

Fundamental Infection Prevention Applied to Inpatient Hemodialysis

A Guide for Infection Preventionist

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NEBRASKA INFECTION CONTROL ASSESSMENT AND PROMOTION PROGRAM

Dialysis Vascular Access: Preventing Blood Stream Infections and Ensuring Safe Injection Practices

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Outcomes

Identify

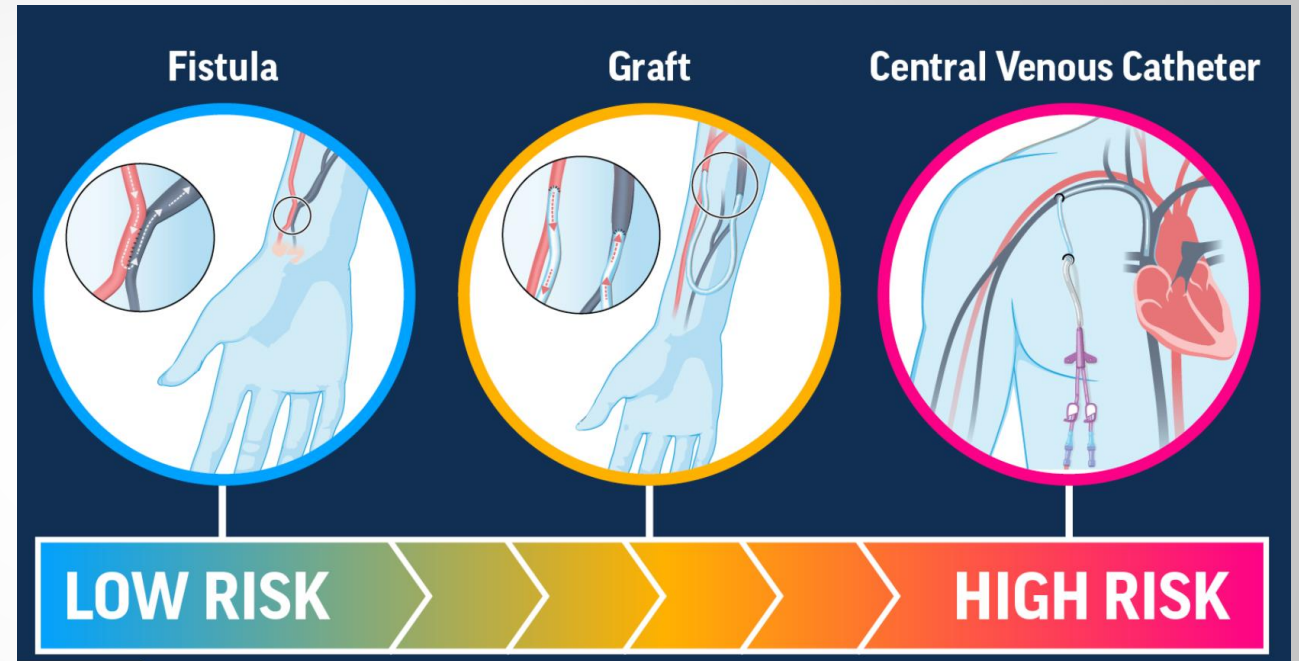
Identify the infection risk associated with various types of hemodialysis access.

State

State where to locate the best practice guidelines and recommendations for infection prevention in hemodialysis access.

Vascular Access Types

AV Fistula	AV Graft	Tunneled CVC	Nontunneled CVC
Surgical anastomosis created between an artery and a vein	A synthetic graft is used to create the anastomosis between the artery and vein	A catheter with a cuff is inserted under the skin to a large vein.	Catheter directly inserted through the skin to a large vein under the skin.
Requires 6 weeks to 4 months before it can be used	Requires 3-6 weeks before it can be used	Available for immediate use	Available for immediate use
Preferred access by KDOQI	Higher risk of infection and complications compared to AV fistulas	Recommended if expected to use > 3 weeks	Short term use only
Lowest risk of infection	Second lowest risk of infection	Second highest risk of infection	Highest risk of infection



[Preventing Bloodstream Infections in People on Dialysis | VitalSigns | CDC](#)

Blood Stream Infections (BSI)

BSIs are serious infections caused by bacteria that get into the blood stream

Central line catheters have a higher risk of infection than fistulas or grafts

Symptoms include fever, chills, low blood pressure

Staphylococcus aureus (found on skin) is the most common group of bacteria that causes BSI's

