

## Scope of Guideline

- This guideline applies only to patients with central venous catheters in place

## Scope of the Problem

- Approximately 30,000 central line infections occur each year nationally in the acute care setting.
- CLABSIs occur in patients hospitalized in the ICU, outside the ICU, and in outpatients
- A CLABSI is associated with increased length of hospital stay and increased cost
- On average, each CLABSI costs an institution \$45,814.

## Definitions

- A central line is an intravascular catheter that terminates at or close to the heart or in one of the great vessels and is used for infusion, withdrawal of blood, or hemodynamic monitoring. Great vessels include:
  - Aorta
  - Pulmonary artery
  - Superior vena cava
  - Inferior vena cava
  - Brachiocephalic veins
  - Internal jugular veins
  - Subclavian veins
  - External iliac veins
  - Common iliac veins
  - Femoral veins
- The following devices are not considered central lines (per the NHSN Surveillance definition):
  - Extracorporeal membrane oxygenation (ECMO)
  - Arterial catheters
  - Intra-aortic balloon pump (IABP) devices.
  - Hemodialysis reliable outflow (HeRO) dialysis catheters
  - Impella heart devices
  - Midline catheters
- Identification of CLABSI is made through laboratory results plus signs and symptoms (most often fever)
- For surveillance purposes, a CLABSI is a laboratory-confirmed bloodstream infection where central line is in place for more than two calendar days on the date of event, with day of device placement being Day 1 and the line was also in place on the date of event or the day before.
- A temporary central venous catheter is a short-term central venous catheter that is placed directly into central circulation.
- A tunneled central venous catheter is a long-term central venous catheter that is placed using a subcutaneous tunnel and entering central circulation. It is placed in Interventional Radiology.

## Pathogenesis of CLABSI

- Mechanisms (Appendix A)
  - Pathogen migration along external surface
    - More common
    - Usually occurs early after insertion (<7 days)
  - Hub contamination with intraluminal colonization
    - More common
    - Usually occurs > 10 days after insertion
  - Hematogenous seeding from another source
  - Contaminated infusates

## Prevention

- CLABSIs can be prevented through proper insertion and management and early removal of a central line
- CLABSIs originate from the insertion site, hub of a lumen, or both
- Daily bathing with chlorhexidine gluconate (CHG) impregnated cloth, foam or soap.
  - CHG cloths are the preferred over foam or soap

## Prior to Central Line Insertion

- Decisions regarding the type of device, duration of use, and intended therapy and retention should be determined on an individual basis in consultation with the primary service, vascular access team, pharmacy, interventional radiology or surgery as needed. Refer to the [Venous Access Device Selection Clinical Practice Guideline](#).
- Preferred site for temporary central venous catheter (CVC) insertion is: internal jugular.
- Catheterization of the femoral vein is to be avoided.
- Complete informed consent
- Perform [Time Out](#)

## During Central Line Insertion

- Utilize the all-inclusive catheter insertion kit.
- Use the [Central Venous Catheter \(CVC\) Insertion Checklist](#) with **EVERY** central line insertion.
- Insertion team should include both an
  - Operator (MD or LIP)
  - Assistant (RN, APP, or MD)
- Use ultrasound guidance for internal jugular catheter insertions
- Perform hand hygiene with soap / water or alcohol-based hand rub prior to starting insertion procedure.
- All staff present in the room during insertion should don a hat and mask.
- Prep site, wearing sterile gloves, with ChlorPrep® for 30 seconds (if femoral, 2 minutes) using a back and forth friction scrub and allow the area to air dry prior to skin puncture.

## Figure 1 Central Line Maintenance Remember C.L.A.B.S.I.

### C – Change Tubing

- Change and label all continuous infusion tubing every 96hr or immediately change when contamination is suspected or integrity of the product is compromised
  - IV solutions with lipid emulsion (ex. TPN) change tubing q24hrs
  - Propofol or Clevidipine change tubing q12hr
- Change and label all intermittent infusion tubing q24hr or immediately change when contamination is suspected or integrity of the product is compromised
- Change luer lock connectors, filters, and stopcocks with tubing change or immediately if integrity is compromised
- Document date connector changed in IHIS ([Connector documentation in IHIS](#))
  - Tego® Connector changes are every 7 days
  - MaxZero® Connector changes are every 96 hours

