



**Indiana**  
**Department**  
**of**  
**Health**

# CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION (CLABSI)

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OUR MISSION:

To promote, protect, and improve the health and safety of all Hoosiers.

OUR VISION:

Every Hoosier reaches optimal health regardless of where they live, learn, work, or play.



# Objectives

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- Identify sign and symptoms associated with central line associated bloodstream infections
- Identify interventions to prevent central line associated bloodstream infections (CLABSI)
- Implement care and management of central line catheters before, during and after insertion
- Identify the four recognized routes for contamination of catheters:
- Identify indications/use for central line placement

# Target Audience

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## All healthcare workers inserting or managing central lines

Central venous catheters can be found in multiple settings such as:

- Hospitals (Intensive Care Units, Special Care Units, and other hospital settings);
- Long Term Acute Care Hospitals (LTACH)
- Long-term care facilities (LTCFs)
- Outpatient facilities such as:
  - Ambulatory surgical clinics
  - Dialysis centers.
- Additionally, sometimes a patient can have a central venous catheter while at home after a hospital stay or during long-term treatment for conditions like cancer.

[Frequently Asked Questions about Catheters | HAI | CDC](#)

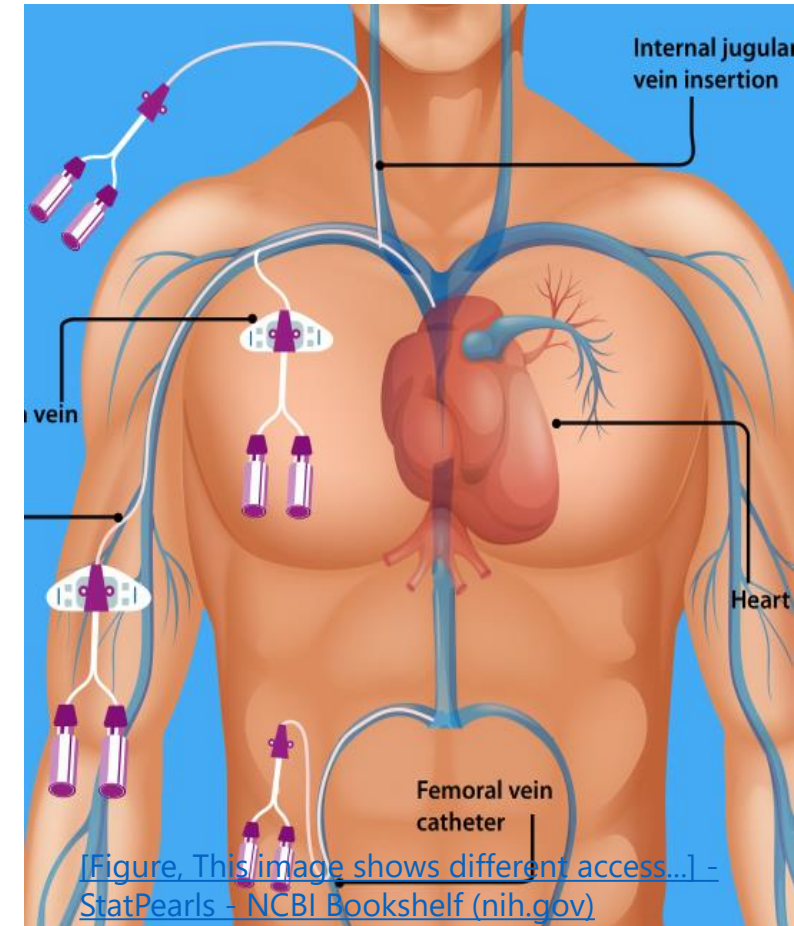
# Central line

## What is a central line?

A central line (also known as a central venous catheter (CVC)) is a catheter (tube) that doctors often place in a large vein in the neck, chest, or groin to give medication or fluids or to collect blood for medical tests.

Central lines are different from IVs because central lines access a major vein that is close to the heart and can remain in place for weeks or months and be much more likely to cause serious infection.