MRSA (Methicillin-resistant Staphylococcus aureus) is the most common type

AVF is considered the optimal vascular access due to superior durability, lower risk of infection, least number of interventions to maintain patency

Dialysis Guidelines

National Kidney Foundation
(NKF) Kidney Disease
Outcomes Quality
Indicators(KDOQI): Provide
clinical practice guidelines

- [2019 Vascular Access Guidelines](#)

CDC: MMWR
Recommendations and
Reports April 27, 2001;

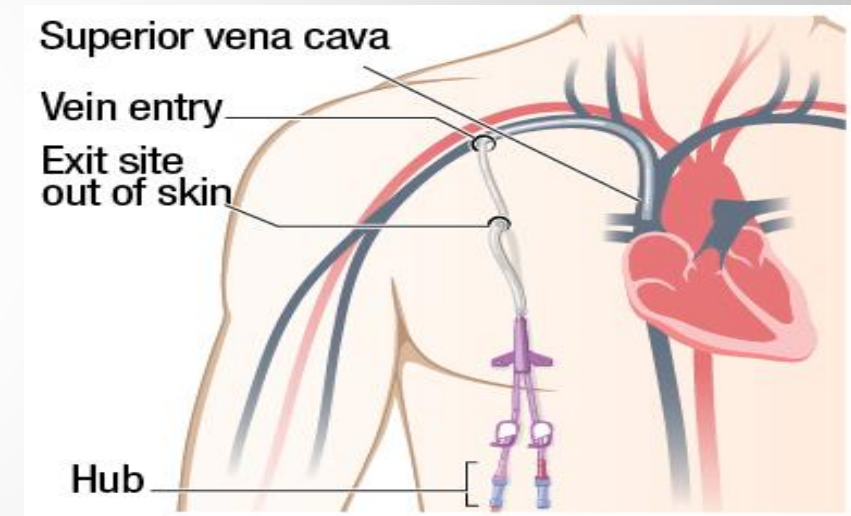
- [Recommendations for Preventing Transmissions of Infections Among Chronic Hemodialysis Patients](#)
- [2011 Intravascular Catheter-related Infections \(BSI\) Prevention Guidelines](#)

Hemodialysis (HD) Catheter-CVC

Hemodialysis (HD) Catheter

- A catheter (small tube) inserted in the neck, chest, or leg near the groin
- Most are temporary access
- Long-term catheters are tunneled-cuffed catheters that are held in place with stitches and a special cuff that the skin grows into
- Can be used immediately after insertion

Tunneled is placed under the skin and meant to be used longer duration of time



Non-tunneled is placed directly into the vein and designed to be temporary

CVC: Indications For Short-term

AVF or AVG created, but not ready to use

Acute transplant rejection or other complications requiring dialysis

Peritoneal Dialysis (PD) patient with complications that require time-limited peritoneal rest

PD patient has a living donor transplant confirmed with an operation date in the near future