### L – Line Necessity Assessment Daily

- Leave catheters in place for as short a time as possible; remove CVCs as soon as it's use is no longer clinically indicated
- Discuss during multidisciplinary rounds daily and document in IHIS

### A – Aseptic Access

- Maintain asepsis when accessing line
- Apply Curoso® Disinfecting Port Protector **in all inpatients with central lines**
  - All open central line ports
  - All open peripheral IV ports
  - All open ports on IV tubing
- If Curoso® Disinfecting Port Protector has not been in place for at least 1 minute, scrub hub with alcohol products for at least 15 seconds and let dry completely before accessing
- If the port is visibly soiled, scrub hub with alcohol products for at least 15 seconds and let dry completely before accessing

### B – Bathing with Chlorhexidine Gluconate (CHG) Daily

- Daily CHG bathing **in all inpatients with central lines** using CHG cloths (preferred product) or CHG foam or soap
  - Follow [Chlorhexidine Gluconate Waterless Bath Protocol](#)
  - Follow CHG Soap bath protocol
- Documentation of 'bath/scrub, chlorhexidine' in IHIS

### S – Site Assessment

- Assess site daily for drainage, tenderness, pain, redness, and swelling

### I – Intact, Dry, and Occlusive Dressing

- Change dressing immediately if loose, soiled, or damp
- Change transparent CHG dressing every 7 days (preferred dressing)
- Change gauze dressing every 48 hours
- Document date and time of dressing change in IHIS under site preparation / maintenance:
  - Document "dressing changed"
  - Type of dressing applied

### During Central Line Insertion, continued

- The inserter must utilize maximal sterile barrier precautions during the procedure: a cap, mask, sterile gown, sterile gloves, and sterile full body drape.
- Maintain aseptic technique during the insertion procedure.
- If a guidewire exchange is being performed, use new sterile gloves before handling the new catheter.
- Apply a CHG impregnated disc or CHG impregnated sterile dressing immediately after insertion and prior to removing hats and masks.
- If a breach in aseptic technique is observed, any member of the healthcare team should stop the procedure immediately.

### Central Line Maintenance

- [Hand hygiene](#)
- See Figure 1. During Central Line Maintenance
- Remember C.L.A.B.S.I
- A CVC dressing change is a sterile procedure. For procedure, refer to Mosby's Nursing Skills: [Central Venous Catheter: Maintenance and Dressing Change](#)
- If a patient desires a soap and water shower
  - Do not submerge catheter or catheter site in water
  - An Aquaguard moisture barrier is required to be placed over any central line and dressing
  - Wrap all luerlock connections not covered by Aquaguard with Parafilm.
  - Shower should take place PRIOR to CHG cloth application. Ensuring skin is completely dry before using CHG cloths.

### Blood Culture Overview

- Patients with a CVC should be thoroughly evaluated for the source of signs and symptoms.
- Blood cultures should be performed when a patient develops clinical or laboratory criteria for systemic inflammatory response without an obvious nonvascular site of infection.
- Blood cultures should be performed when a catheter is removed for a suspected infection, not for routine removals.
- Obtain blood cultures prior to initiation of antibiotic therapy.
- Blood cultures should be obtained following [OSUWMC Patient Care Standards of Practice Guideline Blood Cultures, Obtaining](#)

### When to Change Central Line Catheters

- Do not change catheters routinely for the purpose of preventing CLABSI
- Use guidewire-assisted catheter exchange to replace a malfunctioning catheter or to convert an existing catheter
  - Use new sterile gloves before handling the new catheter
- Do not use guidewire-assisted catheter exchange if catheter-related infection is documented or suspected

- If the patient requires continued central access, remove the implicated catheter and insert a new catheter at a different insertion site

### When to Remove Central Line Catheters

- Daily assessment of need for catheter should be performed daily
- Remove catheter when no longer clinically indicated
- If a catheter-related infection is documented or suspected and the patient requires continued central access, remove the implicated catheter and insert a new catheter at a different insertion site. Do not use guidewire-assisted catheter exchange.

### Removal of Central Line Catheters

- Temporary percutaneous CVCs may be removed by a qualified RN upon MD/LIP order. Refer to OSUWMC Nursing Protocol – [Intravascular Access Devices, Peripheral and Central](#)
- Tunneled CVCs must be removed by an MD/LIP
- Following catheter removal a dressing should be applied. The site should be assessed and dressing changed every 24 hours until the site is epithelialized.

