

State of Kuwait
Ministry of Health
Infection Control Directorate

Guidelines for the Prevention of Intravascular Catheter-Related Infections

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OBJECTIVE

To provide health care practitioners with the background information and specific recommendations to reduce the incidence of intravascular catheter –related blood stream infections (CRBSI).

INTRODUCTION

Catheter-related bloodstream infections (CRBSI) independently increase hospital costs and length of stay, but have not been shown to independently increase mortality. To improve patient outcome and to reduce healthcare costs, there is considerable interest by healthcare personnel reducing the incidence of these infections. This effort should be multidisciplinary, involving healthcare personnel who order the insertion and removal of CVCs, those personnel who insert and maintain intravascular catheters, infection control personnel, and healthcare managers and patients who are capable of assisting in the care of their catheters.

RECOMMENDATIONS

I. Education, Training and Staffing

1. Educate healthcare personnel regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections.
2. Periodically assess knowledge of and adherence to guidelines for all personnel involved in the insertion and maintenance of intravascular catheters.
3. Designate only trained personnel who demonstrate competence for the insertion and maintenance of peripheral and central intravascular catheters.
4. Ensure appropriate nursing staff levels in ICUs. Observational studies suggest that a higher proportion of "pool nurses" or an elevated patient–to-nurse ratio is associated with CRBSI in ICUs where nurses are managing patients with CVCs.

II. Selection of Catheters and Sites

A. Peripheral Catheters and Midline Catheters

1. In adults, use an upper-extremity site for catheter insertion. Replace a catheter inserted in a lower extremity site to an upper extremity site as soon as possible.
2. In pediatric patients, the upper or lower extremities or the scalp (in neonates or young infants) can be used as the catheter insertion site.
3. Select catheters on the basis of the intended purpose and duration of use, known infectious and non-infectious complications (e.g., phlebitis and infiltration), and experience of individual catheter operators.

4. Avoid the use of steel needles for the administration of fluids and medication that might cause tissue necrosis if extravasation occurs.

5. Use a midline catheter or peripherally inserted central catheter (PICC), instead of a short peripheral catheter, when the duration of IV therapy will likely exceed six days.

6. Evaluate the catheter insertion site daily by palpation through the dressing to discern tenderness and by inspection if a transparent dressing is in use. Gauze and opaque dressings should not be removed if the patient has no clinical signs of infection. If the patient has local tenderness or other signs of possible CRBSI, an opaque dressing should be removed and the site inspected visually.

7. Remove peripheral venous catheters if the patients develop signs of phlebitis (warmth, tenderness, erythema or palpable venous cord), infection, or a malfunctioning catheter.

B. Central venous catheter

1. Weigh the risks and benefits of placing a central venous device at a recommended site to reduce infectious complications against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement).

2. Avoid using the femoral vein for central venous access in adult patients.

3. Use a subclavian site, rather than a jugular or a femoral site, in adult patients to minimize infection risk for nontunneled CVC placement.

4. No recommendation can be made for a preferred site of insertion to minimize infection risk for a tunneled CVC.

5. Avoid the subclavian site in hemodialysis patients and patients with advanced kidney disease, to avoid subclavian vein stenosis.

6. Use a fistula or graft in patients with chronic renal failure instead of a CVC for permanent access for dialysis.

7. Use ultrasound guidance to place central venous catheters (if this technology is available) to reduce the number of cannulation attempts and mechanical complications. Ultrasound guidance should only be used by those fully trained in its technique.

8. Use a CVC with the minimum number of ports or lumens essential for the management of patient.

9. No recommendation can be made regarding the use of a designated lumen for parenteral nutrition.

10. Promptly remove any intravascular catheter that is no longer essential.

11. When adherence to aseptic technique cannot be ensured (i.e catheters inserted during a medical emergency), replace the catheter as soon as possible, i.e, within 48 hours.

III. Hand Hygiene and Aseptic Technique

1. Perform hand hygiene procedures, either by washing hands with conventional soap and water or with alcohol-based hand rubs (ABHR). Hand hygiene should be performed before and after palpating

catheter insertion sites as well as before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.