AVF or AVG complication such as infiltration injury or cellulitis

CVC: Indication for Long-term or Indefinite Duration

Multiple prior failed AV accesses with no available options

Valid patient preference whereby use of AV access would severely limit QOL

Limited life expectancy

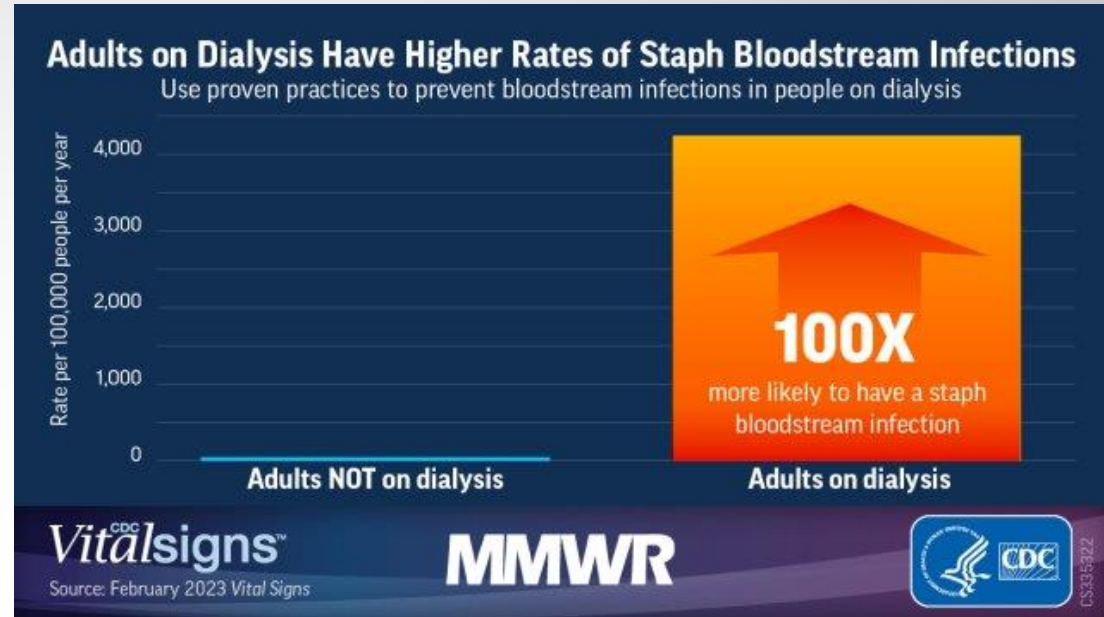
Absence of AV access creating options

Special medical circumstances

Fistula First Catheter Last (FFCL)



Vital Signs:
Health
Disparities in
Hemodialysis-
Associated
Staphylococcus
aureus
Bloodstream
Infections —
United States,
2017–2020 |
MMWR (cdc.gov)



Conclusions and implications for public health practice: Disparities exist in hemodialysis-associated *S. aureus* infections. Health care providers and public health professionals should prioritize prevention and optimized treatment of ESKD, identify and address barriers to lower-risk vascular access placement, and implement established best practices to prevent bloodstream infections.

Best Practices for Bloodstream Infection Prevention in Dialysis Setting | Dialysis Safety | CDC

CDC Approach to BSI Prevention in Dialysis Facilities

(i.e., the Core Interventions for Dialysis Bloodstream Infection (BSI) Prevention)

1. Surveillance and feedback using NHSN

Conduct monthly surveillance for BSIs and other dialysis events using CDC's National Healthcare Safety Network (NHSN). Calculate facility rates and compare to rates in other NHSN facilities. Actively share results with front-line clinical staff.

2. Hand hygiene observations

Perform observations of hand hygiene opportunities monthly and share results with clinical staff.

3. Catheter/vascular access care observations

Perform observations of vascular access care and catheter accessing quarterly. Assess staff adherence to aseptic technique when connecting and disconnecting catheters and during dressing changes. Share results with clinical staff.

4. Staff education and competency

Train staff on infection control topics, including access care and aseptic technique. Perform competency evaluation for skills such as catheter care and accessing every 6-12 months and upon hire.

5. Patient education/engagement

Provide standardized education to all patients on infection prevention topics including vascular access care, hand hygiene, risks related to catheter use, recognizing signs of infection, and instructions for access management when away from the dialysis unit.

6. Catheter reduction

Incorporate efforts (e.g., through patient education, vascular access coordinator) to reduce catheters by identifying and addressing barriers to permanent vascular access placement and catheter removal.

7. Chlorhexidine for skin antiseptics

Use an alcohol-based chlorhexidine (>0.5%) solution as the first line skin antiseptic agent for central line insertion and during dressing changes.*

8. Catheter hub disinfection

Scrub catheter hubs with an appropriate antiseptic after cap is removed and before accessing. Perform every time catheter is accessed or disconnected.**

9. Antimicrobial ointment

Apply antibiotic ointment or povidone-iodine ointment to catheter exit sites during dressing change.***