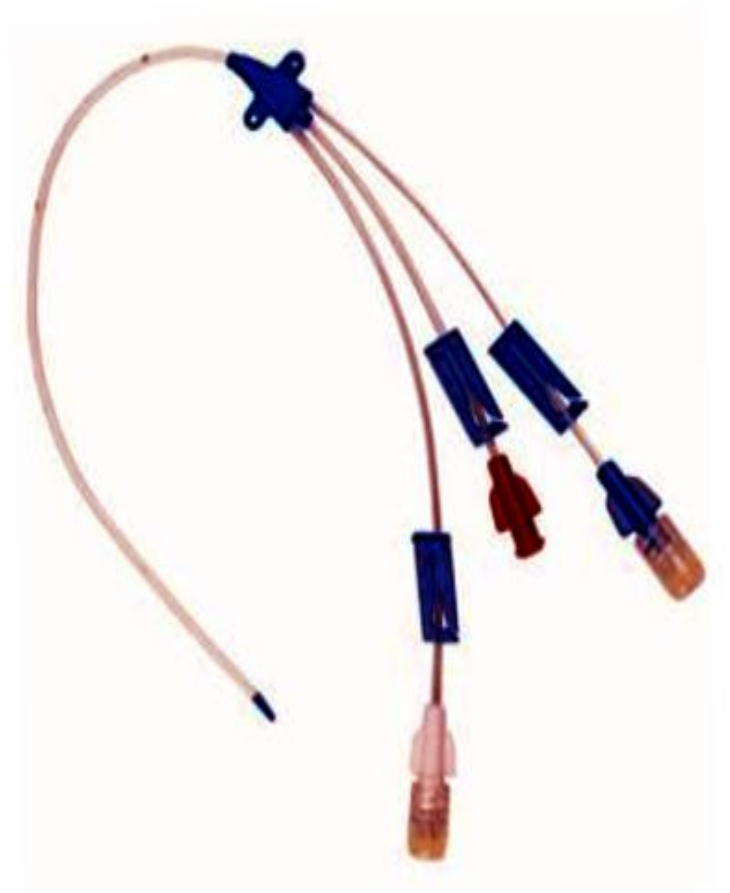
[Central Line-associated Bloodstream Infections: Resources for Patients and Healthcare Providers | HAI | CDC](#)



# Indication/Uses of Central Lines

Central lines may be placed for the following indications:

- Hemodynamic instability that requires vasopressor support
- Need to instill hyperosmolar agents or agents known to cause vein scarring.
- Inadequate peripheral IV access (either failure to obtain peripheral access anywhere, or needing multiple IVs to sustain and resuscitate a patient)
- Mass transfusion protocol in patients with inadequate peripheral access



[Central Line - StatPearls - NCBI Bookshelf \(nih.gov\)](#)

[Central Line - StatPearls - NCBI Bookshelf \(nih.gov\)](#)

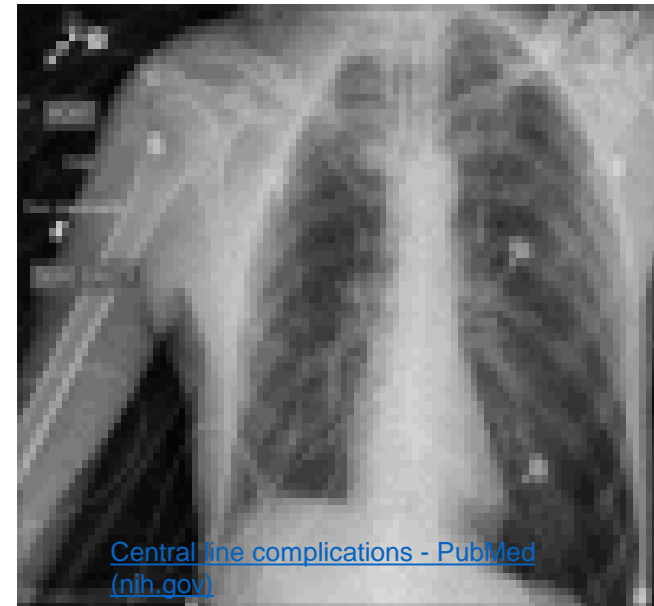
# Complications

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As with any procedure, there is the risk of complications associated with central line use:

- Discomfort during placement,
- Bleeding, Infection,
- Blocking or kinking,
- Collapsed lung.