2. Maintain aseptic technique for the insertion and care of intravascular catheters.
3. Wear clean gloves, rather than sterile gloves, for the insertion of peripheral intravascular catheters, if the access site is not touched after the application of skin antiseptics.
4. Sterile gloves should be worn for the insertion of arterial, central, and midline catheters.
5. Use new sterile gloves before handling the new catheter when guidewire exchanges are performed.
6. Wear either clean or sterile gloves when changing the dressing on intravascular catheters.

III. Maximal Sterile Barrier Precautions

1. Use maximal sterile barrier (MSB) precautions, including the use of a cap, mask, sterile gown, sterile gloves, and sterile full body drape, for the insertion of CVCs, PICCs, or guide wire exchange.
2. Use a sterile sleeve to protect pulmonary artery catheters during insertion.

IV. Skin Preparation

1. Prepare clean skin with an antiseptic (70% alcohol, tincture of iodine, or alcoholic chlorhexidine gluconate solution) before peripheral venous catheter insertion.
2. Prepare clean skin with a >0.5% chlorhexidine preparation with alcohol before central venous catheter and peripheral arterial catheter insertion and during dressing changes. If there is a contraindication to chlorhexidine, tincture of iodine, an iodophor, or 70% alcohol can be used as alternatives.
3. No comparison has been made between using chlorhexidine preparations with alcohol and povidone-iodine in alcohol to prepare clean skin.
4. No recommendation can be made for safety or efficacy of chlorhexidine in infants aged <2 months.
5. Antiseptics should be allowed to dry according to the manufacturer's recommendation prior to placing the catheter.

VI. Catheter Site Dressing Regimens

1. Use either sterile gauze or sterile, transparent, semipermeable dressing to cover the catheter site.
2. If the patient is diaphoretic or if the site is bleeding or oozing, use a gauze dressing until it resolved.
3. Replace catheter site dressing if the dressing becomes damp, loosened, or visibly soiled.

4. Do not use topical antibiotic ointment or creams on insertion sites, except for dialysis catheters, because of their potential to promote fungal infections and antimicrobial resistance.
5. Do not submerge the catheter or catheter site in water. Showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter (e.g., if the catheter and connecting device are protected with an impermeable cover during the shower).
6. Replace dressings used on short-term CVC sites every 2 days for gauze dressings.
7. Replace dressings used on short-term CVC sites at least every 7 days for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter may outweigh the benefit of changing the dressing.
8. Replace transparent dressings used on tunneled or implanted CVC sites no more than once per week (unless the dressing is soiled or loose), until the insertion site has healed.
9. No recommendation can be made regarding the necessity for any dressing on well-healed exit sites of long-term cuffed and tunneled CVCs.
10. Ensure that catheter site care is compatible with the catheter material.
11. Use a sterile sleeve for all pulmonary artery catheters.
12. Use chlorhexidine-impregnated sponge dressing for temporary short-term catheter in patient older than 2 months of age if CLABSI rate is not decreasing despite adherence to basic prevention measures including education and training, appropriate use of chlorhexidine for skin antisepsis, and MSB.
13. No recommendation is made for other types of chlorhexidine dressings.
14. Monitor the catheter sites visually when changing the dressing or by palpation through an intact dressing on a regular basis, depending on the clinical situation of the individual patient. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or bloodstream infection, the dressing should be removed to allow thorough examination of site.
15. Encourage patients to report changes in their catheter site or any new discomfort to their provider.

VII. Patient Cleansing

Use a 2% chlorhexidine wash for daily skin cleansing to reduce CRBSI.

VIII. Catheter Securement Devices

Use a sutureless securement device to reduce the risk of infection for intravascular catheters.

IX. Antimicrobial/Antiseptic Impregnated Catheters and Cuffs

Use a chlorhexidine/silver sulfadiazine or minocycline/rifampin -impregnated CVC in patients whose catheter is expected to remain in place >5 days if, after successful implementation of a comprehensive strategy to reduce rates of CLABSI, the CLABSI rate is not decreasing. The comprehensive strategy should include at least the following three components: educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a >0.5% chlorhexidine preparation with alcohol for skin antisepsis during CVC insertion.

