

CLABSI Prevention Practices

*Cal HQ Change
Package 2026*



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About Cal HQ

California Alignment for Hospital Quality (Cal HQ) is a statewide collaboration focused on improving hospital quality through aligned action. The initiative is led by Covered California, CalPERS, and Cal Healthcare Compare, with oversight from steering committee members from state agencies, hospitals, health plans, improvement organizations, and patients to identify and advance a common set of hospital quality measures. The [Cal HQ Steering Committee](#) provides strategic guidance, ensures industry alignment, promotes Cal HQ's activities, and advises on statewide scaling and dissemination efforts.



Prevent 2,000
Infections over two
years



34% overall
reduction by 2027



Projected to
potentially save
approximately \$64
million



Projected to
potentially save 120
lives

About this Change Package

Change packages are tools to help health care improvement teams make patient care safer and improve outcomes. This change package, developed by a team of experts in patient safety and infection prevention, outlines evidence-based practices. It includes a menu of strategies, change ideas, and specific, actionable steps that your team can implement in your unique context.

All Cal HQ change packages are organized around a driver diagram, a tool to identify, organization, and prioritize improvement activities. Each primary driver has accompanying focus area (called secondary drivers) and change ideas, or specific actions that a hospital team can take to improve outcomes.

Use this change package as background information, a checklist, reference material or simply a place to start. Learn more about other Cal HQ resources on our website: www.calhq.calhospitalcompare.org.

Part 1: Definition and Scope

What is a CLABSI?

Hospital-associated central line-associated bloodstream infections (CLABSI) are serious but preventable infections when evidence-based guidelines for central line insertion and maintenance are properly prioritized and implemented.¹

Magnitude of the Problem

Central lines are life saving devices. They enable us to administer large volumes of fluids and medications to patients who might otherwise not improve or survive. However, these critical devices can also result in significant harm when they become the source of a bloodstream infection and/or sepsis.

CLABSIs result in increased length of hospital stay, increased cost and increased patient morbidity and mortality. An estimated 30,100 CLABSIs occur in the ICUs in the United States each year.² Patient mortality rates associated with CLABSIs range from 12 to 25 percent³ and the cost of CLABSIs per episode of care ranges from \$3,700 to \$36,000.⁴

Between 2008 and 2013, the adoption and implementation of evidence-based practices was associated with an impressive 46 percent reduction in CLABSIs.⁵ Leveraging this improvement, further efforts are needed to prevent patient harm, especially in noncritical care settings including hemodialysis centers and inpatient wards. As the majority of CLABSIs occur outside the ICU¹, the maintenance, application and spread of ICU improvement successes are necessary to realize safety goals across patient populations.

Between 2018 and 2019, US hospitals saw a 7 percent decrease in CLABSIs, with the largest reduction in NICUs. There was an approximate 7% decrease reduction in the US between 2018 and 2019. The largest decrease was observed in NICU's.

It is not surprising that the percentage of improvement is shrinking since many of the practices that impacted the 2013 data have been hardwired. We do need to stay focused and continue to apply standardized prevention strategies that have demonstrated an impact and reduction of CLABSIs.

Fortunately, CLABSI prevention strategies are applicable to both critical and noncritical care settings. The CLABSI central venous catheter (CVC) insertion bundle includes: procedural pause, hand hygiene, aseptic technique, optimal site selection, chlorhexidine for skin preparation and maximal sterile (full-barrier) precautions.⁶ The

CLABSI maintenance bundle includes central line site dressing changes, administration tubing changes, IV fluid changes and daily review of line necessity with timely removal¹

Part 2: Measurement

A key component in making patient care safer in your hospital is to track your progress toward improvement. Collecting data points at your hospital will guide your quality improvement efforts as part of the Plan-Do-Study-Act (PDSA) process. Tracking your data in this manner will provide valuable information needed to study your data across time and help determine the impact of your improvement initiatives on reducing patient harm.

Nationally Recognized Outcome Measures

- CLABSI Rate:
 - Numerator: CLABSI events
 - Denominator: Central Line Days
- CLABSI Standardized Infection Ratio (SIR):
 - Numerator: Observed CLABSI events
 - Denominator: Predicted CLABSI events
 - Comment: SIR is calculated by NHSN, and adjusted for several risk factors.
- Standardized Utilization Ratio (SUR)
 - Numerator: Observed number of central line days
 - Denominator: Predicted number of central line says
 - Comment: SUR is calculated by NHSN and adjusted for several risk factors.
- Central Line Utilization Ratio:
 - Numerator: Central Line Days
 - Denominator: Patient Days
- Cumulative Attributable Difference
 - Numerator: Observed number of CLABSIs
 - Denominator: Prevention target (predicted CLABSIs x SIR goal).
 - Comment: This is calculated by NHSN and assist with prioritizing where the greatest need for infection prevention may be by identifying the number of infections that need to be prevented.

Suggested Bundles and Toolkits

[Agency for Healthcare Research & Quality \(AHRQ\) Tools for Reducing Central Line-Associated Blood Stream Infections](#)

[Centers for Disease Control and Prevention \(CDC\) Guidelines for the Prevention of Intravascular Catheter Related Infections, 2011](#)

[APIC Preventing Catheter-Associated Bloodstream Infections \(CLABSI\) in Adults](#)

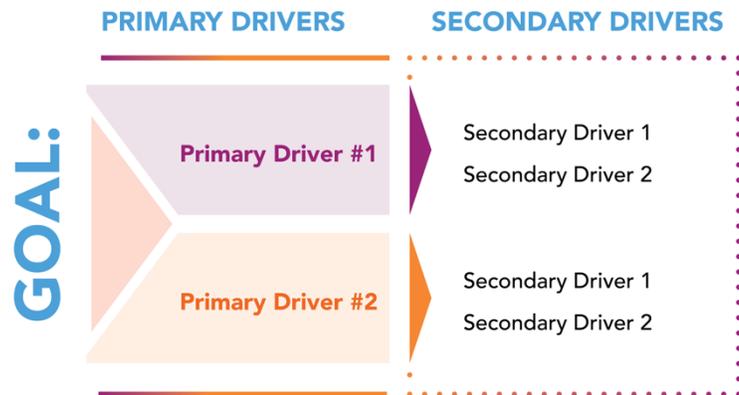
[StriveTiered Approach for Preventing Central Line Associated Bloodstream Infection](#)

Part 3: How to Improve

Investigate Your Problem and Implement Best Practices

Driver Diagrams

A driver diagram visually demonstrates the causal relationship between change ideas, secondary drivers, primary drivers and your overall aim. A description of each of these components is outlined in the table below. This change package is organized by reviewing the components of the driver diagram to (1) help your care team identify potential change ideas to implement at your facility and (2) show how this quality improvement tool can be used by your team to tackle new process problems.