[Central Line-associated Bloodstream Infection \(CLABSI\) | HAI](#)  
[Central Line Management - StatPearls - NCBI Bookshelf \(nih.gov\)](#)  
[central-venous-catheter.pdf \(thoracic.org\)](#)



# Contamination

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There are four recognized routes for contamination of catheters:

1. Migration of skin organisms at the insertion site into the cutaneous catheter tract and along the surface of the catheter with colonization of the catheter tip; this is the most common route of infection for short-term catheters.
2. Direct contamination of the catheter or catheter hub by contact with hands or contaminated fluids or devices
3. Less commonly, catheters might become exposed from another focus of infection and
4. Rarely, infusate contamination.

[Central Line Associated Blood Stream Infections - StatPearls - NCBI Bookshelf \(nih.gov\)](#)  
[Guidelines for the Prevention of Intravascular Catheter-Related Infections \(2011\) \(cdc.gov\)](#)

Last update: October 2017



# Reasons for removal of central lines

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- Is there is an infection that is proven (that is, there are positive blood cultures from both the CVC and peripheral blood or a positive swab test result from the exit site) and unresolved (that is, cultures are still positive after appropriate antimicrobial therapy has been administered through the CVC for 48 hours)?
- Is there an infection that is compromising the patient?
- Is there a proven thrombosis in the patient's blood vessel?
- Is there an occlusion that remains after all appropriate methods of unblocking have been tried?
- Has a condition of phlebitis or thrombophlebitis developed that is unresponsive to treatment?
- Is there an irreparable fault or fracture in the CVC?
- Has the CVC exceeded its recommended dwell time and have the patient's venous access requirements been assessed to determine whether there are suitable veins for the length of therapy required and the patient is clinically stable for another CVC insertion?
- Does the risk of keeping a long-term access device in place at the end of treatment outweigh the patient's potential requirement for further central venous access in the next few days?
- Has the patient requested removal of the CVC.

[clabsi toolkit tool 3-24 cvc removal considerationspdf.pdf \(jointcommission.org\)](https://www.jointcommission.org/assets/Content/RelatedContent/Clabsi_Toolkit_Tool_3-24_CVC_Removal_Considerations.pdf)

# Central line-associated bloodstream infection (CLABSI)

- A central line-associated bloodstream infection (CLABSI) is a serious infection that occurs when germs (usually bacteria or viruses) enter the bloodstream through the central line.
- Healthcare providers must follow a strict protocol when inserting the line to make sure the line remains sterile and a CLABSI does not occur.
- Healthcare providers must use stringent infection control practices each time they check the line or change the dressing.



[Bloodborne Infectious Diseases: Management & Treatment Guidelines | NIOSH | CDC](#)

# Central Line-associated Bloodstream Infections

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Central line-associated bloodstream infections (CLABSIs) result in thousands of deaths each year and billions of dollars in added costs to the U.S. healthcare system, yet these infections are preventable.

CDC is providing guidelines and tools to the healthcare community to help end CLABSIs.



[Central Line-associated Bloodstream Infections: Resources for Patients and Healthcare Providers | HAI | CDC](#)

# Rates of CLABSI

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Of an estimated 250,000 CLABSI that occur in U.S. hospitals annually, only about 80,000 occur in ICUs.

Increased recognition of the problem of CLABSI outside of ICUs has led hospitals to expand CLABSI surveillance to non-ICU settings.

Reported CLABSI rates in non-ICU settings range from 2 to 6 per 1000 line-days, 7-14 which is similar to rates observed in ICUs before implementation of interventions to reduce CLABSI.

[A Central Line Care Maintenance Bundle for the Prevention of Catheter-Associated Bloodstream Infection in Non-ICU Settings \(cdc.gov\)](https://www.cdc.gov/infectioncontrol/bundles/CLABSI-Prevention-Non-ICU-Settings.html)



# NHSN

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Surveillance may occur in any type of patient care location where central lines are inserted.

