01.18 - Infection Control Guidance for Central Lines and Other Infusion Devices

Purpose To provide infection control guidelines for the proper placement and management of intravascular devices and infusion systems

Audience All employees of UTMB hospitals, clinics, outpatient surgical center, contract workers, volunteers, and students.

Hand Hygiene

- Observe proper hand-hygiene procedures either by washing hands with conventional antiseptic-containing soap and water or using waterless alcohol-based surgical hand rubs. Observe hand hygiene 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.
- The use of gloves does not remove the need for hand hygiene.

Documentation Record the operator, date, and time of catheter insertion and removal, and dressing changes in the electronic medical record (EMR).

Surveillance

- Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local infection or bloodstream infection (BSI), the dressing should be removed to allow thorough examination of the site.
- For patients who are admitted with a central line in place:
  - Document in the EMR that the line was present on admission (POA)
  - Enter the insertion date as the date of admission
  - Inspect the insertion site for any signs of infection
  - Ensure the dressing meets the UTMB catheter site dressing requirements *(see Catheter-site Dressing Regimens below).*

Replacement of Infusion Administration Sets and Intravenous Fluids

Tubing

- Replace administration sets, including secondary sets and add-on devices (including needleless connectors), **at 96-hour intervals.**
- For tubing change policy when transfusing TPN or intralipids, refer to policy 07.35 Care of Adult, Neonatal, and Pediatric Patients Receiving Parenteral Nutrition (TPN, PPN, Hyperalimentation).
- For tubing change policy when transfusing blood or blood products, refer to policy 09.13.29 Transfusion of Blood Components, Adults and Pediatrics.

- Replace tubing used to administer propofol infusions every 6 or 12 hours, when the vial is changed, according to the manufacturer's recommendation.

Needleless Intravascular Devices

- Change the needleless connectors no more frequently than every 96 hours or according to manufacturers' recommendations for the purpose of reducing infection rates. If tubing must be changed more frequent than 96 hours (see above section "Tubing"), the needleless connector should be changed at the same time.
- Ensure that all components of the system are compatible to minimize leaks and breaks in the system.
- Minimize contamination risk by scrubbing the access port or hub with friction immediately prior to each use with an appropriate antiseptic (3.15% chlorhexidine gluconate and 70% alcohol, or 70% alcohol) letting the alcohol dry, and then accessing the port only with sterile devices.
- Use a needleless system to access IV tubing.
- 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.

IV Injection Ports

- Clean injection ports with an appropriate disinfectant (3.15% chlorhexidine gluconate and 70% alcohol, or 70% alcohol), and let the alcohol dry before accessing the system.
- Cap all stopcocks when not in use. **Do not** loop the tubing back into itself when disconnecting from infusion and reconnecting.

Preparation and Quality Control of Intravenous Admixtures

- Admix all routine parenteral fluids in the pharmacy in a laminar-flow hood using aseptic technique.
- Do not use any container of parenteral fluid that has visible turbidity, leaks, cracks, or particulate matter or if the manufacturer's expiration date has passed.
- Use single-dose vials for parenteral additives or medications when possible.
- Do not combine the leftover content of single-use vials for later use.
- If multidose vials are used:
  - Refrigerate multidose vials after they are opened, if recommended by the manufacturer.
  - Cleanse the access diaphragm of multidose vials with 70% alcohol and let the alcohol dry before inserting a device into the vial.
  - Use a sterile device to access a multidose vial and avoid touch contamination of the device before penetrating the access diaphragm.
  - Discard a multidose vial if sterility is compromised.

- All multidose vials should be dated when first used and thereafter not used beyond the manufacturer's stated expiration period.

In-line filters

- Do not use in-line filters routinely for infection-control purposes.

IV-Therapy Personnel

- Designate trained personnel for the insertion and maintenance of intravascular devices.