AIM: A clearly articulated goal or objective describing the desired outcome. It should be specific, measurable and time-bound.

PRIMARY DRIVER: System components or factors that contribute directly to achieving the aim.

SECONDARY DRIVER: Action, interventions or lower-level components necessary to achieve the primary driver.

CHANGE IDEAS: Specific change ideas which will support or achieve the secondary

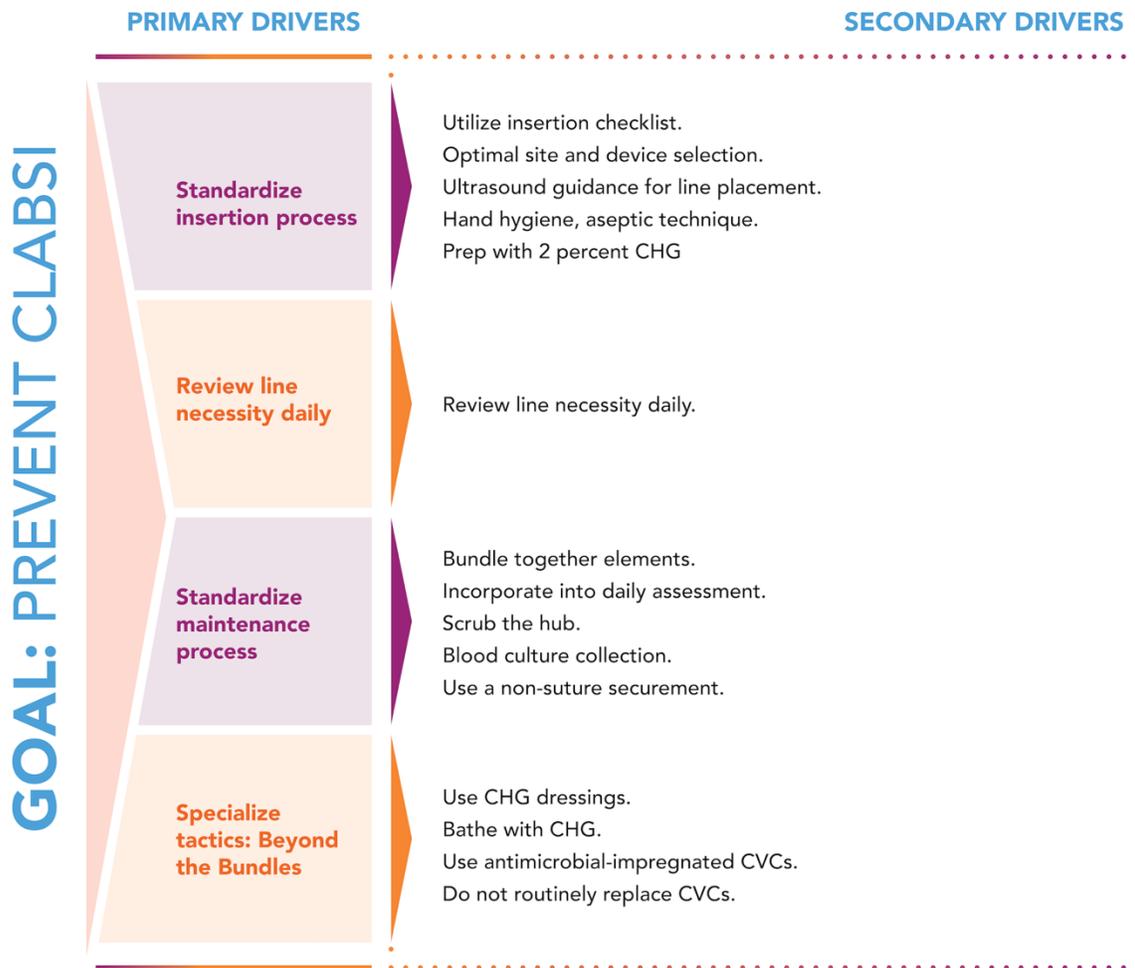
Foundational Infection Prevention Practices

This change package builds on foundational infection prevention and control practices that are a crucial component of safe and quality health care delivery:

- Leadership support
- Health care personnel education and training
- Patient, family and caregiver engagement
- Surveillance
- Hand hygiene
- Environmental cleaning and disinfection

You can learn more about these practices in the **Foundational Infection Prevention Practices Change Package:** https://calhq.calhospitalcompare.org/wp-content/uploads/2026/02/CalHQ_FoundationalIPC_TOOLKIT.pdf

Drivers in this Change Package



Driver 1: Standardize Insertion Process with Insertion Bundles

Following established guidelines for central venous catheter (CVC) insertion will decrease CLABSI rates.^{1,7,8} The insertion bundle includes: indication for CVC, selection of an insertion site, hand hygiene, use of full barrier precautions, skin preparation, and sterile insertion technique.

Secondary Drivers in this Section

1. Utilize an insertion checklist.
2. Optimal site and device selection.
3. Ultrasound guidance for line placement.
4. Hand hygiene and aseptic technique.
5. Prep with 2 percent CHG.

1. Utilize an insertion checklist

An insertion checklist can help ensure that all recommendations for insertion of a CVC are followed each time. The checklist includes a list of actions that should occur before, during, and after CVC insertion.⁸ Use of a checklist is an effective approach to ensure patients are receiving appropriate care. See Appendix II for an example of CVC insertion checklists.

Change Ideas

- Engage staff nurses to adopt and adapt a CVC insertion checklist to promote patient safety.
- Enlist the medical director or other provider champion to support the use of the checklist and to educate and mentor providers.
- Determine who will complete the insertion checklist at the time of insertion: the nurse assisting, an independent nurse observer, or a technician.
- Outline what is to be done with the paper or electronic checklist after it has been completed for tracking of compliance to the insertion bundle (e.g., could be sent to infection prevention manager or CLABSI prevention champion)

Suggested Process Measures for Your Tests of Change

- Percent compliance of insertion bundle guidelines

2. Optimal site and device selection.

Research data suggest that certain CVC sites may have a lower risk of infection.^{9,10,11,12,13,14} The current CDC/NHSN and SHA/IDSA practice recommendation is to avoid using the femoral vein for central venous access in adult patients.^{15,16,17} Site selection is based on patient need and risks. If the femoral site is used, site prep and line maintenance done according to guidelines are vitally important. Consider alternatives to central lines when clinically indicated such as midline catheters or longer dwell-time peripheral intravenous catheters.