[National Healthcare Safety Network \(NHSN\) Central Line Insertion Practice \(CLIP\) \(cdc.gov\)](#)

CDC's National Healthcare Safety Network is the nation's most widely used healthcare-associated infection tracking system. NHSN provides facilities, states, regions, and the nation with data needed to identify problem areas, measure progress of prevention efforts, and ultimately eliminate healthcare-associated infections.

[Enroll Facility Here](#)

[NHSN | CDC](#)

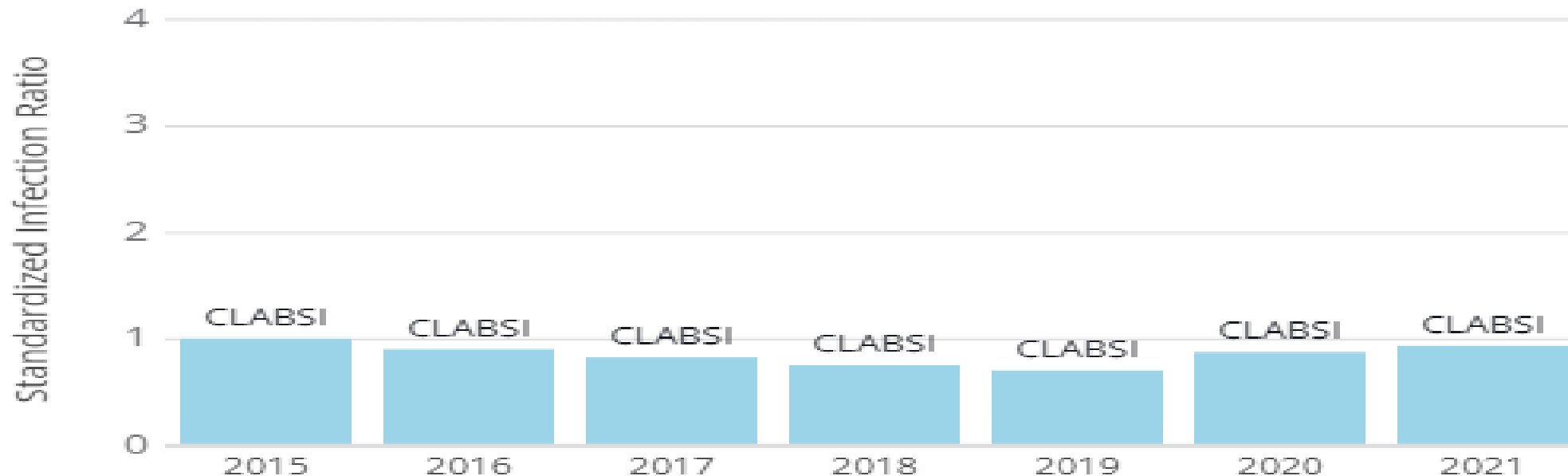
[2023 NHSN Patient Safety Component Manual \(cdc.gov\)](#)

**NHSN provides medical facilities, states, regions, and the nation with data collection and reporting capabilities needed to:**

- identify infection prevention problems by facility, state, or specific quality improvement project
- benchmark progress of infection prevention efforts
- comply with state and federal public reporting mandates, and ultimately,
- drive national progress toward elimination of HAIs.

# Progress Report

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[2020 National and State Healthcare-Associated Infections \(HAI\) Progress Report | A.R. & Patient Safety Portal \(cdc.gov\)](#)

[Current HAI Progress Report | HAI | CDC](#)

# Strategies for Prevention-CLABSI

- Education, Training and Staffing
- Selection of Catheters and Sites
- Type of Catheter Material
- Hand Hygiene and Aseptic Technique
- Maximal Sterile Barrier Precautions
- Skin Preparation
- Catheter Site Dressing Regimens
- Patient Cleansing
- Catheter Securement Devices
- Antimicrobial/Antiseptic Impregnated Catheters and Cuffs
- Systemic Antibiotic Prophylaxis
- Antibiotic/Antiseptic Ointments
- Antibiotic Lock Prophylaxis, Antimicrobial Catheter Flush and Catheter Lock Prophylaxis
- Anticoagulants
- Replacement of CVCs, Including PICCs and Hemodialysis Catheters
- Umbilical Catheters
- Peripheral Arterial Catheters and Pressure Monitoring Devices for Adult and Pediatric Patients
- Replacement of Administration Sets
- Needleless Intravascular Catheter Systems