### Quality Measures\*

#### Process Measures

- Percentage of patients who have a CVC and:
  - Who receive a CHG bath daily
  - Have a dry, intact, and occlusive dressing in place
  - Who have a Curoc® caps covering all open IV ports
  - Documentation of necessity of CVC by the provider

#### Outcome Measures

- **NHSN CLABSI rate:** number of CLABSIs per 1,000 catheter-days.
- **Standardized Infection Ratio (SIR):** observed number of CLABSIs / expected number of CLABSIs
- **CLABSIs Device utilization ratio:** number of catheter-days / number patient-days.
- **Standardized utilization ratio:** observed number catheter-days / expected # catheter-days.
- **Duration of catheterization:** mean duration in days

\*System-wide and stratified by hospital, unit, and location-type (e.g. ED, ICU, Med/Surg)

### References

- Center for Disease Control and Prevention (CDC) Bloodstream Infection Event ([Central Line- Associated Bloodstream Infection and Non-Central Line-Associated Bloodstream Infection](#)), published January 2016
- Center for Disease Control and Prevention (CDC) National and State Healthcare-Associated Infections [Progress Report](#), published March 2014, available at [Infusion Nurses Society](#). (2016). Infusion therapy standards of practice. *Journal of Infusion Nursing*, 39(1S), S1-S159.

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- Zimlichman E, Henderson D, Tamir O et al. Health care-associated infections: A meta-analysis of costs and financial impact on the US health care system. *JAMA*. 2013; 173(22):2039-46
- Brunelli, S. M., Njord, L., Hunt, A. E., & Sibbel, S. P. (2014). Use of the tego needlefree connector is associated with reduced incidence of catheter-related bloodstream infections in hemodialysis patients. *International Journal of Nephrology and Renovascular Disease*, 7, 131-139. doi:10.2147/IJNRD.S59937 [doi]
- McAfee, N., Seidel, K., Watkins, S., & Flynn, J. T. (2010). A continuous quality improvement project to decrease hemodialysis catheter infections in pediatric patients: Use of a closed luer-lock access cap. *Nephrology Nursing Journal : Journal of the American Nephrology Nurses' Association*, 37(5), 541-4; quiz 545.
- Micklos, L. (2015). Do needle-free connectors prevent catheter-related bloodstream infections in patients receiving hemodialysis treatments using central venous catheters? *Nephrology Nursing Journal: Journal of the American Nephrology Nurses' Association*, 42(4), 383-386.
- [Tego ® product brochure](#)
- [Tego ® Needlefree Connector](#)

## Guideline Approved

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**Disclaimer:** *Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC's guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.*

## Resources

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- [Central line dressing change and connector documentation in IHIS](#)
  - Document date dressing changed
  - Document date connector changed
- Mosby's Nursing Skills: [Central Venous Catheter: Maintenance and Dressing Change](#)
- OSUWMC Nursing Protocol – [Intravascular Access Devices, Peripheral and Central](#)
- OSUWMC Nursing Guideline – [Intravenous Therapy \(IV\)](#)
- OSUWMC Clinical Practice Guideline - [Venous Access Device Selection / CVC Protocols / Venous Access in Chronic Kidney Disease](#)
- OSUWMC Nursing Guideline – [Blood Cultures, Obtaining](#)
- [OSUWMC Central Venous Catheter \(CVC\) Insertion Checklist](#)
- [OSUWMC 2% Chlorhexidine Gluconate Waterless Bath Protocol](#)
- [The Joint Commission: CLABSI Toolkit](#)

