

Chapter 13

Prevention of Intravascular Device Associated Infection

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Key points

- Thorough hand disinfection by operator before insertion of catheter and during maintenance procedures.
- Thorough disinfection of skin at insertion site.
- No touch technique or gloved hands during insertion, maintenance and removal of catheter.
- Secure the IV line to prevent movement of the catheter.
- Maintain a closed system.
- Protect the insertion site with a sterile dressing.
- Inspect insertion site daily.
- Remove the catheter as early as possible and immediately if any signs of infection are present.

Introduction

Intravenous infusions are among the most common invasive procedures performed in health care and are administered either by peripheral or central routes. Infections are common and in many countries intravenous catheters are the main source of healthcare-associated bacteraemia. The principles used for prevention of infection are similar for both central and peripheral catheters.

An intravenous catheter is a foreign body that produces a reaction in the host resulting in a film of fibrinous material on its inner and outer surfaces. This biofilm may become colonized by microorganisms which are then protected from host defense mechanisms and the effect of antibiotics. Microbial contamination may cause local infection, thrombophlebitis, or bacteremia/sepsis.¹ Infection prevention and control measures are designed to prevent microorganisms from entering equipment, catheter insertion site, or bloodstream. (See Figure 13.1)

Because of the danger of infection, catheters should not be inserted unnecessarily and indications for insertion of catheters should be strict (e.g., severe dehydration, blood transfusion, and parenteral feeding). Use alternative routes where possible for hydration or parenteral therapy. Once catheters have been inserted, they should be removed as soon as possible. Good aseptic technique is required during insertion of the catheter and maintenance of the insertion site.² The site should be kept dry, free from contamination, secured, and dressed in a comfortable position for the patient.

Sources and Routes of Transmission of Infection

Sources of contamination are either intrinsic (contamination before use) or extrinsic (contamination introduced during therapy). Most infections are acquired from the patient's own skin flora.³ The microorganisms involved are typically coagulase-negative staphylococci or occasionally *Staphylococcus aureus*. Less frequently, Gram-negative bacilli or *Candida albicans* may be identified due to growth in the infusate.

Skin microorganisms enter the catheter insertion site along the outside of the catheter. Occasionally microorganisms from the hands of staff or

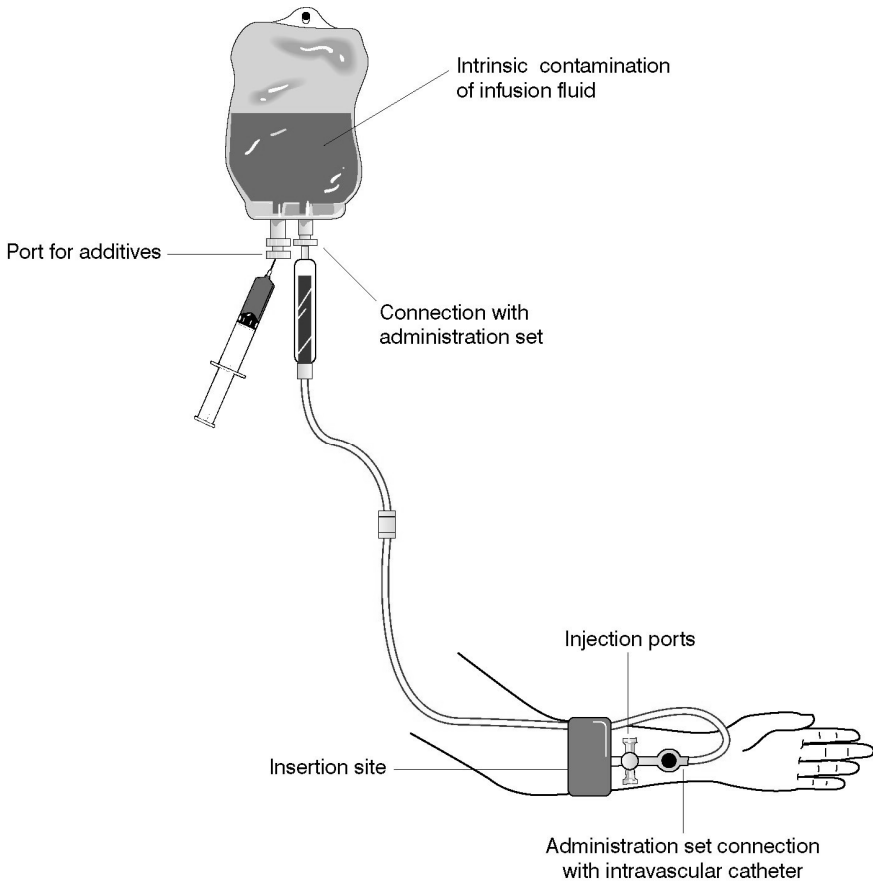


Figure 13.1. Sites of Possible Contamination of Intravascular Infusions
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the patient's skin enter through the hub when the catheter is disconnected or through injection ports. The microbes grow in the biofilm, usually on the catheter's outer surface, and may be released into the bloodstream. Rare infections have been caused by microorganisms growing in commercially prepared infusate due to faulty sterilization or by contaminated medications.⁴ Finally, colonisation of the catheter tip may occur, seeded from a distant site of infection (e.g., wound, lung, or kidney).