# What can patients do to help prevent CLABSI

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Here are some ways patients can protect themselves from CLABSI:

- Research the hospital, if possible, to learn about its CLABSI rate.
- Speak up about any concerns so that healthcare personnel are reminded to follow the best infection prevention practices.
- Ask a healthcare provider if the central line is absolutely necessary. If so, ask them to help you understand the need for it and how long it will be in place.
- Pay attention to the bandage and the area around it. If the bandage comes off or if the bandage or area around it is wet or dirty, tell a healthcare worker right away.
- Don't get the central line or the central line insertion site wet.
- Tell a healthcare worker if the area around the catheter is sore or red or if the patient has a fever or chills.
- Do not let any visitors touch the catheter or tubing.
- The patient should avoid touching the tubing as much as possible.
- In addition, everyone visiting the patient must wash their hands—before and after they visit.

[Central Line-associated Bloodstream Infections: Resources for Patients and Healthcare Providers | HAI | CDC](#)



# Signs and Symptoms CLABSI

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- Altered Mental Status
  - Fever
  - Chills
  - Hypotension
  - Lethargy
  - Fatigue
  - Inflammation
  - Pain
  - Swelling
  - Discharge
  - Redness
  - Difficulty drawing blood or poor flow
- **Exit site infection:** Signs of inflammation confined to an area (typically < 2 cm) surrounding the catheter exit site and the presence of exudate that proves to be culture positive.
  - **Tunnel infection:** Inflammation extending beyond 2 cm from the exit site, typically associated with pain and tenderness along the subcutaneous track and culture-positive exudate at the exit site that may not be seen unless expressed by palpation.

[Central Line Associated Blood Stream Infections - StatPearls - NCBI Bookshelf \(nih.gov\)](#)

[Central Line Associated Blood Stream Infections - StatPearls - NCBI Bookshelf \(nih.gov\)](#)

# Treatment

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When CLABSI is suspected, empiric therapy should be based on the most likely organism, and the overall clinical picture. While awaiting cultures, empiric treatment should be instituted promptly. In general, coverage for common gram-positive and gram-negative organisms is necessary. The local prevalence and antimicrobial susceptibility patterns in institutional antibiograms should be considered.

[Toolkit 3. The Nursing Home Antibiogram Program Toolkit: How To Develop and Implement an Antibiogram Program | Agency for Healthcare Research and Quality \(ahrq.gov\)](#)

[Central Line Associated Blood Stream Infections - StatPearls - NCBI Bookshelf \(nih.gov\)](#)

# Tools, Central Line Toolkit and Bundles

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CDC, in collaboration with other organizations, has developed guidelines for the prevention of CLABSI and other types of healthcare-associated infections.

[CLABSI Toolkit - Introduction | The Joint Commission](#)

[Accreditation options: Understanding the Accreditation Association for Hospitals/Health Systems \(beckershospitalreview.com\)](#)

[Check list for Prevention of Central Line Associated Blood Stream Infections](#)

[Toolkit for Reducing Central Line-Associated Blood Stream Infections AHRQ](#)

[clabsi toolkit tool 3-23 daily central line maintenance checklist - \\_templatepdf.pdf \(jointcommission.org\)](#)

[CVC Maintenance Bundles](#)

[Daily Central Line Maintenance Checklist – Template](#)

[CUSP Toolkit](#)

# Procedural Reminders

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## Suspected Infection:

- If central venous catheter infection is strongly suspected, replace catheter and all intravenous fluids, tubing, and caps.

## Hand Hygiene:

- Clean hands immediately before and after each episode of patient contact using the correct hand hygiene technique. (Use World Health Organization "My 5 Moments for Hand Hygiene".)

## Cap Changes:

- Sanitize caps with 2%chlorhexidine gluconate in 70% isopropyl alcohol before and after each use ("Scrub the Hub"). Change caps when necessary, using sterile gloves and mask, that is, after administering blood and if there is visual observation of blood in the caps. Change caps no more often than 72 hours (or according to the manufacturer's recommendations and whenever the administration set is changed).