X. Systemic Antibiotic Prophylaxis

Do not administer systemic antimicrobial prophylaxis routinely before insertion or during use of an intravascular catheter to prevent catheter colonization or CRBSI.

XI. Antibiotic/Antiseptic Ointments

Use povidone iodine antiseptic ointment or bacitracin/gramicidin/ polymyxin B ointment at the hemodialysis catheter exit site after catheter insertion and at the end of each dialysis session only if this ointment does not interact with the material of the hemodialysis catheter per manufacturer's recommendation.

XII. Antibiotic Lock Prophylaxis, Antimicrobial Catheter Flush and Catheter Lock Prophylaxis

Use prophylactic antimicrobial lock solution in patients with long term catheters who have a history of multiple CRBSI despite optimal maximal adherence to aseptic technique.

XIII. Anticoagulants

Do not routinely use anticoagulant therapy to reduce the risk of catheter-related infection in general patient populations.

XIV. Replacement of Peripheral and Midline Catheters

1. There is no need to replace peripheral catheters more frequently than every 72-96 hours to reduce risk of infection and phlebitis in adults.
2. No recommendation is made regarding replacement of peripheral catheters in adults only when clinically indicated.
3. Replace peripheral catheters in children only when clinically indicated.

4. Replace midline catheters only when there is a specific indication.

XV. Replacement of CVCs, including PICCs and hemodialysis catheters

1. Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections.

2. Do not remove CVCs or PICCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected.

3. Do not use guidewire exchanges routinely for non-tunneled catheters to prevent infection.

4. Do not use guidewire exchanges to replace a non-tunneled catheter suspected of infection.

5. Use a guidewire exchange to replace a malfunctioning non-tunneled catheter if no evidence of infection is present.

6. Use new sterile gloves before handling the new catheter when guidewire exchanges are performed.

XVI. Umbilical catheters

1. Remove and do not replace umbilical artery catheters if any signs of CRBSI, vascular insufficiency in the lower extremities, or thrombosis are present.

2. Remove and do not replace umbilical venous catheters if any signs of CRBSI or thrombosis are present.

3. No recommendation can be made regarding attempts to salvage an umbilical catheter by administering antibiotic treatment through the catheter.

4. Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Avoid tincture of iodine because of the potential effect on the neonatal thyroid. Other iodine-containing products (e.g., povidone iodine) can be used.

5. Do not use topical antibiotic ointment or creams on umbilical catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance.

6. Add low-doses of heparin (0.25—1.0 U/ml) to the fluid infused through umbilical arterial catheters.

7. Remove umbilical catheters as soon as possible when no longer needed or when any sign of vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place >5 days.

8. Umbilical venous catheters should be removed as soon as possible when no longer needed, but can be used up to 14 days if managed aseptically.

9. An umbilical catheter may be replaced if it is malfunctioning, and there is no other indication for catheter removal, and the total duration of catheterization has not exceeded 5 days for an umbilical artery catheter or 14 days for an umbilical vein catheter.

XVII. Peripheral Arterial Catheters and Pressure Monitoring Devices for Adult and Pediatric Patients

1. In adults, use of the radial, brachial or dorsalis pedis sites is preferred over the femoral or axillary sites of insertion to reduce the risk of infection.
2. In children, the brachial site should not be used. The radial, dorsalis pedis, and posterior tibial sites are preferred over the femoral or axillary sites of insertion.
3. A minimum of a cap, mask, sterile gloves and a small sterile fenestrated drape should be used during peripheral arterial catheter insertion.
4. During axillary or femoral artery catheter insertion, maximal sterile barriers precautions should be used.
5. Replace arterial catheters only when there is a clinical indication.
6. Remove the arterial catheter as soon as it is no longer needed.
7. Use disposable, rather than reusable, transducer assemblies when possible.
8. Do not routinely replace arterial catheters to prevent catheter-related infections.
9. Replace disposable or reusable transducers at 96-hour intervals. Replace other components of the system (including the tubing, continuous-flush device, and flush solution) at the time the transducer is replaced.
10. Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile.
11. Minimize the number of manipulations of and entries into the pressure monitoring system. Use a closed flush system (i.e, continuous flush), rather than an open system (i.e, one that requires a syringe and stopcock), to maintain the patency of the pressure monitoring catheters.
12. When the pressure monitoring system is accessed through a diaphragm, rather than a stopcock, scrub the diaphragm with an appropriate antiseptic before accessing the system.
13. Do not administer dextrose-containing solutions or parenteral nutrition fluids through the pressure monitoring circuit.
14. Sterilize reusable transducers according to the manufacturers' instructions if the use of disposable transducers is not feasible.

