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Owner	Sherie Goldbach: Project Coordinator
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The Prevention of Intravascular Catheter-Related Infections

I. Description

Describes the infection prevention and control guidelines to prevent intravenous catheter-related infections.

II. Policy

A. General Recommendations for All Intravascular Catheters

1. For additional guidelines, refer to Nursing Policies:
    a. Central Venous Access Device (CVAD) Care and Maintenance
    b. Midline Catheters
    c. Parenteral Nutrition (PN)
    d. Peripheral Intravenous Device and Venipuncture
2. Health Care Worker Education and Training
    a. Initial and ongoing education and training of health care workers who manage intravascular catheters is conducted by the Venous Access Team, CVAD Liaison Team, Nursing Department, and Center for Nursing Excellence includes indications for the use of and procedures for the insertion and maintenance of intravascular devices, and appropriate infection prevention measures to prevent intravascular catheter-related infections. Infection

Prevention personnel will conduct surveillance for intravascular device-related infections to determine infection rates, monitor trends in those rates, and assist in identifying lapses in infection prevention practices.

3. Hand Hygiene
    - Refer to Infection Prevention policy: Hand Hygiene and Use of Antiseptics for Skin Preparation
4. Catheter Removal
    - Remove non-essential CVADs. Assess the need the intravascular catheters on a daily basis. Remove catheters not required for patient care.
5. Skin Antisepsis
    - Disinfect skin prior to insertion and at time of dressing change. Refer to the Infection Prevention policy: Hand Hygiene and Use of Antiseptics for Skin Preparation.
6. Dressings
    a. Refer to Nursing policies for specific instructions:
        i. Central Venous Access Device (CVAD) Care & Maintenance
        ii. Midline Catheters
        iii. Peripheral Intravenous Device and Venipuncture
    b. Change transparent dressings and perform site care every 7 days or immediately if the dressing is soiled loose, or damp; change gauze dressings every 2 days or earlier if the dressing is soiled loose or damp.
    c. Less frequent dressing changes may be used for selected pediatric patients to reduce the risk of catheter dislodgement.
    d. Do not use topical antibiotic ointment to the insertion site during dressing changes because of the potential to promote fungal infections and antimicrobial resistance. An exception to this guidance is hemodialysis catheters.
7. Administration Sets
    a. General Recommendations
        i. Change IV tubing per Nursing policy: Central Venous Access Device (CVAD) Care & Maintenance.
        ii. Change all IV tubing whenever a catheter is removed due to a suspected catheter-related infection.

iii. Extension tubing attached to the catheter should be treated as part of the catheter.

iv. It is not necessary to change the IV fluids at the time the tubing is changed unless the bag has been hanging for 96 hours or contamination is suspected.

v. Tubing/bag connection must be prepped with a sterile alcohol wipe for at least 5 seconds and allowed to dry prior to removing old tubing and spiking new bag.

vi. Change IV tubing whenever contamination is suspected (e.g., uncapped end of tubing falls on the floor or bed)

vii. Vasopressors or other Life Supporting Medications

- For critically ill patients who are receiving vasopressors or other life supporting medications through a manifold stopcock system, it is allowable to delay changing the manifold. When the patient's condition improves, the manifold should be changed at the same interval as the remainder of the administration sets.

b. Prime & Spike

- IV fluids will be prepped immediately prior to use and started within 1-hour of IV fluid spike and prime.

c. Accessing Intravenous Devices

i. Disinfect catheter hubs, needless connectors and injector ports before accessing the catheter per Patient Care policy: Medication Administration.

ii. The IV system should remain a closed system. If tubing must be disconnected, use aseptic technique to prevent contamination per Patient Care policy: Medication Administration. The catheter must be capped with a needleless access port and the administration set tubing closed with a sterile cap.

iii. Flush intravenous access devices per Nursing policy: Central Venous Access Device (CVAD) Care & Maintenance.

8. Pressure Monitoring Systems (Arterial and Venous)

a. Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile.

b. Minimize the number of manipulations 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. If stopcocks are used, treat them as sterile and cover them with a sterile cap or syringe when not in use.

c. Replace the pressure monitoring system every 96 hours.