Central Venous Catheters (CVC), Including PICCs, Hemodialysis, and Pulmonary Artery Catheters

General Principles

- Use ultrasound guidance to place CVCs to reduce the number of cannulation attempts and mechanical complications. Ultrasound guidance should only be used by those fully trained in its use.
- An observer will monitor the insertion using a checklist to verify appropriate insertion technique. (*See* **Appendix A** *for checklist.*)
- Use a CVC with the minimum number of ports or lumens essential for the management of the patient.
- Designate personnel who have been trained and exhibit competent in the insertion of catheters to supervise trainees who perform catheter insertion.
- Use totally implantable access devices for patients who require long-term, intermittent vascular access. For patients requiring frequent or continuous access, a PICC or tunneled CVC is preferable.
- Use a cuffed CVC for dialysis if the period of temporary access is anticipated to be prolonged (e.g., >3 weeks).
- Use a fistula or graft instead of a CVC for permanent access for dialysis.
- Do not use hemodialysis catheters for blood drawing or applications other than hemodialysis except during dialysis or under emergency circumstances.

Selection of Catheter Insertion Site

- Weigh the risk and benefits of placing a 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).
- In adults, use an upper instead of a lower extremity site for catheter insertion. Replace a catheter inserted into a lower extremity site to an upper extremity site as soon as possible. Use a subclavian site (rather than a jugular or a femoral site) in adult patients to minimize infection risk for non-tunneled CVC placement.
- In pediatric patients, the upper or lower extremities or the scalp can be used as the catheter insertion site.
- Place catheters used for hemodialysis and pheresis in a jugular or femoral vein rather than in a subclavian vein to avoid venous stenosis.

Maximal Sterile Barrier Precautions during Catheter Insertion

- Perform hand hygiene procedures, either by washing hands with conventional antiseptic containing soap and water or with waterless alcohol-based handrubs.
- Use sterile technique including the use of a cap, mask, sterile gown, sterile gloves, and a large fenestrated sterile drape, for the insertion of CVCs (including PICCs) or guidewire exchange.
- Disinfect clean skin with an alcohol/CHG solution (2% chlorhexidine/70% isopropyl alcohol) antiseptic before catheter insertion and during dressing changes. Air dry before inserting the catheter.
- After catheter insertion, apply a chlorhexidine impregnated sponge dressing to the insertion site followed by placement of a transparent or gauze dressing. Replace the chlorhexidine impregnated sponge dressing every 7 days or at any time if it becomes soaked with blood.
- Premature neonates:
  - Neonates who cannot tolerate an alcohol/CHG solution (2% chlorhexidine/70% isopropyl alcohol) will be bathed with a 2% CHG cloth if they meet the following criteria:
    - > 1000 g birth weight or ≤ 1000 g birth weight but age ≥ 28 days after birth.
  - Frequency of bathing neonates is determined by birth weight and gestational age or chronological age. See **Appendix B**.
- Use a sterile sleeve to protect pulmonary artery catheters during insertion.

Replacement or Removal of Catheter

- Evaluate the catheter insertion site daily, by palpation through the dressing to discern tenderness and by inspection if local tenderness or other signs of a CLABSI are suspected.
- Remove peripheral venous catheters if the patient develops signs of phlebitis (e.g., warmth, tenderness, erythema, and palpable venous cord), or infection, or if the catheter is malfunctioning.
- In adults, replace short, peripheral venous catheters no more frequently than every 72-96 hours to reduce the risk for phlebitis. If sites for venous access are limited and no evidence of phlebitis or infection is present, peripheral venous catheters can be left in place for longer periods, although the patient and the insertion sites should be closely monitored.
- Do not routinely replace midline catheters to reduce the risk of infection.
- In pediatric patients, leave peripheral venous catheters in place until IV therapy is completed, unless a complication (e.g., infection, phlebitis or infiltration) occurs.
- Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections.
- Do not remove CVCs or PICCs based on 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.

