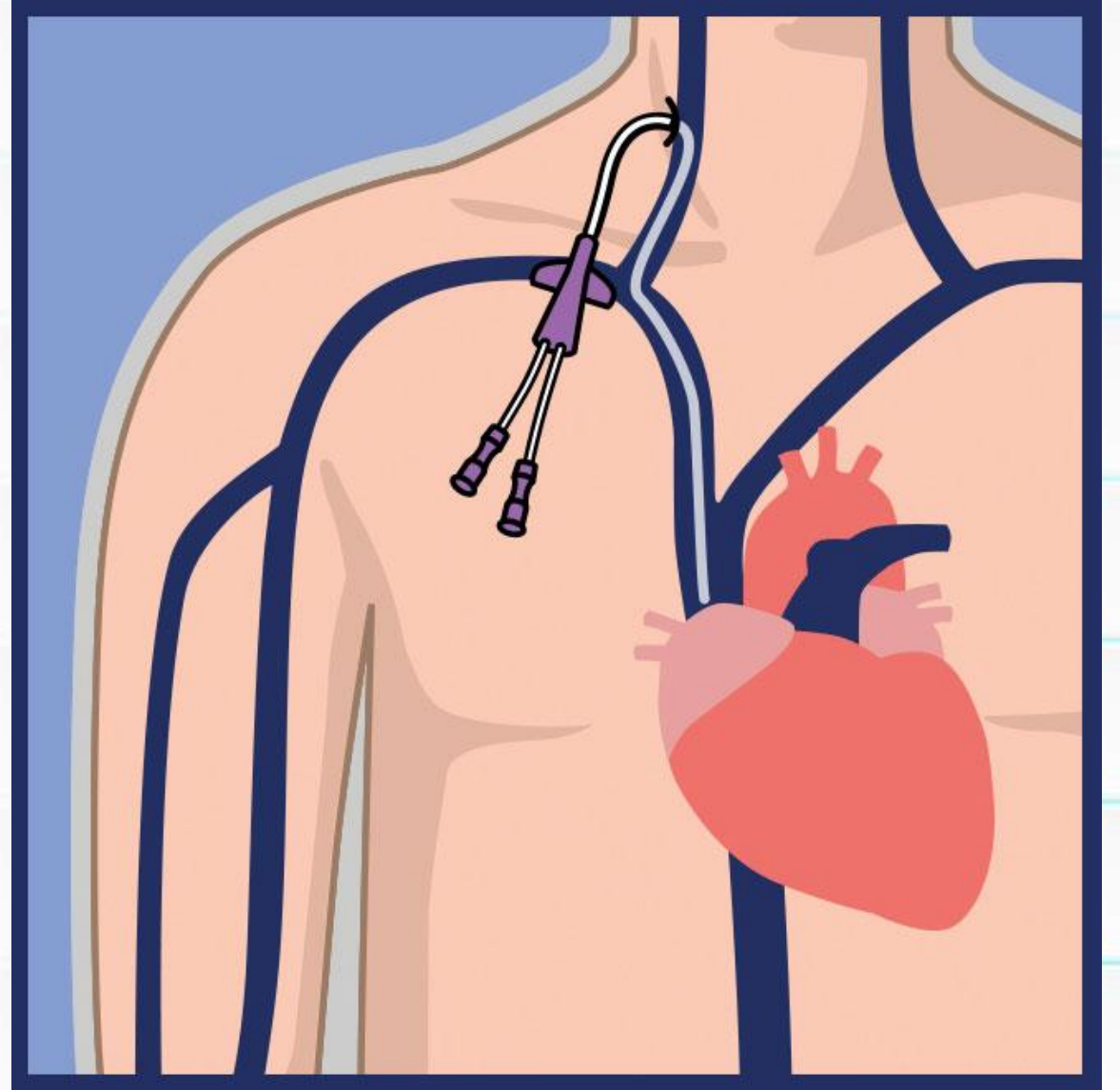

CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION

DR NOR HANANI MOHD NOAH
Anaesthesiology & Intensive Care Unit

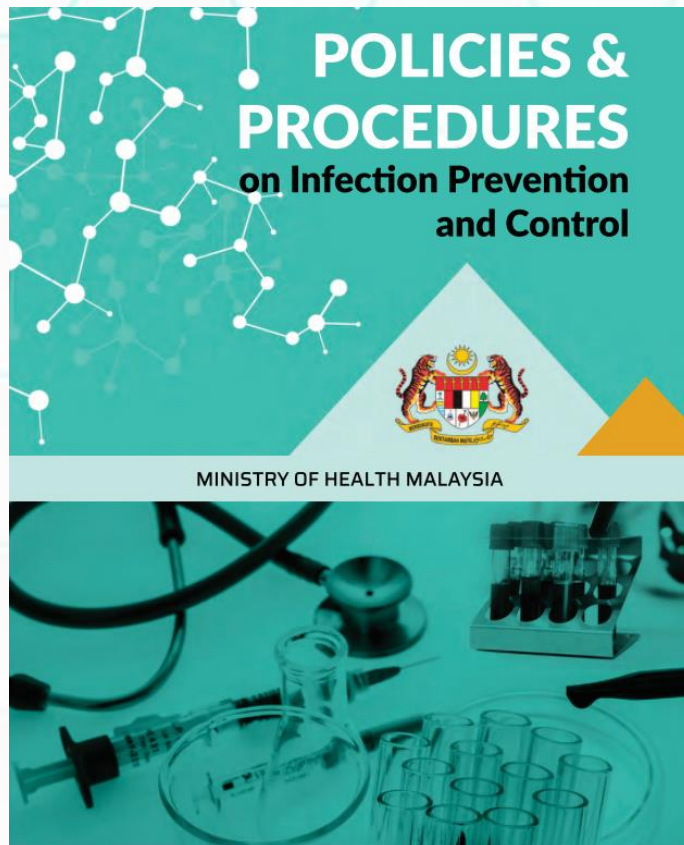


OUTLINE

- CENTRAL LINE
- CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION
 - Definition
 - Pathogenesis
 - Risk Factors
 - Criteria
 - Management
 - Prevention

PROTOCOL

3rd Edition - 2018



Healthcare-Associated Infections (HAIs)

CDC > Healthcare-associated Infections (HAI) > Types of Infections

Healthcare-associated Infections (HAI)

HAI Data +

Types of Infections -

Central Line-associated Bloodstream Infections -

Resources for Patients & Providers

FAQs about Catheters

Surgical Site Infection +

Catheter-associated Urinary Tract Infection +

Ventilator-associated Pneumonia +

Central Line-associated Bloodstream Infection (CLABSI)

[Print](#)

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.

Resources for Patients and Healthcare Providers

- [Central Line-associated Bloodstream Infections: Resources for Patients and Healthcare Providers](#)
- [Frequently Asked Questions about Catheters](#)
- [Strategies to Prevent Central Line-Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update](#) [↗](#)



Learn vital information about healthcare-associated infections.

WHAT IS A CENTRAL LINE?

- A central line is defined as an intravascular access device or catheter that **terminates at or close to the heart or in one of the great vessels**
- A hollow introducer is considered a central line if **the tip is situated in a great vessel.**

Great Vessels for CLABSI Reporting

- | | |
|--------------------------|-----------------------------------|
| • Aorta | • Subclavian veins |
| • Pulmonary artery | • External iliac veins |
| • Superior vena cava | • Common iliac veins |
| • Inferior vena cava | • Femoral veins |
| • Brachiocephalic veins | • Umbilical artery/vein (neonate) |
| • Internal jugular veins | |