## Tubing Changes:

- Replace administration sets and add-on devices no more frequently than every 96 hours, and at least every 7 days, after initiation of use, unless contamination occurs. Replace set and add-on devices within 24 hours of start of infusion if fluids that enhance microbial growth are infused (for example, fat emulsions combined with amino acids and glucose in three-in-one admixture or blood products infused separately). Change needleless components as often as the administration set and no more often than 72 hours.

## Dressing Changes:

- Change gauze dressing every 2 days, clear dressings every 7 days, unless dressing becomes damp, loosened, or visibly soiled then change. Use sterile gauze or sterile, transparent, semipermeable dressings. Perform catheter site care using 2% chlorhexidine gluconate in 70% isopropyl alcohol to clean the insertion site during dressing changes.

# Daily Central Line Maintenance Reminders

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- Assess Necessity?
- Are Injection sites covered by caps or valved connectors?
- Caps changed?
- Is the Insertion site without evidence of infection?
- Dressing intact and labeled properly?
- Dressing changed?
- Catheter stabilized/no tension on the line?
- Administration set changed? or labeled?

# Key Points

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- Weigh the risks and benefits of placing a central venous device at a recommended site to reduce infectious complications against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement).
- Avoid using the femoral vein for central venous access in adult patients.
- Use a subclavian site, rather than a jugular or a femoral site, in adult patients to minimize infection risk for nontunneled CVC placement.
- No recommendation can be made for a preferred site of insertion to minimize infection risk for a tunneled CVC.
- Avoid the subclavian site in hemodialysis patients and patients with advanced kidney disease, to avoid subclavian vein stenosis.
- Use a fistula or graft in patients with chronic renal failure instead of a CVC for permanent access for dialysis.
- Use ultrasound guidance to place central venous catheters (if this technology is available) to reduce the number of cannulation attempts and mechanical complications. Ultrasound guidance should only be used by those fully trained in its technique.
- Use a CVC with the minimum number of ports or lumens essential for the management of the patient.
- No recommendation can be made regarding the use of a designated lumen for parenteral nutrition.
- Promptly remove any intravascular catheter that is no longer essential.
- When adherence to aseptic technique cannot be ensured (i.e., catheters inserted during a medical emergency), replace the catheter as soon as possible, i.e., within 48 hours.

# Question 1

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What are central venous catheters, and why is it used?

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Answer 1

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A central venous catheter, also known as a central line, is a tube that doctors place in a large vein in the neck, chest, groin, or arm to give fluids, blood, or medications or to do medical tests quickly. These long, flexible catheters empty out in or near the heart, allowing the catheter to give the needed treatment within seconds. You may be familiar with standard intravenous lines (IVs). Central lines are much different from standard IVs that are used to give medicine into a vein near the skin's surface, usually for short periods of time. A central venous catheter can remain for weeks or months, and some patients receive treatment through the line several times a day. Central venous catheters are important in treating many conditions, particularly in intensive care units (ICUs)

[Frequently Asked Questions about Catheters | HAI | CDC](#)



## Question 2

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What types of central venous catheters are there?

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Answer 2

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There are several types of central venous catheters. Healthcare providers use the type that is best for each patient's case.

- A *peripherally inserted central catheter* (PICC) line is placed into a vein in the arm.
- A *tunneled catheter* is surgically placed into a vein in the chest or neck and then passed under the skin. One end of the catheter comes out through the skin so medicines can be given right into the catheter.
- An *implanted port* is similar to a tunneled catheter, but an implanted port is placed entirely under the skin. Medicines are given by a needle placed through the skin into the catheter. An implanted port is not as visible as a tunneled catheter, does not require as much daily care, and does not get in the way of a patient's regular activities as much as a PICC line or a tunneled catheter might.