- When catheters are removed, do not routinely culture the tips.
- Guidewire exchange
  - Do not use guidewire exchanges routinely for non-tunneled catheters to prevent infection.
  - Use a guidewire exchange to replace a malfunctioning non-tunneled catheter if no evidence of infection is present.
  - Use a new set of sterile gloves before handling the new catheter when guidewire exchanges are performed.

Catheter and Catheter-site Care

- Antibiotic lock solutions:
  - Use prophylactic antimicrobial lock solution in patients with long-term catheters who have a history of multiple CLABSIs despite optimal maximal adherence to aseptic techniques.
  - Do not routinely use anticoagulant therapy to reduce the risk of catheter-related infection in general patient populations
- Catheter-site dressing regimens:
  - Chlorhexidine-impregnated dressings must be placed to protect the insertion site.
  - Use transparent, semi-permeable dressings or gauze dressings to cover central venous catheter sites. Replace dressings every 7 days for transparent dressings and every 48 hours for gauze dressings.
  - Dressings must be dated to help provide a visual reminder for dressing changes when the dressing is clean, dry, and intact.
  - Replace transparent semi-permeable or gauze catheter-site dressings if they become damp, loosened, or visibly soiled
  - If the patient is diaphoretic, or if the site is bleeding or oozing, gauze dressing is preferable to a transparent semi-permeable dressing.
  - Tunneled central venous catheter (CVC) sites that are well healed do not require dressing.
  - Do not use topical antibiotic ointment or creams on insertion sites because of their potential to promote fungal infections and antimicrobial resistance.
  - Do not submerge the catheter in water. Showering may be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter site (e.g., if the catheter and connecting device are protected with an impermeable cover during the shower.
  - Replace the catheter-site dressing when it becomes damp, loosened, or soiled or when inspection of the site is necessary.

- Replace dressings used on short-term CVC sites weekly for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter outweighs the benefit of changing the dressing.
- Replace dressings used on short term CVC sites every 2 days if a gauze dressing is required.
- Replace dressings used on tunneled or implanted CVC sites weekly, until the insertion site has healed.
- Ensure that catheter-site care is compatible with the catheter material.
- Use a sterile sleeve for all pulmonary artery catheters.

Withdrawing Blood Samples from CVCs for Blood Cultures

- Blood may be drawn from a central line following the procedures outlined below:
  - Initial blood samples should not be drawn from CVCs unless blood cannot be obtained percutaneously from any vein. Blood cultures should always be drawn by venipuncture from 2 independent sites.
  - An order from a Licensed Independent Practitioner (LIP) is needed to draw a set of blood cultures from a central line. A set consists of one aerobic bottle and one anaerobic bottle. Two sets should be collected.
  - A positive peripherally drawn culture may be followed with a culture drawn from the central line to determine if the line has been sterilized by antibiotics.
  - The lab requisition must clearly state that the specimen was obtained from a central line.

Additional Recommendations for Insertion of Arterial Catheters and Pressure Monitoring Devices for Adult and Pediatric Patients

Insertion of Arterial Catheters

- Insertion of radial arterial catheters
  - An observer will monitor the insertion using a checklist to verify appropriate insertion technique. (See **Appendix A** for checklist.)
  - Wash hands with an antimicrobial soap or apply an alcohol hand rub.
  - Don a cap, mask, sterile gown, sterile gloves and use a small sterile fenestrated drape. As an option, a small sterile non-fenestrated drape, to open supplies onto a sterile field, may be added.
  - Use an alcohol/CHG solution (2% chlorhexidine/70% isopropyl alcohol) to prep the insertion site. Let the alcohol/CHG solution (2% chlorhexidine/70% isopropyl alcohol) air dry before inserting the catheter. For premature neonates: see **Appendix B** for premature neonates whose birthweight is <1000 g and who are ≤28 days of age.
  - Chlorhexidine-impregnated dressings must be placed to protect the insertion site. Fix the catheter to the skin with a sterile adhesive product before applying the dressing.
  - Either gauze and tape or a polyurethane dressing can be used.