Source of infection and prevention

Table 13.1 outlines the major sources of contamination related to intravascular catheters.

Table 13.1. Major sources of contamination related to intravascular catheters

Main source of infection	Prevention
Infusion fluid	Ensure fluid is pyrogen free. Monitor sterilisation process. Avoid damage to container during storage. Inspect container for cracks, leaks, cloudiness, and particulate matter.
Addition of medications	Use aseptic precautions (hand disinfection, no touch technique). Add sterile medications. Carry out procedure preferably in the pharmacy. Use a sterile device for access. Use single-dose vials whenever possible. If multidose vials have to be used: Refrigerate after opening (if not otherwise recommended by manufacturer). Wipe diaphragm with 70% alcohol before entering vial.
Container and water used	Ensure no contamination from warming fluid. Dry warming systems are preferred.
Insertion of catheter	Thorough hand disinfection and use of sterile gloves by operator. Thoroughly disinfect the skin insertion site.
Catheter site	Cover with sterile dressing as soon as possible. Remove catheter if signs of infection occur. Inspect site every 24 hours. Change dressing only when soiled, loosened or wet/damp, using good aseptic technique. Do not use antimicrobial ointments.
Injection ports	Clean with 70% alcohol (isopropanol) and allow drying before use. Close ports that are not needed with sterile stopcocks.
Changing of infusion set	Replace no more frequently than 72 hours (blood and lipids 24 hours*). Thorough hand disinfection by operator. Use good aseptic technique.

* In some countries, national guidelines or recommendations exist for infusion of blood or blood products including infusion times <24 hours. Certain lipid products may require more frequent replacement.⁵

General Comments

- Unless signs of infection or irritation occur, peripheral intravenous (IV) catheters may be used as long as they are needed. Some guidelines recommend changing peripheral venous catheters every 72-96 hours in adults. Central catheters should not be replaced routinely.^{5,6}
- The risk of infection in peripheral IV sites increases with length of time of catheterisation. Catheters should be removed as soon as possible.⁷
- Infection rates are lowest with smaller needles. Teflon catheters are also associated with low rates; however they are not necessary for short periods of infusion.
- Well-trained staff should set up and maintain infusions. Masks, caps and gowns are not necessary for insertion of peripheral lines. The use of non-sterile gloves and an apron or gown will protect the operator if profuse bleeding is likely.

Protocol for peripheral infusions

- Place arm on clean towel.
- Operator should use an alcohol hand rub or antiseptic soap to disinfect hands. If alcohol or antiseptic are not available, wash hands thoroughly for 20 seconds.
- Dry hands thoroughly on a paper or clean linen towel, unless alcohol is used.
- Avoid shaving skin site; clip hair instead, if necessary.
- Disinfect skin site with 0.5% chlorhexidine-alcohol, 2% tincture of iodine, 10% alcoholic povidone-iodine, or 70% alcohol (isopropanol). Apply with rubbing for 30 seconds and allow drying before inserting the cannula.
- Insert cannula into vein, preferably in an upper limb, using no touch technique.
- Apply sterile dressing (gauze or equivalent or clear semi-permeable) and secure. Semi-permeable adhesive dressings are more expensive, but have the advantage of allowing inspection of the site without removal of the dressing.⁸
- Secure cannula to avoid movement and label with insertion date.

- Assess the need for continuing catheterisation every 24 hours.
- Inspect catheter daily and remove at first sign of infection.
- Avoid cut downs, especially in the leg.
- Cannulae and administration sets should be sterilized before use. It is preferable to use disposable products.
 - If reuse is necessary, clean thoroughly and autoclave if possible.
 - If this is not possible, use boiling water.
 - Chemical disinfection is undesirable. However, if reusable items are heat-labile, immerse in 0.5% sodium hypochlorite or other chlorine-releasing solution for 15 minutes after thorough cleaning (hypochlorites are neutralised by proteins – such as blood). Use syringe and needle for cleaning the interior of the cannula. Ensure the agent remains in contact with all surfaces of tubes and catheters. Hypochlorites are corrosive to metals and some plastics; thorough rinsing in sterile water is required after disinfection.

Additional guidelines for central catheters

- Use maximum barrier precautions: sterile gloves, gowns, cap and mask for operator and a large sterile drape to cover the patient.²
- Preferably disinfect skin site with 2% chlorhexidine-alcohol. Allow drying before inserting the catheter.
- Change dressings regularly, at least once a week (individually determined, depending on the state of the patient).

References and Further Reading

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