9. Preparation and Quality Control of Intravenous Admixtures

    a. Admix all parenteral fluids in the Pharmacy under a laminar-flow hood using aseptic technique. Strict aseptic technique must be used when preparing these solutions. Refer to the Infection Prevention Policy: Pharmacy.

    b. Check all containers of parenteral fluid for visible turbidity, leaks, cracks, particulate matter, and the manufacturer's expiration date before use and discard if present or solution expired. Report abnormal observations to the originating source of the parenteral fluid (i.e., pharmacy for pharmacy prepared medications, central distribution for stocked fluids, etc.) Share any information that could assist in identifying a wider issue such as lot numbers, date of preparation, type of defect, etc.

    c. Medication Vials

        - Refer to the Patient Care policy: Medication Administration for instructions on accessing medicine vials.

10. Prophylactic Antimicrobials

    a. Do not routinely administer antimicrobials for prophylaxis of catheter colonization or bloodstream infection before insertion or during use of an intravascular device.

    Prophylactic Antibiotic Lock Therapy might be considered in high-risk patients to prevent CLABSI in lines that are infrequently accessed such as dialysis and chemotherapy lines. See Pharmacy Guideline: Antibiotic Locks for the Treatment or Prevention of Catheter-Related Bloodstream Infections.

B. Additional Recommendations for Central Venous Catheters

(Including PICC, Pulmonary Artery Catheters in Adult and Pediatric Patients)

1. Patients/family member should be educated regarding measures to prevent catheter-associated infections and documented.

2. Selection of Catheters (for additional guidance consult the Best Practice Guideline for Adult Vascular Access, UNC Medical Center: Focus on Central Lines)

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

b. A peripherally inserted central catheter (PICC) may be indicated when the duration of therapy is expected to exceed 6 days.

c. Use tunneled catheters (i.e., Powerlines, Hickman or Broviac) or implantable vascular access devices (i.e., ports) when long-term vascular access (>30 days) is anticipated. Use totally implantable access devices for long-term intermittent venous access. Use a tunneled catheter for frequent or continuous access.

3. Selection of Insertion Site

    a. The risk and benefits of different insertion sites (e.g., subclavian vein vs. internal jugular vein) must be considered on an individual basis with regard to infectious and noninfectious complications.

    b. Avoid using the femoral vein for central venous access in adult patients when the catheter is placed under planned and controlled conditions.

4. Catheter Insertion

    a. Central catheters should be inserted with maximal sterile barrier technique (e.g., patient draped in a sterile drape from head to toe) using sterile equipment. This includes sterile gloves, sterile gown, hair covering, and a surgical mask with eye protection.

    b. A checklist can be used as a reminder for important elements of insertion. Here is a link to the Central Line Insertion Check List (located on the CLABSI Prevention Initiative page Infection Prevention intranet site), which can also be found in the plastic sleeves of the triple lumen and introducer kit.

    c. Needle-guided access using ultrasound technology should be used for CVAD insertion whenever possible to reduce the risk of mechanical complications and infection. Transilluminators may also be used for catheter insertion.

    d. Perform all ultrasound guided vascular access device insertions (PIV, Midline, PICC, CVC, arterial line) with the use of a sterile sheath and single-use sterile gel.

    e. When inserting the catheter, a wide field should be prepped using a 2% chlorhexidine gluconate and alcohol solution (e.g., Chloraprep) unless there is a contraindication in which case 70% alcohol, or 10% povidone iodine may be used. Solutions should be allowed to air dry.

    f. Use a sterile sleeve to protect pulmonary artery catheters.

    g. The catheter site should be dressed immediately after insertion.

i. **Temporary (<30 days) non-tunneled catheters** (e.g., triple lumen catheters) should be dressed immediately after insertion. This includes catheters placed in Vascular Interventional Radiology (VIR) and the Operating Room (OR).

ii. **Long-term tunneled catheters** (e.g., broviacs, hickmans) are dressed as a central line.

iii. **Implanted ports** are dressed as a surgical wound immediately after placement. When the port is accessed with a non-coring needle (e.g., Port Safety Needles), the site is dressed as a central line. The dressing and non-coring needle are changed every 7 days.