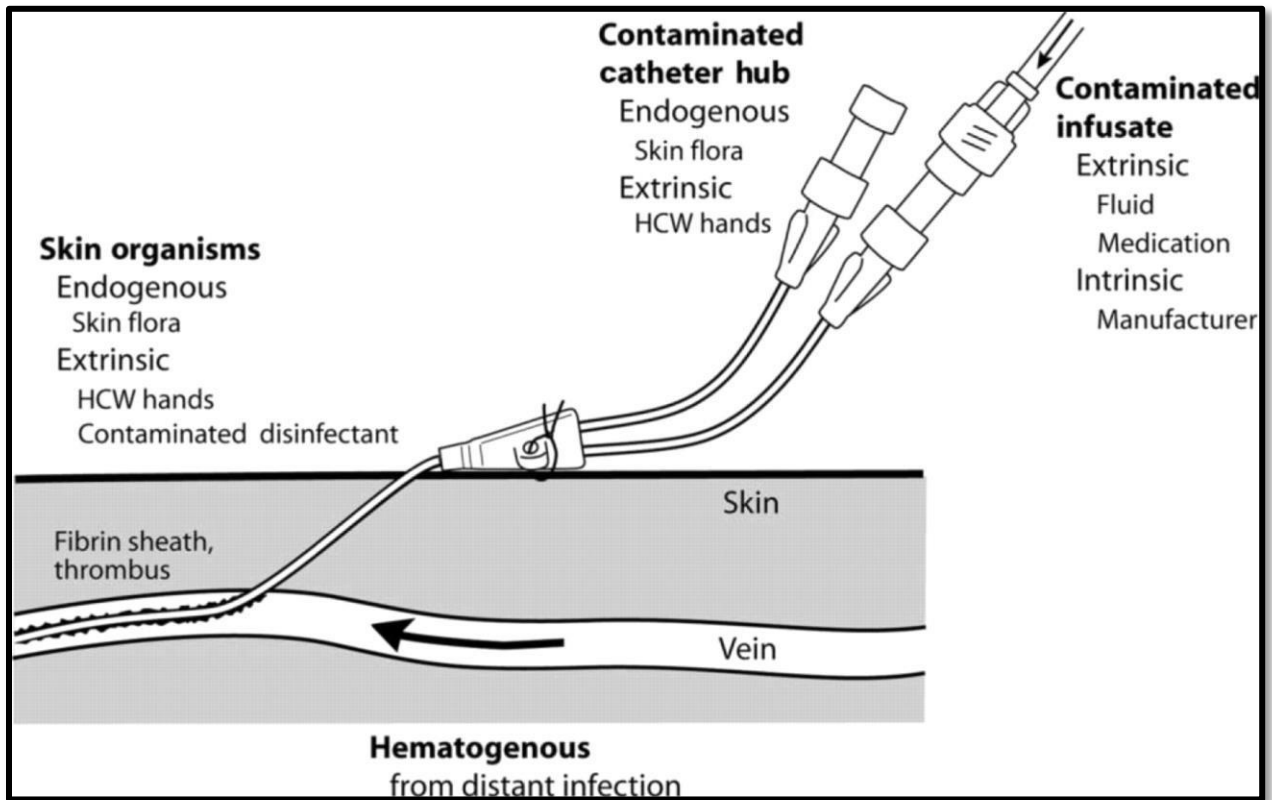
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## Appendix A

### Pathogenesis of CLABSI



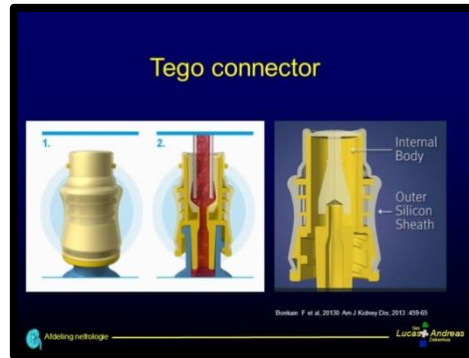
**Source:** Cmich CJ, Maki DG. The promise of novel technology for the prevention of intravascular device-related bloodstream infection. I. Pathogenesis and short-term devices. *Clinical Infectious Disease*. 2002; 34(9):1232-1242.

## Appendix B

### Tego® Connector Use and Care for intermittent HD (iHD), CRRT and Apheresis

#### Purpose

A Tego® connector creates a mechanically and microbiologically closed system when attached to the hub of a catheter, eliminates open catheter hubs and lowers the chance of contamination and infection.