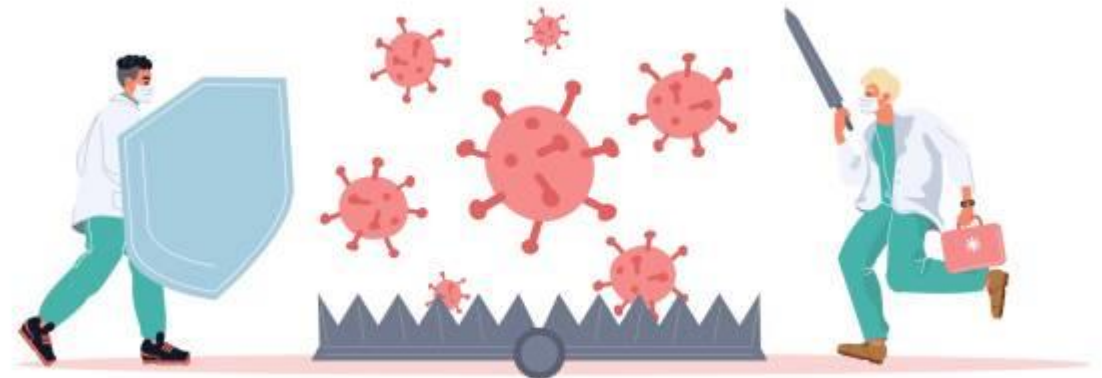
* Povidone-iodine (preferably with alcohol) or 70% alcohol are alternatives for patients with chlorhexidine intolerance.

** If closed needleless connector device is used, disinfect device per manufacturer's instructions.

*** See information on selecting an antimicrobial ointment for hemodialysis catheter exit sites on CDC's Dialysis Safety website (<http://www.cdc.gov/dialysis/prevention-tools/core-interventions.html#sites>). Use of chlorhexidine-impregnated sponge dressing might be an alternative.

For more information about the Core Interventions for Dialysis Bloodstream Infection (BSI) Prevention, please visit <http://www.cdc.gov/dialysis>

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Notes/Discussion:**Antiseptic Use and Selection**

As described in the 2011 CDC/Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines for the Prevention of Intravascular Catheter-Related Infections, prior to accessing the catheter hub it should be disinfected with an appropriate antiseptic (greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine). There is not enough evidence to recommend one antiseptic over the others. Generally, antiseptics should be allowed to dry for maximal effect.

If using 70% alcohol, sterile antiseptic pads should be used (sterile pads are labeled sterile and packaging for nonsterile pads often does not state whether the pads are sterile or nonsterile). For practical reasons, pads or similar products might be preferred over other forms of antiseptics (e.g., swabsticks) for disinfecting the catheter as they are malleable and allow for vigorous cleaning of small spaces.

If using an antiseptic that leaves a residue (e.g., chlorhexidine), avoid allowing large amounts of antiseptic to enter the lumen of the catheter to avoid potential toxicities to the patient.

If using chlorhexidine, removing all blood residue is particularly important to maximize the effect of the antiseptic.

Soaking Caps

The role of soaking caps in an antiseptic prior to removing them is not clear. It is not a CDC/HICPAC recommendation. This procedure is described in the 2000 National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (KDOQI) Vascular Access Guidelines but was not included in the 2006 update.

Handling Catheter Hubs

Catheter hubs should always be handled aseptically. Once disinfected, the catheter hubs should not be allowed to touch nonsterile surfaces. This might be best performed by holding them until the antiseptic dries. During this time, the staff member performing the procedure should also ensure that the catheter remains clamped.

When disinfecting catheter hubs, clean, nonsterile gloves can be used if aseptic technique is maintained.

Bloodline Disinfection

When accessing the line, disinfecting the ends of the sterile blood lines is not required if care has been taken not to contaminate the ends of the blood lines (i.e., through careful aseptic technique). Blood lines can become contaminated during connections and disconnections, as well as during the priming process. Contact with contaminated prime waste in prime buckets that have not been properly cleaned and disinfected or through backflow from waste handling ports must be avoided. Disinfecting the bloodlines does not address this issue.

Disconnection and Line Reversals

Catheter hubs should be disinfected again after disconnecting from bloodlines and before replacing a new cap at the end of a treatment. This should be done in a manner similar to that used when disinfecting the hub prior to accessing. Disinfecting the catheter hub and the end of the extracorporeal blood line should also be performed if, during a treatment, a patient must be disconnected and their blood is re-circulated. Anytime a patient's circuit is disconnected this should be done aseptically and the number of times a patient's catheter is disconnected from the blood lines should be minimized to the extent possible.

Securing Caps with Tape

Caution should be used if taping caps on to hubs between treatments. Tape can leave residue on the hubs that might make disinfecting them more difficult.

Use of Masks

Although data supporting the use of masks during catheter accessing/deaccessing to prevent vascular access infections is lacking, this practice is recommended for patients and staff in the 2000 KDOQI guidelines and is included in the Centers for Medicare and Medicaid Services (CMS) End Stage Renal Disease Program Conditions for Coverage Interpretive Guidance.