- If gauze and tape are used, it must be changed every 48 hours.
- If polyurethane is used, it must be changed every 7 days. However, if the site begins to ooze blood, the dressing must be changed to a gauze and tape dressing which must be changed every 48 hours.

- During femoral artery catheter insertion, maximal sterile barrier precautions will also be used.
  - Apply a chlorhexidine-impregnated dressing to the insertion site followed by a dressing.
  - Either gauze and tape or a polyurethane dressing can be used.
  - If gauze and tape is used, it must be changed every 48 hours.
- If polyurethane is used, it must be changed every 7 days. However, if the site begins to ooze blood, the dressing must be changed to a gauze and tape dressing which must be changed every 48 hours.

Replacement of Catheter and Pressure Monitoring System

- Replace arterial catheters only when there is a clinical indication.
- Remove the arterial catheter as soon as it is no longer needed.
- Replace 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.

Care of Pressure Monitoring Systems

- General Measures
  - Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile.
  - 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.
  - When the pressure monitoring system is accessed through a diaphragm rather than a stopcock, scrub the diaphragm with alcohol and let it dry before accessing the system.
  - Do not administer dextrose-containing solutions or parenteral nutrition fluids through the pressure monitoring circuit.

Recommendations for Umbilical Catheters in Neonates

Replacement of Catheters

- Remove and do not replace umbilical catheters (arterial or venous) if any signs of umbilical infection, catheter-related bloodstream infection or thrombosis are present.
- Replace umbilical venous catheters only if the catheter malfunctions.

Catheter-site Care

- Cleanse the umbilical insertion site with CHG or povidone iodine before catheter insertion. Avoid tincture of iodine because of the potential effect on the neonatal thyroid. See **Appendix B** for premature neonates.
- Do not use topical antibiotic ointment or creams on umbilical catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance.
- Add low doses of heparin (0.25-1.0 U/ml) to the fluid infused through umbilical arterial catheters.
- Remove umbilical catheters as soon as possible when no longer needed or when any sign of umbilical infection, vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place >5 days.
- 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 venous catheter.

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See Non-IHOP / Nursing Services:
7.6.06 Central Catheters and Peripherally Inserted Central Catheters, Neonatal

Appendix A

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Central Intravenous Catheter and Arterial Catheter Insertion Practices Monitoring Form

Data Collected by: _____ Date of Insertion ____ / ____ / _____

Patient Initials _____ UH# _____ Procedure Start Time:_____

Male____ Female____ DOB ____ / ____ / _____ Procedure End Time: _____

Event type: CVC____ PAC____ PICC____ Location of Pt: MICU____ SICU____ BICU____ TDCU____ NCCU____

Site of insertion: subclavian ____ internal jugular ____ arm (PICC) ____ femoral ____ radial artery ____

Operator's Name (central line or radial artery inserter): _____

Operator's Occupation: Attending ____ Intern/Resident ____ Fellow ____ PA ____

Nurse ____ Medical Student ____ Other _____ (please specify)

Reason for inserting: New indication ____Suspected central line infection____ Other (explain)_____

Replace (rewire) malfunctioning central line ____

Replace (rewire) central line in preparation for discharge from the ICU____

Insertion practices:

Mask donned	☐ Yes ☐ No ☐ Yes, after intervention
Cap donned	☐ Yes ☐ No ☐ Yes, after intervention
Eye shield donned	☐ Yes ☐ No ☐ Yes, after intervention
Performed hand hygiene	☐ Yes ☐ No ☐ Yes, after intervention
Touched any surface or object after hand hygiene and before donning sterile gown and gloves	☐ Yes ☐ No ☐ No, after intervention
Sterile gloves	☐ Yes ☐ No ☐ Yes, after intervention
Sterile gown	☐ Yes ☐ No ☐ Yes, after intervention
Gloves pulled up over cuffs of gown	☐ Yes ☐ No ☐ Yes, after intervention
Touched gown and/or gloves to nonsterile surface prior to setting up the sterile field	☐ Yes ☐ No ☐ No, after intervention
Skin preparation with 2% chlorhexidine/alcohol	☐ Yes ☐ No ☐ Yes, after intervention
Was chlorhexidine/alcohol prep completely dry *before* first skin puncture or start of rewire procedure	☐ Yes ☐ No ☐ Yes, after intervention
Sterile full body fenestrated drape used (small fenestrated drape for radial artery catheter insertion)	☐ Yes ☐ No ☐ Yes, after intervention
Placed sterile fenestrated full body drape or sterile small fenestrated drape over insertion site without contaminating the drape during placement	☐ Yes ☐ No ☐ Yes, after intervention

Number of skin punctures (circle one) 1 2 3 ≥4 ☐ N/A for rewire

List any other breaks in technique that occur before or during insertion of the catheter_____

_____

(This section to be answered only if your are replacing a line)

For catheter exchange, managed wire without contamination	☐ Yes ☐ No ☐ Yes, after intervention
For catheter exchange, new sterile gloves donned prior to insertion of new catheter	☐ Yes ☐ No ☐ Yes, after intervention

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Appendix B

Evidence-based Recommendations for Neonate Bathing

General bathing principles
1. Implement safety principles when bathing newborns: • Use standard precautions, including wearing gloves until after the newborn's first bath (which ideally should be between 6-24 hours after birth). • Ensure bath equipment is not a source of cross contamination among newborns. • Implement environmental controls to create a neutral thermal environment and to minimize heat loss.
2. Bathe according to facility protocols and include measures to reduce stress and prevent heat loss associated with bathing. Bathing techniques include: • Immersion (tub) bathing (recommended). • Swaddled (tub) bathing (recommended to reduce stress). • Sponge bathing (least recommended).
First bath - applies to all newborns, but additional considerations for preterm infants given below
1. Provide the first bath once cardiorespiratory and thermal stability have been achieved. • Ideally, the first bath should occur between 6 and 24 hours of life. • For infants born to an HIV-positive mother, the first bath should occur as soon as possible after birth.
2. Use warm tap water and a minimal amount of pH neutral or slightly acidic cleanser to assist with removal of blood and amniotic fluid.
3. Leave vernix intact as much as possible.
4. Keep bath time as short as possible.
5. Use appropriate rewarming measures after bathing, including skin-to-skin contact
Routine bathing
1. Frequency of bathing and time of day should be based on individual need. Until crawling, bathing does not need to be more than every few days/twice a week. Appropriate safety measures should be used.
2. Shampooing once or twice a week is usually adequate. Ensure skin and eyes do not become irritated.
Bathing preterm infants
1. Consider weight, gestational age, and severity of illness when bathing preterm infants
2. For infants less than 32 weeks of gestation, consider the use of warm water only bathing during the first week of life due to skin irritation risk with cleansers.
3. Use warm sterile water when areas of skin breakdown are evident
Considerations for water and cleansers
1. Use warm tap water with a mild, gentle cleanser. • Select mild cleansing bars or liquid cleansers that have a neutral or mildly acidic (pH 5.5-7.0) or have minimal impact on the baby's skin surface pH. • Some cleansers pose risks to newborn skin including skin and eye irritation, and disruption of normal skin pH or microbiome. • If eczema family history (atopic dermatitis), bathing products and emollients will need special consideration.
2. Choose products containing preservatives that have demonstrated safety in newborns
3. Avoid the use of antimicrobial soaps or chlorhexidine.
4. Use of herbal therapies can result in allergic contact dermatitis or eczema. Check ingredients/product and whether it can be used on newborn skin.