5. **Central Venous Catheter Dressing Changes**

    a. Generally, central venous catheters (including Peripherally Inserted Central Catheters – PICC's) are dressed using a sterile transparent dressing and CHG impregnated product. The dressing is changed every 7 days or sooner if the dressing becomes loosened, damp, or soiled.

    b. A CHG containing product (i.e., CHG Tegaderm, BioPatch) should be used on central venous access devices and midline catheters for inpatients unless contraindicated. Contraindications include sensitivity to product, umbilical catheter, and use on PICC lines with premature infants in NCCC. The CHG containing product should be placed at the insertion site within 24 hours of catheter placement. If the dressing must be changed prior to the 7-day time-period, the CHG containing product also should be changed at that time. For known or suspected CHG allergies, a silver impregnated disc (Silverlon) and transparent dressing is the recommended alternative (refer to the Central Line Dressing Troubleshooting Guide).

    c. **Refer to the** Nursing policy: Central Venous Access Device (CVAD) Care & Maintenance for detailed instructions.

6. Catheter exchange/replacement

    a. Guidewire Exchange

        i. Routine guidewire exchange of non-tunneled catheters has not been shown to reduce CLABSI and should be avoided.

        ii. Use a guidewire exchange to replace a malfunctioning non-tunneled catheter if there is **no evidence of infection** and the risk of inserting a catheter into a new site is unacceptably high. This procedure is completed using the same aseptic technique as used to place a new central line.

iii. Use full barrier precautions (hair cover, mask, sterile gown, gloves, towels, drape) and site preparation as if placing a new catheter in a new site. Use a new set of sterile gloves prior to handling the new catheter.

b. Do not use guidewire-assisted catheter exchange whenever catheter-related sepsis is documented, or tunnel/IV site infection is present. If the patient requires continued vascular access, remove the implicated catheter, and replace it with another catheter at a new site.

7. Flush Solutions and Anticoagulants

a. Patients with a positive HIT test (heparin induced thrombocytopenia) or pending HIT test result should not receive heparin. Use of a positive or neutral pressure cap is recommended.

b. Use commercially prepared, pre-filled flush solutions.

8. Additional Recommendations for Hemodialysis/Apheresis Catheters

a. Selection of Catheter

- Use cuffed tunneled central venous catheters for hemodialysis if the period of temporary access is anticipated to be prolonged (i.e., >3 weeks). Use a fistula or graft instead of a central catheter for permanent access.

b. Selection of Insertion Site

- Use the jugular or femoral vein rather than a subclavian vein to avoid venous stenosis.

c. Catheter Insertion

- Whenever possible, these catheters should be placed in Vascular Interventional Radiology or the Operating Room. If the catheter must be placed outside these areas, follow the insertion guidelines for central venous catheters provided in this policy.

d. Catheter Changes

- Do not routinely replace hemodialysis catheters as a method to prevent catheter-related infection. There is no routine change required for hemodialysis/apheresis catheters. Refer to the catheter change section for Central Venous Catheters in this policy for additional information regarding catheter changes.

e. Additional Guidelines

i. Catheters, shunts, fistulas, femoral, subclavian, or other vascular

access catheters (e.g., ECMO cannulas) will be cared for using aseptic technique. Hemodialysis catheter and Apheresis catheter care is described in detail in the Nursing policy: Central Venous Access Device (CVAD) Care & Maintenance. ECMO vascular access catheter care is performed following the guidelines in the ECMO policies: Care of the SICU ECMO Patient, Care of the PICU ECMO Patient and Nursing policy: ECMO and Temporary Ventricular Assist Devices in the CTICU.

ii. Only hemodialysis staff/nephrologists may access catheters used for dialysis. The only exception to this policy would be in the event of a life-threatening medical emergency where rapid vascular access is required for resuscitation. If the catheter is being considered for other purposes, the Nephrology Consult Service should be contacted.

iii. Hemodialysis and Apheresis staff will perform catheter dressing changes on treatment days when indicated. Dressings may be changed by any nurse following the Dressing Change procedure within the Nursing policy: Central Venous Access Device (CVAD) Care & Maintenance (refer to the Bedside RN's Guide to Dialysis Catheters for more information).

C. Management of Parenteral Nutrition (PN)

Refer to the Nursing policy: Parenteral Nutrition (PN) for specific instructions.

D. Peripheral Arterial Catheters

1. Arterial Catheter Insertion

    a. A cap, mask, sterile gloves, and a large sterile fenestrated drape should be used during peripheral arterial catheter insertion.