Personal Protective Equipment (PPE)

Proper PPE should always be worn by staff to avoid exposure to potentially infectious blood and body fluids when connecting/disconnecting catheters.

Aseptic Technique

This includes practices that prevent the contamination of clean/sterile items and surfaces. Once tasks requiring aseptic technique have been started, care must be taken to avoid contamination of gloves and other clean/sterile items that can occur when touching dirty surfaces (e.g., positioning patient, using computer keyboard).

Selected References:

1. National Kidney Foundation. KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for 2006 Updates: Hemodialysis Adequacy, Peritoneal Dialysis Adequacy and Vascular Access. *Am J Kidney Dis* 2006; 48 (suppl 1):S1-S322.
2. National Kidney Foundation. KDOQI Clinical Practice Guidelines for Hemodialysis Adequacy, 2000. *Am J Kidney Dis* 2001; 37 (suppl 1):S7-S64.
3. O'Grady NP, Alexander M, Burns LM, et al. Guideline for the prevention of intravascular catheter-related infections. *Clin Infect Dis* 2011; 52:e162-e193.

Use of Mask

Aseptic Technique

Hemodialysis Central Venous Catheter Scrub-the-Hub Protocol

This protocol outlines a suggested approach to preparing catheter hubs prior to accessing the catheter for hemodialysis. It is based on evidence where available and incorporates theoretical rationale when published evidence is unavailable.

Definitions:

Catheter refers to a central venous catheter (CVC) or a central line

Hub refers to the end of the CVC that connects to the blood lines or cap

Cap refers to a device that screws on to and occludes the hub

Limb refers to the catheter portion that extends from the patient's body to the hub

Blood lines refer to the arterial and venous ends of the extracorporeal circuit that connect the patient's catheter to the dialyzer

Catheter Connection and Disconnection Steps:**Connection Steps**

1. Perform hand hygiene and don new clean gloves.
2. Clamp the catheter (Note: **Always** clamp the catheter before removing the cap. Never leave an uncapped catheter unattended).
3. Disinfect the hub with caps removed using an appropriate antiseptic (see notes).
 - a. (Optional) Prior to cap removal, disinfect the caps and the part of the hub that is accessible and discard the antiseptic pad (i.e., use a separate antiseptic pad for the next step).
 - b. Remove the caps and disinfect the hub with a new antiseptic pad for each hub. Scrub the sides (threads) and end of the hub thoroughly with friction, making sure to remove any residue (e.g., blood).
 - c. Using the same antiseptic pad, apply antiseptic with friction to the catheter, moving from the hub at least several centimeters towards the body. Hold the limb while allowing the antiseptic to dry.
 - d. Use a separate antiseptic pad for each hub/ catheter limb. Leave hubs "open" (i.e., uncapped and disconnected) for the shortest time possible.

4. Always handle the catheter hubs aseptically. Once disinfected, do not allow the catheter hubs to touch nonsterile surfaces.
5. Attach sterile syringe, unclamp the catheter, withdraw blood, and flush per facility protocol.
6. Repeat for other limb (this might occur in parallel).
7. Connect the ends of the blood lines to the catheter aseptically.
8. Remove gloves and perform hand hygiene.

Disconnection Steps:

1. Perform hand hygiene and don new clean gloves.
2. Clamp the catheter (Note: **Always** clamp the catheter before disconnecting. Never leave an uncapped catheter unattended).
3. Disinfect the catheter hub before applying the new cap using an appropriate antiseptic (see notes).
 - a. (Optional) Disinfect the connection prior to disconnection. If this is done, use a separate antiseptic pad for the subsequent disinfection of the hub.
 - b. Disconnect the blood line from the catheter and disinfect the hub with a new antiseptic pad. Scrub the sides (threads) and end of the hub thoroughly with friction, making sure to remove any residue (e.g., blood).
 - c. Use a separate antiseptic pad for each hub. Leave hubs "open" (i.e., uncapped and disconnected) for the shortest time possible.
4. Always handle the catheter hubs aseptically. Once disinfected, do not allow the catheter hubs to touch nonsterile surfaces. Hold the catheter until the antiseptic has dried.
5. Attach the new sterile caps to the catheter aseptically. Use caution if tape is used to secure caps to the catheter (see notes).
6. Ensure that catheter is still clamped.
7. Remove gloves and perform hand hygiene.