XVIII. Replacement of Administration Sets

1. In patients not receiving blood, blood products or fat emulsions, replace administration sets

that are continuously used, including secondary sets and add-on devices, no more frequently than at 96-hour intervals, but at least every 7 days.

2. No recommendation can be made regarding the frequency for replacing intermittently used administration sets.
3. No recommendation can be made regarding the frequency for replacing needles to access implantable ports.
4. Replace tubing used to administer blood, blood products, or fat emulsions (those combined with amino acids and glucose in a 3-in-1 admixture or infused separately) within 24 hours of initiating the infusion
5. Replace tubing used to administer propofol infusions every 6 or 12 hours, when the vial is changed, per the manufacturer's recommendation.
6. No recommendation can be made regarding the length of time a needle used to access implanted ports can remain in place.

XIX. Needleless Intravascular Catheter Systems

1. Change the needleless components at least as frequently as the administration set. There is no benefit to changing these more frequently than every 72 hours.
2. Change needleless connectors no more frequently than every 72 hours or according to manufacturers' recommendations for the purpose of reducing infection rates.
3. Ensure that all components of the system are compatible to minimize leaks and breaks in the system.
4. Minimize contamination risk by scrubbing the access port with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol) and accessing the port only with sterile devices.
5. Use a needleless system to access IV tubing.
6. When needleless systems are used, a split septum valve may be preferred over some mechanical valves due to increased risk of infection with the mechanical valves.

XX. Performance Improvement

Use hospital-specific or collaborative-based performance improvement initiatives in which multifaceted strategies are "bundled" together to improve compliance with evidence-based recommended practices.

Table 1. Catheters used for venous and arterial access.

Catheter Type	Entry Site	Length	Comments
Peripheral venous catheters	usually inserted in veins of forearm or hand	less than 7.6 cm	phlebitis with prolonged use rarely associated with bloodstream infection
Peripheral arterial catheters	usually inserted in radial artery; can be placed in femoral, axillary, brachial posterior tibial arteries	less than 7.6 cm	low infection risk; rarely associated with blood stream infection.
Midline catheters	inserted via the antecubital fossa into the proximal basilic or cephalic veins; does not enter central veins, peripheral catheters	7.6 to 20 cm	anaphylactoid reactions have been reported with catheters made of elastomeric hydrogel; does not enter central veins; lower rates of phlebitis than short peripheral catheters
Nontunneled central venous catheters	percutaneously inserted into central veins (subclavian, internal jugular, or femoral)	8 cm or longer depending on patient size	account for majority of CRBSI
Pulmonary artery catheters	inserted through a Polytetrafluoroethylen introducer in a central vein(subclavian, internal jugular, or femoral)	30 cm or longer depending on patient size	usually heparin bonded; similar rates of bloodstream infection as CVC; subclavian site preferred to reduce infection risk
Peripherally inserted central venous catheters(PICC)	inserted into basilic, cephalic or brachial veins and enter the superior vena cava	20 cm or longer depending on patient size	lower rate of infection than non tunneled CVCs
Tunneled central venous catheters	implanted into subclavian internal jugular or femoral veins	8 cm or longer depending on patient size	cuff inhibits migration of organisms into catheter tract; lower rate of infection than non tunnelled CVC
Totally implantable	tunneled beneath skin and have subcutaneous port accessed with a needle; implanted in subclavian or internal jugular vein	8 cm or longer depending on patient size	lowest risk for CRBSI improved patient self image; no need for local catheter site care; surgery required for catheter removal
Umbilical catheters	inserted into either umbilical vein or umbilical artery	6 cm or less, depending on patient size	risk for CRBSI similar with catheters placed in umbilical vein vs. artery

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