Change Ideas

- Include site selection as an item on insertion checklist.
- Promote documentation of rationale for use of femoral site if it is selected for CVC placement.

Suggested Process Measures for Your Tests of Change

- Percent compliance with documentation of insertion site selection

3. Ultrasound guidance for line placement.

The use of ultrasound (US) to guide insertion may reduce the number of complications and increase accuracy of line placement. Studies have demonstrated that, as compared to the technique of using landmarks, US guidance in placement of CVC in adults and children decreases the number of anatomical sites utilized and decreases the number of attempts to achieve successful placement.^{18,19,20,21} US guidance may therefore decrease patient discomfort, risk of harm and time to successful CVC placement, and may increase compliance with insertion guidelines.

Change Ideas

- Collaborate with interdisciplinary team members such as, clinical champion(s), supply chain management, nursing educators, and others, to identify and procedure required equipment and supplies.
- Partner with your infection prevention practitioner when introducing US-guided CVC placement.
- Design a comprehensive training program in partnership with clinical champion.

Suggested Process Measures for Your Tests of Change

- Percentage of central lines placed with ultrasound guidance.

4. Follow recommended practices for hand hygiene, aseptic technique and maximal sterile barrier precautions.

Establish a process to ensure appropriate practices for hand hygiene, aseptic technique, and maximal sterile barrier precautions are followed. Hand hygiene continues to be an integral part of any infection prevention program.^{1,22} Following aseptic technique for insertion and care is crucial to prevent CLABSI. Aseptic technique includes using maximal sterile barrier precautions such as a cap, mask, sterile gown, sterile gloves, and a sterile full-body drape during insertions of CVCs or during guide wire exchange.²²

Change Ideas

- Provide easy access to hand hygiene agents.
- Utilize an all-inclusive catheter kit or cart to ensure necessary components are easily accessible for aseptic insertion.
- Include hand hygiene and maximal barrier precautions as part of a CVC insertion checklist.

Suggested Process Measures for Your Tests of Change

- Percent compliance with maximum barrier drape.
- Percent compliance with hand hygiene prior to CVC insertion.

5. Skin prep with 2 percent chlorhexidine (CHG).

The preferred agent for skin antisepsis before catheter insertion and during dressing changes is two percent chlorhexidine (2 percent chlorhexidine in 70 percent isopropyl alcohol) unless the patient is allergic to chlorhexidine or under two months of age.^{1,20,24,25}

Change Ideas

- Utilize an all-inclusive catheter kit or cart to ensure necessary components are easily accessible for aseptic insertion including 2% CHG swabs.

- Include skin prep with two percent CHG as an item on the insertion checklist

Suggested Process Measures for Your Tests of Change

- Percent compliance with use of CHG skin prep.

Driver 2: Daily Review of Line Necessity

One of the most effective strategies for preventing CLABSIs is to eliminate or reduce exposure to CVCs. The decision regarding the need for a central line is complex, however, and difficult to standardize or incorporate into a practice guideline. Nevertheless, to reduce exposure to CVCs, the multi disciplinary team should adopt a strategy to systematically evaluate on a daily basis whether all central lines remain necessary or can be removed.^{20,23}

Secondary Drivers in this Section

1. Review of line necessity

1. Review of line necessity.

Current practice guidelines recommend daily review of line necessity and prompt removal of the line when no longer necessary.

Change Ideas

- Combine daily review of line necessity with other best practice reviews such as daily urinary catheter review. Line necessity is determined by a patient's clinical needs.
- Incorporate daily review into routine workflow, such as charge nurse rounds or daily multidisciplinary rounds.
- Integrate central line indication into patient hand-off communication.
- Create electronic or written reminders to indicate the presence of a central line, and prompt documentation around necessity.

Suggested Process Measures for Your Tests of Change

- Percentage of patients in which daily indication for a central line was documented.

Driver 3: Standardize the Maintenance Process

The bundle approach provides a means to incorporate evidence-based interventions into patient care. Adopt and embed evidence-based guidelines (bundle) for CVC maintenance after insertion across care settings. Because a significant proportion of central line days and CLABSIs occur in non ICU settings, it is important to include them in the maintenance process implementation. Implementation of a post-insertion care bundle in addition to an insertion bundle has been shown to be effective in reducing CLABSI.^{1,20}

Current practice recommendations include:

1. Use sterile, transparent, semipermeable dressing (or sterile gauze) to cover the catheter site.
 - Change transparent dressings and perform site care with CGH-based antiseptic every seven (7) days (gauze dressings every two (2) days) or immediately if soiled, loose or damp.
 - Use of topical antibiotic ointment or creams is not recommended unless the line is a dialysis catheter.
2. Replace administration tubing at appropriate intervals. Appropriate intervals include:
 - Every seven (7) days for continuous infusion except for patients receiving blood, blood products or fat emulsions.
 - Every 24 hours for patients receiving blood, blood products or fat emulsions.
 - Every 6 - 12 hours for patients receiving propofol infusions, when the vial is changed.
3. Proper technique when collecting blood specimens.
4. Suture-less securement devices.

Secondary Drivers in this Section

1. Update bundle maintenance elements
2. Incorporate into daily assessment
3. Scrub the hub
4. Blood culture collection
5. Suture-less securement devices

1. Bundle maintenance elements together

Change Ideas

- Have supplies and equipment stored together and easily available, (e.g., central line dressing kits, chlorhexidine dressings, IV fluid infusion bags, and administration sets.)
- Assign dressing change responsibility to a core group of individuals who are highly trained and competent (e.g., the PICC team).
- Have supplies for accessing IV tubing and ports together and easily available, (e.g., chlorhexidine, povidone iodine, an iodophor or 70 percent alcohol, and alcohol impregnated caps for unused ports).
- Establish a specific day of the week for line changes, (e.g., every Wednesday.)
- Utilize electronic health record to prompt daily documentation of central line maintenance activities

Suggested Process Measures for Your Tests of Change

- Percent compliance with site dressing done according to standard.