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Care of CVC HD Catheters

Only the dialysis team should access HD CVC's

Wash hands and don clean gloves prior to touching

Monitor for signs of infection (redness, warmth, tenderness, pus, and fever)

Always keep the dressing clean & dry

Caps must remain on each end and lines always clamped when not in use

Notify the dialysis team if dressing becomes loose or soiled, caps come off, or signs of infection noticed.

Bathing: catheter should never go under water. Moisture increases the risk of infection.

[Checklist: Hemodialysis catheter exit site care \(cdc.gov\)](#)

Checklist: Hemodialysis catheter exit site care

- ☐ Wear mask (if required) and remove dressing
- ☐ Perform hand hygiene
- ☐ Put on new, clean gloves
- ☐ Apply skin antiseptic
- ☐ Allow skin antiseptic to dry
- ☐ Do not contact exit site (after antiseptics)
- ☐ Apply antimicrobial ointment*
- ☐ Apply dressing aseptically
- ☐ Remove gloves
- ☐ Perform hand hygiene

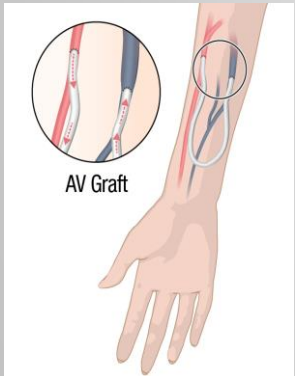
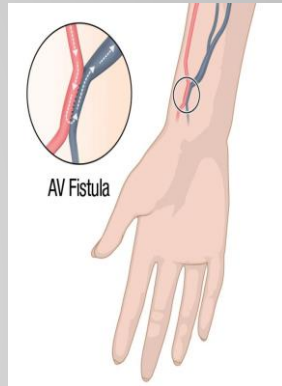
* Use an ointment that does not interact with catheter material



[KDOQI Clinical Practice Guideline for Vascular Access: 2019 Update - American Journal of Kidney Diseases \(ajkd.org\)](#)

Types of Dialysis Accesses- Arterial Venous (AV)

AV Fistula: An artery is connected directly to a vein, usually in the forearm, by a surgeon. The increased blood flow makes the vein grow larger and stronger, then it can be used for repeated needle insertions. It can take 1 month (3-4 months preferred) to be ready for use.



AV Graft: A synthetic tube is used to connect to an artery by a surgeon. It can be used sooner but is more likely to have problems with infection and clotting.

AV Fistula Cannulation Techniques and Infection Risk

Rope Ladder Cannulation: The cannulation needle sites for both arterial and venous needles are rotated along the length of the AV access each dialysis to reduce vessel damage.

Rope ladder cannulation is the preferred cannulation technique for AVFs
Most utilized technique

KDOQI



Buttonhole Technique: Cannulation occurs in the exact same puncture site and needle track tunnel developed by repeated cannulation with a blunt needle at the same location, angle, and depth between the skin and access vein.

Risk of Vascular Access Infection Associated With Buttonhole Cannulation of Fistulas: Data From the National Healthcare Safety Network

Easier for patients to self-cannulate and less painful
Limit AV access buttonhole cannulation only to special circumstances

2023-2014 NHSN DATA 52% BHC (buttonhole cannulation) access-related BSIs were caused by *Staphylococcus aureus*.

Staff Education And Competency Evaluation

- Upon hire, then every 6-12 months
- CDC audit tools and checklist promote core interventions and guide practice

Checklist: Arteriovenous fistula/ graft cannulation

- ☐ Clean site with soap and water
- ☐ Perform hand hygiene (staff)
- ☐ Put on new, clean gloves
- ☐ Apply skin antiseptic and allow it to dry
- ☐ Do not contact site (after antisepsis)
- ☐ Insert needles aseptically
- ☐ Connect to blood lines aseptically
- ☐ Remove gloves
- ☐ Perform hand hygiene



Checklist: Arteriovenous fistula/ graft decannulation

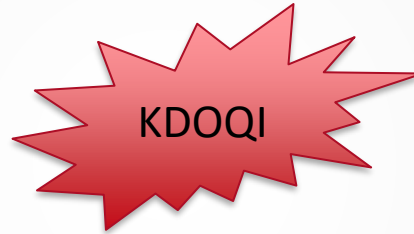
- ☐ Perform hand hygiene (staff)
- ☐ Put on new, clean gloves
- ☐ Disconnect from blood lines aseptically
- ☐ Remove needles aseptically and activate needle retraction device
- ☐ Clean gloves worn (patient and/or staff) to compress site
- ☐ Apply clean gauze/bandage to site
- ☐ Remove gloves (staff and/or patient)
- ☐ Perform hand hygiene (staff and/or patient)



