GAJ *et al* (1990) *Hospital Acquired Infection. Principles and Prevention*. Second edition. Oxford, Butterworth-Heinemann.
- Callaghan I (1998) Bacterial contamination of nurses' uniforms: a study. *Nursing Standard*. 13, 1, 37-42.
- David J (1991) Letters. *Wound Management*. 1, 2, 15.
- Emmerson AM *et al* (1996) The second national prevalence survey of infections in hospitals. *Journal of Hospital Infection*. 32, 175-190.
- Gammon J (1999) Isolated instance: infection control supplement. *Nursing Times*. 95, 2, 59-60.
- Glynn A *et al* (1997) *Hospital Acquired Infection: Surveillance, Policies and Practice*. London, Public Health Laboratory Service.
- Gould D (1997) *Hand Care Monitoring Standards. Hygienic Hand Decontamination*. London, Macmillan Magazines.
- Hollingworth H (1998) Using a non-sterile technique in wound care. *Professional Nurse*. 13, 4, 226-229.
- Kelsey JC (1972) The myth of surgical sterility. *Lancet*. 2, 130-1.
- Knowles H E (1993) The experience of infectious patients in isolation. *Nursing Times*. 89, 30, 53-5.
- Larson E (1981) Resistant carriage of Gram-negative bacteria on hands. *American Journal Infection Control*. 9, 112-119.
- Meers P *et al* (1997) *Infection Control in Healthcare*. Second edition. Cheltenham, Stanley Thornes.
- Morison MJ (1992) *A Colour Guide to the Nursing Management of Wounds*. London, Wolfe Publishing.
- Pritchard AP, Mallett J (1992). *Manual of Clinical Nursing Procedures*. Third edition. The Royal Marsden Hospital. Blackwell Science.
- Thomlinson D (1987) To clean or not to clean? *Nursing Times*. 83, 37, 71-75.
- United Kingdom Central Council for Nursing, Midwifery and Health Visiting (1996) *Guidelines for Professional Practice*. London, UKCC.
- Further reading**
- Bennet JV, Brachman PS (1992) *Hospital Infections*. Third edition. Boston, Little, Brown.
- Briggs M *et al* (1996) The principles of aseptic technique in wound care. *Professional Nurse*. 11, 12, 805-810.
- Cruse PJE, Foord R (1980) The epidemiology of wound infection – a 10 year perspective study of 62,939 wounds. *Surgical Clinics of North America*. 60, 1, 27-40.
- Jones SG, Fraise AP (1997) Coping with nosocomial infection: a non-antibiotic approach. *British Journal of Hospital Medicine*. 58, 5, 217-220.
- Kerr J (1998) Handwashing. *Nursing Standard*. 12, 51, 35-42.
- Mandell GL, *et al* (1995) *Principles and Practice of Infectious Diseases*. Fourth edition. New York NY, Churchill Livingstone.
- Meers P *et al* (1995) *The Microbiology and Epidemiology of Infection for Health Science Students*. London, Chapman & Hall.
- Mercier C (1997) *Infection Control Hospital and Community*. Cheltenham, Stanley Thornes.
- Guidelines for Hand Hygiene (1998) Published by the Infection Control Nurses Association.