2. Incorporate into daily assessment and review.

Incorporate a daily review of the maintenance bundle to ensure that dressings, administration tubing, and IV fluid are current and not expired. If any missing element is found during the review, establish a process to correct the missing element.

Change Ideas

- Perform maintenance bundle review along with daily line necessity review. Items to review can be included in the charge nurse's checklist. If the bedside nurse has not had time to change the dressing or administration tubing, for example, the charge nurse can delegate the task to another nurse.
- Develop a process to ensure CVC maintenance is completed as needed.

Suggested Process Measures for Your Tests of Change

- Percent compliance with maintenance bundle of individual bundle elements.
- Percent compliance of all-or-none bundle element.
- See Appendix III for an example of a CVC maintenance audit or monitoring tool.

3. Scrub the Hub

Before accessing the line, ensure appropriate disinfection of the hub.

Recommendations state to scrub the hub with a CHG preparation or 70 percent alcohol combination for a minimum of five seconds.^{26,27,28} See Appendix IV for a Scrub the Hub flyer.

Change Ideas

- Incorporate use of antiseptic impregnated caps for all central line ports. This minimizes the need to scrub the hub.²⁸
- Establish a process for disinfection of the catheter hub.
- Have supplies for disinfecting line access sites easily available, (e.g., IV carts, medication carts.)

Suggested Process Measures for Your Tests of Change

- Percent compliance with scrub the hub prior to accessing line.

4. Blood culture collection

Increase the accuracy of CLABSI identification and treatment by optimizing best practice in the collection, handling, and management of blood culture specimens. Best practices include:

- Establishment of a standard operating procedure for blood culture collection.
- Ensuring disinfection at the venipuncture site and aseptic technique during collection.
- Collection of two sets of peripheral blood samples when infection is suspected.

Change Ideas

- Preassemble peripheral blood culture collection supplies to promote best practices.
- Review blood culture collection practices with staff to assure reliability of practices.
- Explore the use of a peripheral blood culture technology that reduces blood culture contamination through initial specimen diversion 46

Suggested Process Measures for Your Tests of Change

- Blood culture contamination rates

2. Use a non-suture securement device.

The use of a nonsuture securement device reduces the risk of infection at the CVC site and is included in the CDC/NHSN guidelines.²⁶

Change Ideas

- Work with supply management to ensure CLABSI insertion kit utilized includes non-suture securement devices.

Suggested Process Measures for Your Tests of Change

- Percent compliance with non-suture securement device.

Driver 4: Specialize Tactics – Beyond the Bundles

Additional strategies are recommended to further reduce CLABSI rates if the rates remain unacceptably high after implementation of basic CLABSI prevention strategies. More research has emerged on the use of CHG dressings, CHG bathing, and the use of antimicrobial-impregnated CVCs for adult patients.^{28,29}

Secondary Drivers in this Section

1. Use of chlorhexidine (CHG)-containing dressings
2. CHG bathing
3. Antiseptic- or antimicrobial-impregnated CVCs for adult patients
4. Do not routinely replace CVCs

1. Use of chlorhexidine (CHG)-containing dressings.

Apply CHG-containing dressings directly to the insertion site for temporary short-term catheters under a transparent dressing.^{30,31,32} This recommendation applies to patients younger than 18 years old due to risk of adverse skin reactions.

Change Ideas

- Include CHG dressing use in staff trainings on CVC site care and maintenance and assess staff understanding and competency.
- Ensure CHG dressings are easily accessible and stored with central line maintenance supplies.

- Review the use of CHG dressing sponges daily as part of the maintenance bundle review.

Suggested Process Measures for Your Tests of Change

- Percent compliance with CVC dressing changes.

2. CHG bathing

Daily bathing with CHG has been shown to reduce the incidence of health care associated bloodstream infections and is now a recommended practice as an additional intervention.^{1,20,33} CHG bathing reduces the bio-burden on the patient's skin and thereby reduces the risk of CVC site infection and CLABSI. Bathe patients older than two months of age daily with two percent CHG.^{1,20}

Change Ideas

- Include CHG bathing as part of staff central line care and maintenance training and assess staff competency.
- Have two percent CHG-saturated cloths easily available to staff.
- Integrate use of two percent CHG cloths for daily skin cleansing into the daily workflow
- such as nurse's aides' delivery of daily hygiene care.
- Incorporate CHG skin cleansing daily as part of the maintenance bundle review.
- Utilize electronic health record to prompt healthcare staff to complete daily CHG bathing.

Suggested Process Measures for Your Tests of Change

- Percent compliance with daily CHG bathing

Antiseptic- or antimicrobial-impregnated CVCs for adult patients

Use a CVC impregnated with CHG/silver sulfadiazine or minocycline/rifampin in patients whose catheter is expected to remain in place for more than five days (contraindicated if the patient is allergic to the impregnated substance). Use of antimicrobial-impregnated CVCs can also be an additional strategy to reduce CLABSI rate in facilities with continued high CLABSI rates after the implementation of insertion and maintenance bundles.^{34,35} Consider the use of these CVCs in other situations, such as for inpatients with limited venous access and a history of recurrent CLABSI and for patients

who have increased risk for severe sequelae from a CLABSI (e.g., patients with recently implanted intravascular devices).³⁶

Suggested Process Measures for Your Tests of Change

- Utilization of antimicrobial impregnated CVCs

Change Ideas

- Test the use of an antiseptic- or antimicrobial-impregnated CVC in patients whose CVC is expected to remain in place for more than five days.
- Include an antiseptic- or antimicrobial-impregnated CVC as an option for placement in the CVC line cart.
- Work with supply chain management to procure antimicrobial impregnated CVCs.
- Integrate considerations in catheter selection protocol for the use of antimicrobial-impregnated catheters in select patient populations.

3. Do not routinely replace CVCs

Routine replacement of CVCs is NOT a recommended practice. CVCs should not be removed on the basis of fever alone.³⁷ Recommendations include that physicians use clinical judgment regarding the appropriateness of removing the CVC if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected. Guidelines also caution against the use of routine guide wire exchanges to prevent infection and to replace a catheter suspected of infection.

Change Ideas

- Incorporate into policy the recommendation that CVCs are not to be replaced routinely.