AV Access: Recommendations of Care



Educate patient on using antiseptic to clean the skin prior to every cannulation. (*Expert Opinion*)



Check vascular access and surrounding areas prior to every cannulation for signs and symptoms of infection. (*Expert Opinion*)

Care of AV Fistulas and Grafts

Wash hands and don clean gloves prior to touching

Monitor for signs of infection (redness, warmth, tenderness, pus, and fever)

Keep the access clean & dry-follow dialysis team instructions on removal of dressing

Wash the arm with antibacterial soap or alcohol prior to dialysis

Do not use access arm for blood pressures readings, IV starts, or blood draws.

Access arm should be protected from any type of pressure (i.e., when rolled on side during cares, while transferring, or sleeping)

If access starts bleeding, apply gauze and pressure to site and call dialysis team.

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Injection Safety

CDC-Safe Injection Practices

4 large outbreaks of HBV and HCV among patient in ambulatory care facilities in the US

Contributing factors

Reinsertion of used needles into multiple-dose vial or solution container

Use of a single needle/syringe to administer intravenous medication to multiple patients.

In one outbreak, preparation of medications in the same workspace where used needle /syringes were dismantled may have been a contributing factor.

Deficiencies

Survey of US healthcare workers 1% to 3% reused same needle and/or syringe on multiple patients.

Lack of oversight of personnel and failure to follow up on breaches in IPC practices.

HCW unaware, do not understand, do not adhere to basic IPC and aseptic technique.

THE PROVIDER

DO YOU MULTI-DOSE?



A SINGLE-DOSE VIAL (SDV) is approved for use on a **SINGLE** patient for a **SINGLE** procedure or injection.



SDVs typically lack an antimicrobial preservative. Do not save leftover medication from these vials. Harmful bacteria can grow and infect a patient.

DISCARD after every use!

SIZE DOES NOT MATTER!



SDVs and MDVs can come in any shape and size. **Do not assume** that a vial is an SDV or MDV based on size or volume of medication. **ALWAYS check the label!**



A MULTIPLE-DOSE VIAL (MDV) is recognized by its FDA-approved label.

Although MDVs can be used for more than one patient when aseptic technique is followed, ***ideally even MDVs are used for only one patient.***



MDVs typically contain an antimicrobial preservative to help limit the growth of bacteria. Preservatives have no effect on bloodborne viruses (i.e. hepatitis B, hepatitis C, HIV).



Discard MDVs when the beyond-use date has been reached, when doses are drawn in a patient treatment area, or any time the sterility of the vial is in question!

Single-
Dose or
Multi-
Dose
(cdc.gov)

Centers for Medicare and Medicaid Services final rule for ESRD Facilities- Medication Vials

All single-use injectable medications and solutions be dedicated for use on a single patient and be entered one time only

Medications packaged as multidose should be assigned to a single patient whenever possible

All parenteral medications should be prepared in a clean area separate from potentially contaminated items and surfaces

In hemodialysis settings where environmental surfaces and medical supplies are subjected to frequent blood contamination, medication preparation should occur in a clean area removed from the patient treatment area

Proper infection control practices must be followed during the preparation and administration of injected medications

[Infection Control Requirements for Dialysis Facilities and Clarification Regarding Guidance on Parenteral Medication Vials \(cdc.gov\)](https://www.cdc.gov/dialysis/infection-control-requirements-for-dialysis-facilities-and-clarification-regarding-guidance-on-parenteral-medication-vials)

CDC-Safe Injection Practice Recommendations

1

Limit the use of multi-dose vials and dedicate them to a single patient whenever possible.

2

Always use aseptic technique when preparing and administering injections.

3

Clean and disinfect the medication preparation area on a regular basis and any time there is evidence of soiling.

Audit Tools and Checklists | Dialysis Safety | CDC

Facility Name: _____ Observer: _____
Date(s): _____ Location of Medication Preparation: _____

Audit Tool: Hemodialysis injectable medication preparation

Observe a medication preparation session. (Use a "✓" if action performed correctly, a "Φ" if not performed/performed incorrectly. If not observed, leave blank. All applicable actions within a row must have "✓" for the procedure to be counted as successful.)