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Comparison of Major Types of Central Lines

Catheter Type	Entry Site	Duration of use	Advantages	Disadvantages	Comments
Nontunneled CVCs	Percutaneously inserted into central veins (internal jugular, subclavian, or femoral vein)	Short term*	<ul style="list-style-type: none"> <li>■ Percutaneous insertion</li> </ul>	<ul style="list-style-type: none"> <li>■ Require local anesthesia</li> <li>■ May be inserted in the operating room</li> <li>■ Dressing required over site</li> <li>■ Risk of infection</li> </ul>	<ul style="list-style-type: none"> <li>■ Account for the majority of central line–associated bloodstream infections (CLABSIs)</li> <li>■ More commonly used than longterm CVCs</li> </ul>
Tunneled CVCs	Implanted into internal jugular, subclavian, or femoral vein	Long term†		<ul style="list-style-type: none"> <li>■ Require surgical insertion</li> <li>■ Require local or general anesthesia</li> <li>■ Increased cost</li> </ul>	<ul style="list-style-type: none"> <li>■ Lower rate of infection than nontunneled CVCs</li> <li>■ Dacron cuff inhibits migration of organisms into catheter tract when ingrown</li> </ul>
Implantable ports	Inserted in the subclavian or internal jugular vein. Tunneled beneath the skin; subcutaneous port accessed with a noncoring needle.	Long term	<ul style="list-style-type: none"> <li>■ Improved body image (low visibility of port)</li> <li>■ Patient comfort</li> <li>■ Local catheter site care and dressing not needed when not in use</li> </ul>	<ul style="list-style-type: none"> <li>■ Require surgical insertion and removal</li> <li>■ Require general anesthesia</li> <li>■ Increased cost</li> </ul>	<ul style="list-style-type: none"> <li>■ Lowest risk for CLABSI</li> </ul>
Peripherally inserted central catheter (PICC)	Inserted percutaneously into basilic, brachial, or cephalic vein and enters the superior vena cava	Usually short to intermediate	Ease of insertion, usually at the bedside by a specially trained registered nurse	<ul style="list-style-type: none"> <li>■ Can be difficult to position in central vein</li> <li>■ Potential for occlusion</li> </ul>	

# Question 3

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What is central venous catheter used for?

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Answer 3

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Central venous catheters may be used for the following reason:

- To give medicines for treatment of pain, infection, or other medical issues (e.g., cancer or heart problems)
- To provide fluids for nutrition.
- To help conduct certain medical tests.

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Question 4

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Where are central catheters used?

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Answer 4

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Central venous catheters can be found in a number of settings:

- Hospitals (Intensive Care Units, Special Care Units, and other hospital settings)
- Long-term care facilities (LTCFs);
- Outpatient facilities such as
  - Ambulatory surgical clinics
  - Dialysis centers.
  - Additionally, sometimes a patient can have a central venous catheter while at home after a hospital stay or during long-term treatment for conditions like cancer.

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Question 5

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What are some of the things that healthcare providers can do to prevent CLABSI?

[Frequently Asked Questions about Catheters | HAI | CDC](#)



# Answer 5

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Healthcare providers can take the following steps to help prevent CLABSIs:

- Follow recommended central line insertion practices to prevent infection when the central line is placed, including:

- Perform hand hygiene
- Apply appropriate skin antiseptic
- Ensure that the skin prep agent has completely dried before inserting the central line
- Use all five maximal sterile barrier precautions:
  - Sterile gloves
  - Sterile gown
  - Cap
  - Mask
  - Large sterile drape

- Once the central line is in place:

- Follow recommended central line maintenance practices
- Wash their hands with soap and water or an alcohol-based handrub before and after touching the line

- Remove a central line as soon as it is no longer needed. The sooner a catheter is removed, the less likely the chance of infection.

[Frequently Asked Questions about Catheters | HAI | CDC](#)

# Questions?

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# References

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[Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update - PMC \(nih.gov\)](#)

[Strategies to prevent central line-associated bloodstream infections in acute-care hospitals:](#)  
[Vital Signs: Health Disparities in Hemodialysis-Associated Staphylococcus aureus Bloodstream Infections — United States, 2017–2020 | MMWR \(cdc.gov\)](#)

[Prevention Strategies | BSI | Guidelines Library | Infection Control | CDC](#)

[CDC - Home - Performance Management and Quality Improvement - STLT Gateway](#)

[Prevention Strategies | BSI | Guidelines Library | Infection Control | CDC](#)

[Guidelines for the Prevention of Intravascular Catheter-Related Infections \(2011\) \(cdc.gov\)](#)

[BSI | Guidelines Library | Infection Control | CDC](#)