Suggested Process Measures for Your Tests of Change

- Insertion frequency

Patient and Family Engagement Opportunity

Use the teach-back method to educate patients and families about the steps being taken to minimize the risk of CLABSI. Educate the patient and family about what they can do to help prevent a CLABSI, such as asking if the central line continues to be necessary. Make available to patients educational materials on central lines, such as the [CDC's FAQs About Catheter-Associated Bloodstream Infection](#).

PDSA IN ACTION

Tips on How to use the Model For Improvement

Choice of Tests and Interventions for CLABSI Reduction:

- Implement the CVC maintenance bundle and line necessity review one unit at a time.
- Engage front-line staff from the beginning on process design and on the adoption and adaptation of procedures.
- Consider testing maintenance bundle and line necessity in non-ICU settings.

Implement Small Tests of Change

PLAN | Do not reinvent the wheel. Pick a daily review tool that has been successful at another hospital and adapt it for your facility. See appendices II and III for examples. Engage front-line staff in designing the implementation process, (e.g., the day shift charge nurse on morning rounds will review maintenance bundle items and line necessity with the bedside nurse.) Ask a receptive, early-adopter bedside nurse and charge nurse to test these changes on their next patient with a CVC.

DO | Test “small:” one charge nurse, one bedside nurse, one patient with a CVC, one shift. Coordinate with the trial nurses to begin the daily review of the maintenance bundle and line necessity with one patient.

STUDY | Debrief as soon as possible after the test with those involved, asking:

- What happened?
- What went well?
- What didn’t go well?
- What do we need to do differently next time?



ACT | Do not wait for the next committee meeting to make changes. Revise the procedures and re-test as soon as possible with the same bedside nurse and charge nurse. Grow the second test to include all patients on one unit on one shift and additional bedside nurses.

Common Challenges to Improvement

- Assess for practice drift periodically even if your rates are low. Engage with staff to discuss any barriers to full implementation of the insertion and maintenance bundles.
 - Do a spot check to determine bundle compliance for each element by checking five patients with CVCs (including PICCs). Spot-check questions include:
 1. Were all of the insertion bundle elements completed?
 2. Is the site dressed according to the guidelines, is the dressing current, and is the CHG sponge applied correctly?
 3. Is the administration tubing current?
 4. Was the CVC assessed daily for necessity?
- Recognize that there may be some pushback from physicians regarding changing practice. Engage a physician champion to support your change efforts.
 - Listen to physicians' feedback and engage them in process design and equipment and supply selection.
 - Begin implementation with early-adopter physicians who can lead and recruit other early-adopter champions from among specialty groups and intensivists.
 - Despite the research evidence showing benefits from these guidelines, some physicians may be reluctant to wear a cap or other items required for maximal barrier precautions. One hospital approached this challenge by discussing the research evidence and the pros and cons of the recommendations with the medical director of the ICU. The value of complying with the recommendations was emphasized. After the medical director and other early-adopter champions modeled the new practices, the rest of the medical staff agreed to adopt the evidence-based recommendations as well.

Common Challenges to Improvement, continued

- Nurses may feel uncomfortable with “stopping the line” for an observed violation of infection control practices and physicians may feel their credibility and authority is being challenged when a break in technique is called out.
 - To address these concerns: Both physician and nursing leadership need to be visible and to communicate the expectations of adherence to the insertion bundle. They can coach staff on the importance of consistency in procedure implementation and on how to “call a halt” or “stop the line.”⁶⁷
 - Invite senior or unit-level leadership to meet with nursing and physician staff to emphasize that the focus is on teamwork to promote patient safety and improve patient outcomes.
 - Develop an algorithm for the observer to follow if a “stop the line” intervention is resisted. For example, the observer could page the unit director 24/7 to intervene.
 - Audit the percentage of CVC insertions that had the checklist properly completed. Calculate the rates of compliance with evidence-based practice and the number of corrections required. Make the results known to providers

Action Planning

CLABSI prevention is complex and challenging. However, there are many evidence-based strategies and tools to use to reduce CLABSI. This effort requires a multidisciplinary approach that includes physicians, leaders, and front-line staff. Continual monitoring of compliance to bundles assists in data-driven decision making. Utilizing data to drive practice and process changes as well as communication to clinical staff on bundle performance and CLABSI rates is imperative.

Multidisciplinary approach: Assemble a team with physician champions, front-line staff leaders, and key leadership persons. Determine and define roles that the leader has the energy to lead a dynamic process improvement project. Assess the composition of the team and the support from key strategic partners such as the quality leader, chief medical officer, nursing director, infection prevention, etc. Create strategies and/or allocate resources to engage front-line staff in designing new care processes.

Ongoing monitoring: Use the data to drive decision making for determining practice and process changes. Use the Top Ten Checklist (Appendix I) to assess current efforts in CLABSI prevention. Ask, “Do we have this element in place? If so, how well are we doing it? Have we had practice drift?” Enlist physician and nursing champions on the team to assist in data analysis, determine potential interventions and conduct small tests of change.

Communication: Establish clear lines of communication with physicians, staff, other stakeholders, and supporting leadership. Communication should include bundle compliance performance, CLABSI rates, and annotated with interventions to show effect of improvement efforts.

Part 5: Appendices

Appendix 1: CLABSI Top Ten Checklist

Purpose of Tool: A checklist to review current or initiate new interventions for CLABSI prevention in your facility.

- Implement the insertion bundle: Procedural pause, hand hygiene, aseptic technique for insertion and care, site selection, maximal sterile precautions, and skin prep with two percent chlorhexidine.
- Implement an insertion checklist to promote compliance and monitoring.
- Implement a “stop the line” approach to the insertion bundle. If there is an observed violation of infection control practices (e.g., maximal sterile barrier precaution, break in sterile technique), line placement should stop and the violation should be corrected.
- Adopt the maintenance bundle with dressing changes (every seven days for transparent dressings), line changes, and IV fluid changes. Incorporate dressing changes into daily assessment and review. Can be part of charge nurse’s checklist along with the daily review of line necessity.
- Incorporate a daily review of line necessity and maintenance bundle into workflow (e.g., charge nurse rounds). Use an electronic health care record prompt.
- Use a chlorhexidine impregnated sponge dressing.
- Use two percent chlorhexidine impregnated cloths for daily skin cleansing.
- Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters.
- Use a suture-less securement device.
- Use ultrasound guidance to place lines if this technology is available.

Appendix II: Central Line Procedural Checklist

Associated Organization: Agency for Healthcare Research and Quality (AHRQ)

Purpose of Tool: To document procedural practices related to central line insertion technique.