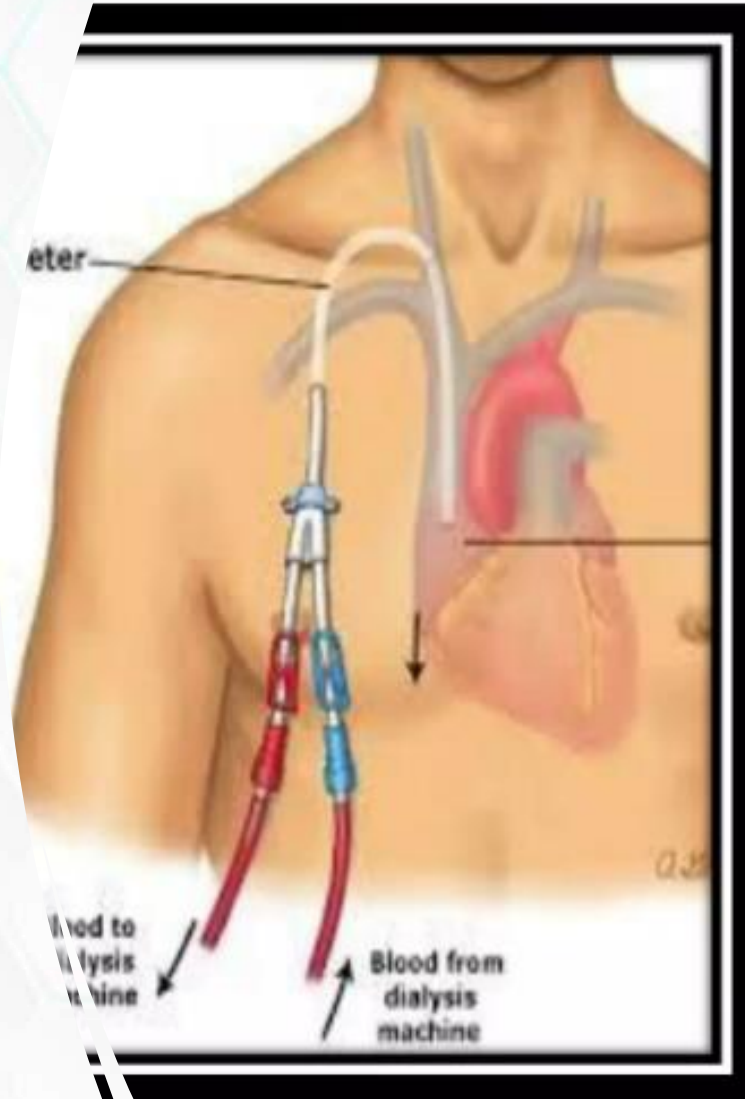
TYPES OF CENTRAL LINE

- Temporary
 - Non tunneled, non implanted catheter
- Permanent
 - Tunneled catheters or implanted port