        - For peripherally inserted arterial catheters in the neonatal population, minimally sterile gloves and mask is required during insertion.

    b. The site is prepped and dressed using guidelines for peripheral venous catheters.

E. Recommendations for Umbilical Catheters

1. Catheter Insertion/Care

    a. Umbilical arterial and venous catheters are placed using sterile technique with sterile barrier, gowns, masks, and gloves. Hair and beards must be

covered.

b. Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Avoid tincture of iodine because of the potential effect on the thyroid. Povidone iodine may be used.

c. Dressings are not routinely applied.

d. Do not use topical antibiotic ointment or creams on an umbilical catheter insertion site.

e. Replace IV tubing and all add on devices at least every 96 hours; lipid-containing lines are changed every 24 hours.

f. Complete infusions of lipid containing fluids within 24 hours of hanging the fluid.

2. Catheter Changes

a. Umbilical catheters should be removed as soon as no longer essential for medical management or for any signs of catheter-related bloodstream infection.

b. Umbilical catheters are not routinely changed.

c. Optimally, remove umbilical arterial catheters within 5 days. Umbilical venous catheters can be left in place up to 14 days if managed aseptically.

F. Special Considerations – Documentation

Licensed Independent Practitioners (LIPs) and/or nurses should document the following:

1. Placement of IV lines under non-sterile conditions such as in emergencies.
2. Use of hemodialysis, PN catheters for other purposes.
3. Inability to change a catheter despite known or probable catheter sepsis.
4. Any line related complications (e.g., phlebitis, extravasation with tissue damage, sepsis).
5. Education of patients and caregivers of patients going home with central line catheters.

G. Management of Stopcock Ports

1. Stopcocks should be used only, when necessary, as in the care of critically ill patients.
2. Prep all ports with a sterile alcohol swab and let dry prior to access.
3. Stopcock ports must be covered with a sterile cap. Never reuse an old cap. Stopcocks

on venous lines (not arterial lines) should be capped with a needleless access cap and all accesses should be through the cap.

4. Flush stopcock immediately if blood is seen in the port.

H. IV-Related Infections

1. Notify the LIP if there is a suspicion of site infection. Clean site and cover with a small occlusive sterile dressing.
2. If an IV system is to be discontinued because of suspected IV-related infection, such as purulent thrombophlebitis or bacteremia, the skin at the skin-cannula junction should be cleaned with CHG/alcohol allowing 30 second contact time and allowed to dry before cannula removal.
    - Notify Infection Prevention of any suspected contamination of IV fluids.
        i. If contamination of fluid is confirmed, the implicated bottle and the remaining units of the implicated lot should be saved, and the lot numbers of fluid and additives should be recorded.
        ii. If intrinsic contamination (contamination during manufacturing) is suspected, the local health authorities, CDC, and the U.S. Food and Drug Administration should be notified immediately.

III. Responsibility Statement

Implementation of this policy is the responsibility of Nursing service line directors, Vascular Access Team, Nutrition Support Service, and Medical Staff.

IV. References

CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011.

Infusion Nurses Society. Infusion Nursing Standards of Practice. Journal of Infusion Nursing. Jan/Feb 2016.

Infusion Nurses Society. (2011) Policies & Procedures for Infusion Nursing, 4th Edition.

V. Related Policies

ECMO Policy: ECMO and Temporary Ventricular Assist Devices in the CTICU

ECMO Policy: Care of the PICU ECMO Patient

ECMO Policy: Care of the SICU ECMO Patient

Infection Prevention Policy: Hand Hygiene and Use of Antiseptics for Skin Preparation

Infection Prevention Policy: Pharmacy

Nursing Policy: Central Venous Access Device (CVAD) Care and Maintenance

Nursing Policy: Midline Catheters

Nursing Policy: Parenteral Nutrition (PN)

Nursing Policy: Peripheral Intravenous Device and Venipuncture

Patient Care Policy: Medication Administration

Approval Signatures

Step Description	Approver	Date
Policy Stat Administrator	Kimberly Novak-Jones: Nurse Educator	09/2023
	Thomas Ivester: CMO/VP Medical Affairs	09/2023
	Emily Vavalle: Dir Epidemiology	09/2023
	Sherie Goldbach: Project Coordinator	09/2023

Applicability

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