Reference: Appendix 5: Central Line Insertion Care Team Checklist - Tools for Reducing Central Line-Associated Blood Stream Infections (<https://www.ahrq.gov/hai/clabsi-tools/appendix-5.html>)

Critical Step	Yes	Yes with Reminder	Procedure Deviation: Complete Report	Comments
Before the procedure, did the operator				
Obtain informed consent				
Obtain supervision if needed (see roles, above)				
Perform a time-out/briefing				
Confirm hand washing/sanitizing immediately prior				
Use full-barrier precautions <ul style="list-style-type: none"> • Operator(s): Cap, mask, sterile gown and gloves, eye protection 				
<ul style="list-style-type: none"> • Supervisor: Cap, mask, sterile gown and gloves, eye protection 				
<ul style="list-style-type: none"> • Assistant: Cap, mask, isolation gown and gloves, eye protection (if at risk for entering sterile field, use sterile gown and gloves) 				
Properly position to prevent air embolism <ul style="list-style-type: none"> • For chest/EJ: Trendelenburg (HOB<0 degrees) • For femoral: supine 				
Sterilize procedure site (chlorhexidine)				
Allow site to dry				
Use sterile technique to drape patient from head to toe				

Critical Step	Yes	Yes with Reminder	Procedure Deviation: Complete Report	Comments
Use local anesthetic and/or sedation				
During the procedure, did the operator				
Maintain a sterile field				
Monitor that lumens were not cut				
Clamp any ports not used during insertion (to avoid air embolism, clamp all but distal port)				
Obtain qualified second operator after 3 unsuccessful sticks (except if emergent)				
Aspirate blood from each lumen (to avoid air embolism and ensure intravascular placement)				
Transduce central venous pressure or estimate central venous pressure by fluid column (to avoid arterial placement)				
After the procedure, did the operator				
Clean blood from the site using antiseptic agent (chlorhexidine) and apply sterile dressing				
Verify placement by x-ray (tip in SVC/RA junction)				

Appendix III: Central Line Maintenance Audit Form

Associated Organization: Agency for Healthcare Research and Quality (AHRQ)

Purpose of Tool: To document procedural practices related to central line insertion technique.

Reference: Central Line Maintenance Audit Form - Tools for Reducing Central Line-Associated Blood Stream Infections (<https://www.ahrq.gov/hai/clabsi-tools/appendix-6.html>)

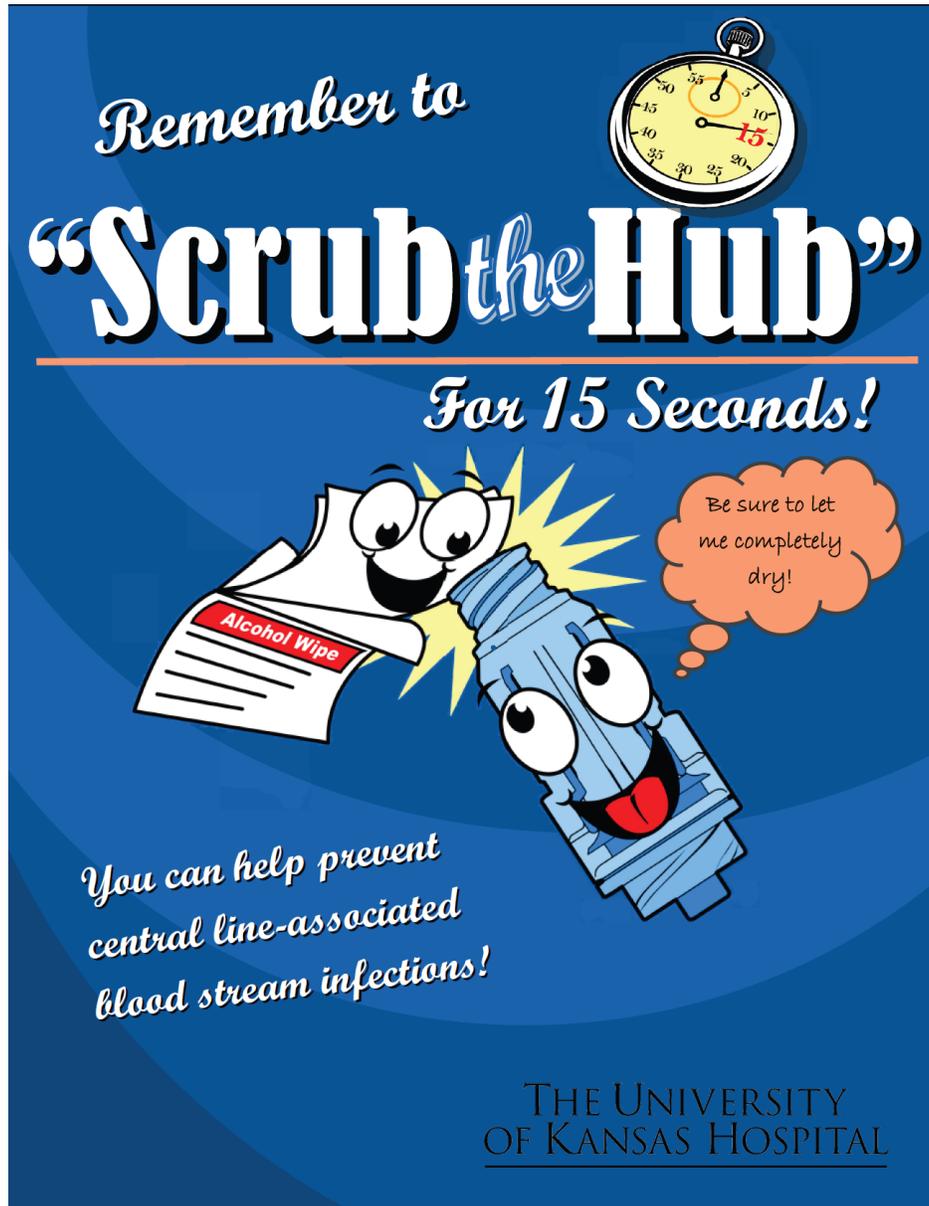
Critical Step	Response
Was the need for a central line for this patient discussed on patient rounds?	<input type="checkbox"/> Yes <input type="checkbox"/> Yes, as part of daily goals <input type="checkbox"/> No
Was proper hand hygiene used by all personnel involved in line care for this patient (i.e., hand washing with soap and water or with alcohol-based hand sanitizer)?	<input type="checkbox"/> Yes <input type="checkbox"/> No, not during <ul style="list-style-type: none"> <input type="checkbox"/> Dressing change <input type="checkbox"/> Accessing the line <input type="checkbox"/> Port/clave change <input type="checkbox"/> Other:
If the line was percutaneously placed, was this line placed in a recommended site?	<input type="checkbox"/> Yes, changed because: <ul style="list-style-type: none"> <input type="checkbox"/> Dressing soiled, damp or non-occlusive <input type="checkbox"/> Due to be changed (7 days for transparent OR 1 day for gauze) <input type="checkbox"/> Changed by specific team (e.g., PICC, TNA) <input type="checkbox"/> Dressing was overdue to be changed <input type="checkbox"/> No, not changed because: <ul style="list-style-type: none"> <input type="checkbox"/> It was intact and not due <input type="checkbox"/> It was due but could not be completed. Explain:
Was 2% chlorhexidine in 70% Isopropyl alcohol used for skin antisepsis?	<input type="checkbox"/> Yes: <ul style="list-style-type: none"> Was it used appropriately? <input type="checkbox"/> Scrub vigorously back and forth for 30 seconds <input type="checkbox"/> Groin sites 2 minutes <input type="checkbox"/> Air dry up to 2 minutes <input type="checkbox"/> No – Explain: <input type="checkbox"/> No, Povidone iodine used <ul style="list-style-type: none"> Secondary to allergy? <input type="checkbox"/> Yes <input type="checkbox"/> No – Explain:
Were central line tubing and all additions (secondary tubing, etc.) changed during this shift?	<input type="checkbox"/> Yes, completed because: <ul style="list-style-type: none"> <input type="checkbox"/> Tubing due to be changed <input type="checkbox"/> 72 hours since last change <input type="checkbox"/> 24 hours for intralipids <input type="checkbox"/> Medication tubing expired <input type="checkbox"/> No, not completed because