Day (i.e., M, Tu, W)	Shift (i.e., 1 - 4)	Discipline	Med prep done in designated area	Med prep area is clean *	All vial(s) are inspected **	Hand hygiene performed	Septum of all vial(s) disinfected	All vials entered with new needle and new syringe	Med prep done aseptically	All single dose vial(s) discarded	All multi dose vial(s) discarded or stored properly

Discipline: P=physician, N=nurse, T=technician, S=student, O=other

Number of sessions performed correctly = _____

Total number of sessions observed = _____

ADDITIONAL COMMENTS/OBSERVATIONS:

*Preparation of injectable medications must be performed in a designated clean area that is free of obvious contamination sources (e.g., blood, body fluids, contaminated equipment, tap water).

**Vial should be discarded if sterility is questionable, or expiration date or beyond-use date has been exceeded. If a multi-dose vial will not be immediately discarded after use, the vial should be labeled upon opening to indicate the beyond-use date.



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Checklist: Hemodialysis injectable medication administration

Injectable medications should be handled and transported from the medication preparation area in a manner that minimizes contamination risk. The provider administering the medication should also ensure the correct medication and dose are being administered to the correct patient.

- ☐ Perform hand hygiene
- ☐ Put on new, clean gloves
- ☐ Scrub injection port with antiseptic*
- ☐ Attach syringe and administer medication aseptically
- ☐ Discard syringe
- ☐ Remove gloves
- ☐ Perform hand hygiene

*The following are appropriate antiseptics: chlorhexidine, povidone-iodine, tincture of iodine, 70% alcohol



Centers for Disease
Control and Prevention
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Zoonotic Infectious Diseases

Guide to Hand Hygiene Opportunities in Hemodialysis

Hand hygiene opportunity category	Specific examples
1. Prior to touching a patient	• Prior to entering station to provide care to patient • Prior to contact with vascular access site • Prior to adjusting or removing cannulation needles
2. Prior to aseptic procedures	• Prior to cannulation or accessing catheter • Prior to performing catheter site care • Prior to parenteral medication preparation • Prior to administering IV medications or infusions
3. After body fluid exposure risk	• After exposure to any blood or body fluids • After contact with other contaminated fluids (e.g., spent dialysate) • After handling used dialyzers, blood tubing, or prime buckets • After performing wound care or dressing changes
4. After touching a patient	• When leaving station after performing patient care • After removing gloves
5. After touching patient surroundings	• After touching dialysis machine • After touching other items within dialysis station • After using chairside computers for charting • When leaving station • After removing gloves

[Audit Tool:
Hemodialysis hand
hygiene observations
\(cdc.gov\)](#)

Please make note of the following during this session.			
	Yes	No	Comments
There is a sufficient supply of alcohol-based hand sanitizer			
There is a sufficient supply of soap at handwashing stations			
There is a sufficient supply of paper towels at handwashing stations			
There is visible and easy access to hand washing sinks or hand sanitizer			



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Contact Us



Call our main department number: 402-552-2881

Office hours are Monday – Friday from 8:00 am – 4:00 pm (CST)

For emergencies, our on-call hours are Saturday – Sunday and Holidays from 8:00 am – 4:00 pm (CST)



**E-mail our department:
NebraskaICAP@NebraskaMed.com**

E-mails will be answered during office hours

Resources

[Preventing Bloodstream Infections in People on Dialysis | VitalSigns | CDC](#)

[KDOQI 2019 Vascular Access Guidelines | National Kidney Foundation](#)

[Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients \(cdc.gov\)](#)

[Intravascular Catheter-related Infection \(BSI\) Prevention Guidelines | Infection Control | CDC](#)

[Vascular Access | National Kidney Foundation](#)

[Best Practices for Bloodstream Infection Prevention in Dialysis Setting | Dialysis Safety | CDC](#)

[Resources & Tools | Dialysis Safety | CDC](#)

[The Buttonhole Technique | National Kidney Foundation](#)

[Safe Injection Practices to Prevent Transmission of Infections to Patients | Injection Safety | CDC](#)

[Single-Dose or Multi-Dose \(cdc.gov\)](#)

[Infection Control Requirements for Dialysis Facilities and Clarification Regarding Guidance on Parenteral Medication Vials \(cdc.gov\)](#)