#### How It Works

##### Accessing the Fluid Path

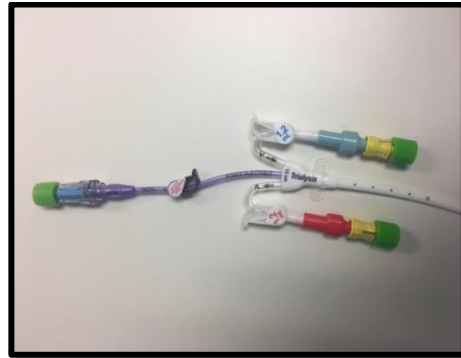
1. When Tego® is not accessed a silicone seal forms a safe, barrier to bacteria.
2. Attaching Tego® to a blood line activates the straight internal fluid path (as above) and creates a mechanically and microbiologically closed system.
3. When a Tego® is in place, a white Curoso® cap is necessary and is to be replaced with each access.

#### **CORRECT**



White Curoso® to Yellow Tego® Connector

#### **INCORRECT**



**NO** Green Curoso® to Yellow Tego®

#### General Expectations

White Curoso® caps must be used with Tego® connectors.

1. Tego® connector must be changed every 7 days or sooner based on iHD/CRRT/ Apheresis scheduled for each patient.
2. The white Curoso® caps must be changed with each access of the HD catheter hubs.
3. Documentation of Tego® connector change must be completed in IHIS on appropriate row of access/monitoring device.
4. Appropriate "medication label" must be indicated on the catheter, if any medication is used for dwell solution (citrate, heparin, or streptokinase).
5. All connector changes will be completed using the Tego® connector kit – with supplies to reduce risk on line of contamination and infection.

## Initiating iHD/CRRT/Apheresis procedure (with Tego® Connector Change)

1. After preparing sterile field and donning sterile gloves (1<sup>st</sup> set), place sterile saline syringe flushes in the sterile field.
2. Vigorously scrub each exiting connector, limbs and hubs of the catheter with CHG/alcohol (ChloroPrep®) for at least 30 seconds to remove any residue and/or blood (total time 60 seconds for both limbs).
3. Remove gloves and don the 2<sup>nd</sup> set of sterile gloves.
4. Remove Tego® Connectors one at a time from each limb, using friction with sterile alcohol pad for 15 seconds. Allow the antiseptic to dry and apply new Tego connector to each catheter limb.
  - a. Goal: Leave the hub “open” for the shortest time possible.
5. Scrub each hub for 15 seconds using friction with a sterile alcohol pads.
6. Aspirate 5 ml from each lumen to clear catheters and discard.
7. Scrub the hub for 15 seconds using friction with sterile alcohol pads.
8. Flush each lumen with 10ml of saline to verify lumen patency.
9. Scrub each hub for 15 seconds using friction with sterile alcohol pads.
10. Attach access and return lines to Tego® Connectors and perform treatment.
11. Document the Tego® Connector change in IHIS.
12. After treatment is complete, disconnect access and return lines according to the iHD, CRRT, and Apheresis procedures.
13. Scrub each hub for 15 seconds using friction with a sterile alcohol pad.
14. Flush catheter limbs using 10ml saline per lumen; clamp the catheter.
15. Apply white Curos® cap to each treatment lumen.

## Subsequent iHD, CRRT, and Apheresis Procedure (without Tego® Connector Change)

1. Remove white Curos® Caps.
2. Aspirate 5 ml from each lumen and discard.
3. Scrub hubs for 15 seconds using friction with sterile alcohol pads.
4. Flush 10 ml of saline to each lumen to verify catheter patency.
5. Scrub hubs for 15 seconds using friction with sterile alcohol pads.
6. Attach access and return lines to Tego® connectors and perform treatment.
7. After treatment is completed, disconnect access and return lines according to iHD, CRRT, and Apheresis procedures.
8. Scrub hubs for 15 seconds using friction with sterile alcohol pads.
9. Flush catheter limbs using 10ml saline per lumen; clamp the catheter.
10. Apply white Curos® cap to each treatment lumen.

## Accessing Catheter for reason other than iHD/ CRRT/ Apheresis procedure

CRRT, and apheresis treatment is often inserted by Nephrology or IR team utilizing catheter that can endure high blood pressure and volume.

1. CVC line intended for iHD/CRRT treatment should be dedicated for iHD/CRRT use only. Accessing this line for other reasons must be approved by Nephrology.
2. CVC line intended solely for the purpose of Apheresis may be accessed for lab draws and medication administration following aseptic principles and using above steps. This line does not require Nephrology approval.
3. If obtaining blood from/administering medication through the catheter are required due to lack of available access, the above procedural steps must be followed to reduce the risk of infection and catheter malfunction.