Critical Step	Response
	<input type="checkbox"/> Not due to be changed <input type="checkbox"/> Due but could not be completed – Explain:
Was there blood return from each lumen?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unable to assess (infusion can't be stopped)
Was a chlorhexidine impregnated BioPatch used?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Was a chlorhexidine impregnated occlusive dressing used?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Was an antibiotic coated catheter used at insertion?	<input type="checkbox"/> Yes <input type="checkbox"/> No
What will you change to improve line maintenance practices?	

Appendix IV: Example of a Scrub the Hub Flyer

Associated Hospital/Organization: University of Kansas Hospital in Kansas City, Kansas

Purpose of Tool: To promote line access disinfecting.



References

1. Marshall, J., et al. (2014). Strategies to prevent central line-associated bloodstream infections in acute care hospitals: 2014 update. *Infection Control & Hospital Epidemiology*, 29(7), 753-771.
2. Centers for Disease Control and Prevention. (2025, January). Central line-associated bloodstream infection (CLABSI) event: NHSN patient safety component manual, Chapter 4 (4psc_clabscurrent.pdf). U.S. Department of Health and Human Services.
https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf
3. Centers for Disease Control and Prevention. (2011). Vital signs: central line-associated blood stream infections – United States, 2001, 2008, and 2009. *Annals of Emergency Medicine*, 58(5), 447-450.
4. Scott, R.D. (2009). The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention.
5. Centers for Disease Control and Prevention. (2014). National and state healthcare-associated infections progress report.
6. Institute for Healthcare Improvement. (2012). How-to guide: Prevent central line-associated bloodstream infections. Cambridge, MA.
7. Agency for Healthcare Research and Quality. (2015). TeamSTEPPS®: Strategies and tools to enhance performance and patient safety.
8. O'Grady NP, et al. (2011). Healthcare Infection Control Practices Advisory Committee (HICPAC) (Appendix 1). Summary of recommendations: Guidelines for the Prevention of Intravascular Catheter-related Infections. *Clin Infect Dis*. 2011 May;52(9):1087-99. doi: 10.1093/cid/cir138. PMID: 21467014; PMCID: PMC3106267.
9. Parienti, J.J., Thirion, M., Magarben, B., et al. (2008). Femoral versus jugular central catheterization in patients requiring renal replacement therapy: A randomized controlled study. *JAMA*, 299, 2413-2422.
10. Merrer, J., Jonghe, B.D., Golliot, F., et al. (2001). Complications of femoral and subclavian venous catheterization in critically ill patients: A randomized controlled trial. *JAMA*, 286, 700.
11. Arvaniti K, Lathyris D, Blot S, Apostolidou-Kiouti F, Koulenti D, Haidich AB. Cumulative Evidence of Randomized Controlled and Observational Studies on Catheter-Related Infection Risk of Central Venous Catheter Insertion Site in ICU Patients: A Pairwise and Network Meta-Analysis. *Crit Care Med*. 2017 Apr;45(4):e437-e448. doi: 10.1097/CCM.0000000000002092. PMID: 27632678.

12. Grady, N.P., Alexander, M., Burns, L.A., Dellinger, P., Graland, J., Heard, S.O., et al. (2011). Guidelines for the prevention of intravascular catheters-related infections, 2011.
13. Parienti, J.J., du Cheryron, D., Timisit, J.F., Traore, O., Kalfon, P., Mimos, O., Mermel, L.A. (2012). Meta-analysis of subclavian insertion and nontunneled central venous catheter-associated infection risk reduction in critically ill adults. *Critical Care Medicine*, 40(5), 1627-1634.
14. Parienti, J.J., Thirion, M., Mégarbane, B., Souweine, B., Ouchikhe, A., Polito, A. Members of the Cathedia Study Group. (2008). Femoral vs. jugular venous catheterization and risk of nosocomial events in adults requiring acute renal replacement therapy: A randomized controlled trial. *JAMA*, 299, 2413-22.
15. Marik, P.E., Flemmer, M., Harrison, W. (2012). The risk of catheter-related infection with femoral venous catheters as compared to subclavian and internal jugular venous catheters: A systematic review of the literature and meta-analysis. *Critical Care Medicine*, 40(8), 2479-2485.
16. Timsit, J.F., et al. (2013). Jugular versus femoral short-term catheterization and risk of infection in intensive care unit patients. Causal analysis of two randomized trials. *American Journal of Respiratory and Critical Care Medicine*, 188(10), 1232-1239.
17. Merrer, J., De Jonghe, B., Golliot, F., Lefrant, J.Y., Raffy, B., Barre, E. French Catheter Study Group in Intensive Care. (2001). Complications of femoral and subclavian venous catheterization in critically ill patients: A randomized controlled trial. *JAMA*, 286, 700-707.
18. Froehlich, C.D., Rigby, M.R., Rosenberg, E.S., Li, R., Roerig, P.L., Easley, K.A., Stockwell, J.A. (2009). Ultrasound-guided central venous catheter placement decreases complications and decreases placement attempts compared with the landmark technique in patients in pediatric intensive care unit. *Critical Care Medicine*, 37(3), 1090-1096.
19. Karakitsos, D., Labropoulos, N., de Groot, E., Patrianakos, A.P., Kouraklis, G., Poularas, J., ... Karabinis, A. (2006). Real-time ultrasound-guided catheterization of the internal jugular vein: A prospective comparison with the landmark technique in critical care patients. *Critical Care*, 10(6), R162.
20. Grady, N.P., Alexander, M., Burns, L.A., Dellinger, P., Graland, J., Heard, S.O., et al. (2011). Guidelines for the prevention of intravascular catheters-related infections, 2011. Retrieved from <http://www.cdc.gov/hicpac/pdf/guidelines/bsguidelines-2011.pdf>
21. Saugel B, Scheeren TWL, Teboul JL. Ultrasound-guided central venous catheter placement: a structured review and recommendations for clinical practice. *Crit*

- Care. 2017 Aug 28;21(1):225. doi: 10.1186/s13054-017-1814-y. PMID: 28844205; PMCID: PMC5572160.
22. Hu, K.K., Lipsky, B.A., Veenstra, D.L., Saint, S. (2004). Using maximal sterile barriers to prevent central venous catheter-related infection: A systematic evidence-based review. *American Journal of Infection Control*, 32, 142-146.
 23. Guerin, K., Wagner, J., Rains, K., Bessesen, M. (2010). Reduction in central line-associated bloodstream infections by implementation of a post insertion care bundle. *American Journal of Infection Control*, 38(6), 430-433.
 24. Soothill, J.S., Bravery, K., Ho, A., Macqueen, S., Collins, J., Lock, P. (2009). A fall in bloodstream infections followed a change to 2% chlorhexidine in 70% isopropanol for catheter connection antisepsis: A pediatric single center before/after study on a hemopoietic stem cell transplant ward. *American Journal of Infection Control*, 37(8), 626-630.
 25. Hong, H., Morrow, D.F., Sandora, T.J., Priebe, G.P. (2013). Disinfection of needleless connectors with chlorhexidine-alcohol provides long-lasting residual disinfectant activity. *American Journal of Infection Control*, 41(8), e77-e79.
 26. Snarterse, M., Ruger, W., Scholte Op Reimer, W.J., Lucas, C. (2010). Antibiotic-based catheter lock solutions for prevention of catheter-related bloodstream infection: a systematic review of randomised controlled trials. *Journal of Hospital Infection*, 75(1), 1-11.
 27. Rupp, M. E., Cavalieri, R. J., Marolf, C., & Lyden, E. (2017). Reduction in Blood Culture Contamination Through Use of Initial Specimen Diversion Device. *Clinical Infectious Diseases*, 65(2), 201-205.
 28. O'Horo, J.C., Sliva, G.L., Munoz-Price, L.S., Safdar, N. (2012). The efficacy of daily bathing with chlorhexidine for reducing healthcare-associated bloodstream infections: A meta-analysis. *Infection Control & Hospital Epidemiology*, 33(3), 257-267.
 29. Karki, S., Cheng, A.C. (2012). Impact of non-rinse skin cleansing with chlorhexidine gluconate on prevention of healthcare associated infections and colonization with multi-resistant organisms: A systematic review. *Journal of Hospital Infection*, 83(2), 71-84.
 30. Miller, S.E., Maragakis, L.L. (2012). Central line-associated bloodstream infection prevention. *Current Opinion in Infectious Diseases*, 25(4), 412-422.
 31. Sievert, D., Armola, R., Halm, M.A. (2011). Chlorhexidine gluconate bathing: Does it decrease hospital-acquired infections? *American Journal of Critical Care*, 20(2), 166-170.
 32. Centers for Disease Control and Prevention. 2017 Recommendations on use of chlorhexidine-impregnated dressings for prevention of intravascular catheter-related infections: An update to the 2011 guidelines for the prevention of

- intravascular catheter-related infections from the Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, Division of Healthcare Quality and Promotion. Accessed December 19, 2025. <https://www.cdc.gov/infection-control/hcp/c-i-dressings/index.html>
33. Waltz, J.M., Ellison, R.T., Mack, D.A., Flaherty, H.M., McIlwaine, J.K., Whyte, K.G., CCOC Research Group. (2013). The bundle “plus”: The effect of multidisciplinary team approach to eradicate central line-associated bloodstream infections. *Anesthesia & Analgesia*. [Epub ahead of print].
 34. Dompkins LS, Tien V, Madison AN. Getting to zero: Impact of a device to reduce blood culture contamination and false-positive central-line-associated bloodstream infections. *Infect Control Hosp Epidemiol*. 2023 Sep;44(9):1386-1390. doi: 10.1017/ice.2022.284. Epub 2022 Dec 21. PMID: 36539993; PMCID: PMC10507495.
 35. Centers for Disease Control and Prevention: Collect Adult Blood Culture Sets. <https://www.cdc.gov/lab-quality/php/preventing-adult-blood-culture-contamination/collect.html>
 36. Nickel B, Gorski L, Kleidon T, Kyes A, DeVries M, Keogh S, Meyer B, Sarver MJ, Crickman R, Ong J, Clare S, Hagle ME. Infusion Therapy Standards of Practice, 9th Edition. *J Infus Nurs*. 2024 Jan-Feb 01;47(1S Suppl 1):S1-S285. doi: 10.1097/NAN.0000000000000532. PMID: 38211609.
 37. Payal K. Patel, Russell N. Olmsted, Louella Hung, et al. A Tiered Approach for Preventing Central Line Associated Bloodstream Infection. *Ann Intern Med*. 2019;171:S16-S22. [Epub 1 October 2019]. doi:10.7326/M18-3469