EXAMPLES OF CENTRAL LINE

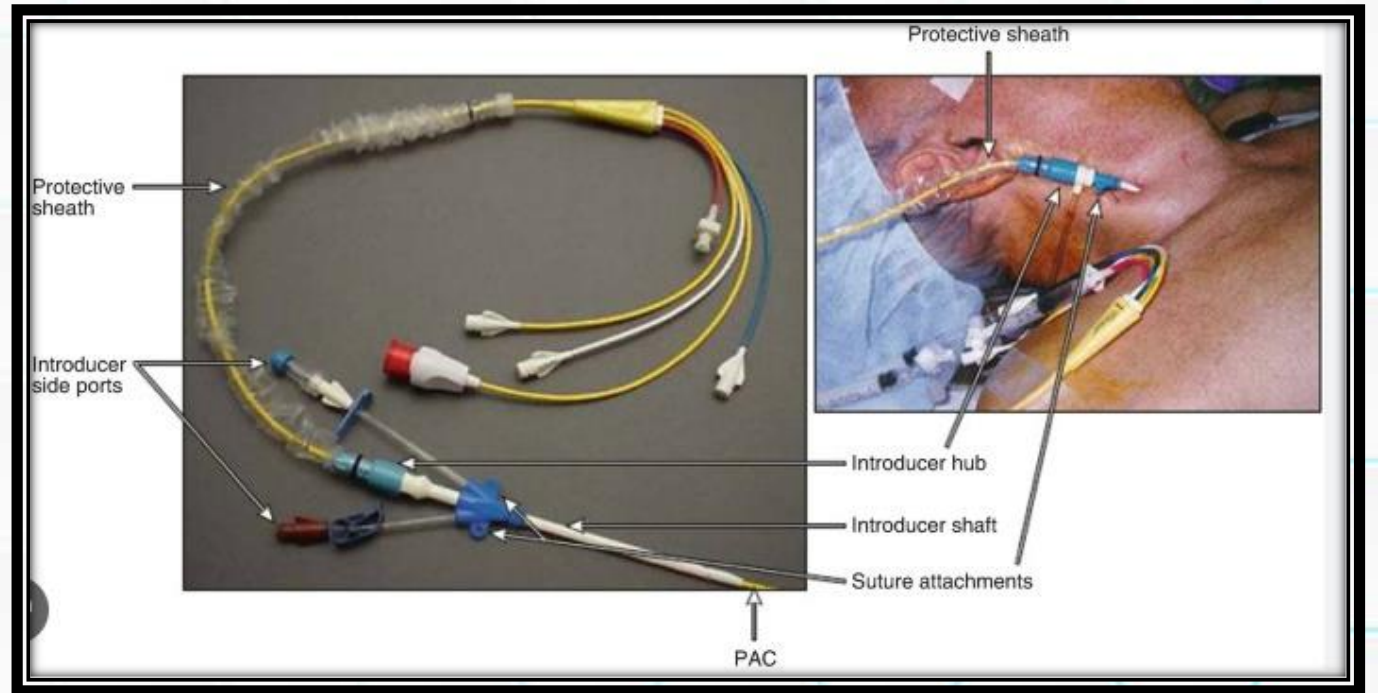
- Non- tunneled or tunneled CVC

Hickman catheter



EXAMPLES OF CENTRAL LINE

- pulmonary artery (PA) catheter, sheath/introducer



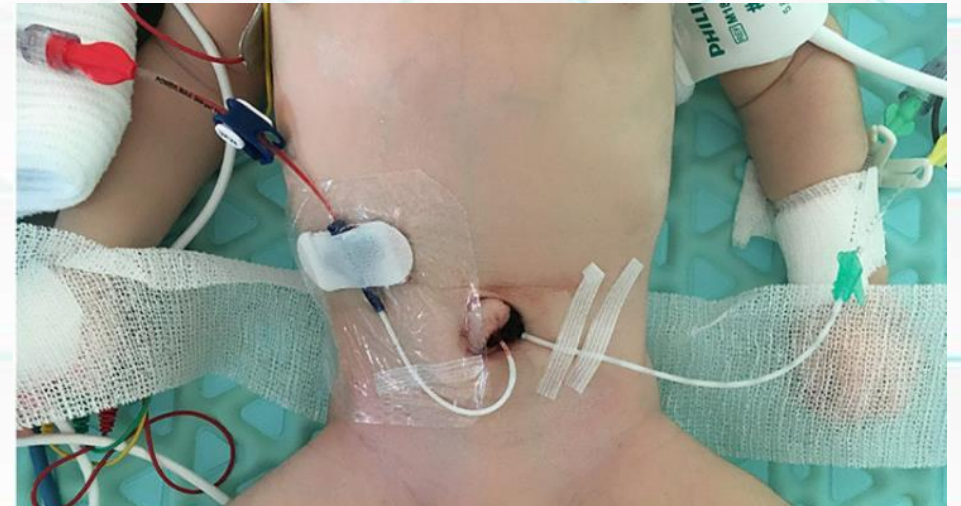
EXAMPLES OF CENTRAL LINE

- Dialysis
hemofiltration
catheter



EXAMPLES OF CENTRAL LINE

- Peripherally inserted central catheter (PICC)
- Umbilical access catheter



EXAMPLES OF CENTRAL LINE

- Implanted ports



Devices that are **NOT** considered central line

Arterial catheters

Arteriovenous fistula

Atrial catheters (transthoracic intracardiac catheters)

Extracorporeal membrane oxygenation (ECMO)

Intra-aortic balloon pump (IABP)

Ventricular Assist Devices (VAD)

Peripheral IVs

INDICATION OF CENTRAL LINE

- ADMINISTRATION OF
 - intravenous fluids
 - blood products
 - Medications such as long term antibiotics, chemotherapy
 - Long term parenteral nutrition
- HAEMODIALYSIS ACCESS
- HAEMODYNAMIC MONITORING



COMPLICATION OF CENTRAL LINE

- **INFECTION**

- Sepsis, cellulitis, septic arthritis

- **VASCULAR**

- Air embolus
- Arterial puncture
- Arteriovenous fistula
- Haematoma
- Blood clot

- **MISCELLANEOUS**

- Dysrhythmias
- Catheter knotting or malposition
- Nerve injury
- Pneumothorax, hemothorax, hydrothorax, haemomediastinum



CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI)

- primary bloodstream infection that develops in a patient with a central line in place within the 48-hour period before onset of the bloodstream infection that is not related to infection at another site.

PATHOGENESIS

EXTRALUMINAL

- patient's skin organisms at the insertion site can migrate along the surface of the catheter into the cutaneous catheter tract surrounding the catheter, resulting in colonization at the catheter tip
- Occurs within 7 days
- most common source of infection in short-term catheters (less than 10 days)

INTRALUMINAL

- Hub contamination, migration along internal surface of the catheter
- Occurs > 7 days
- more associated in prolonged CVC dwell time

PATHOGENESIS

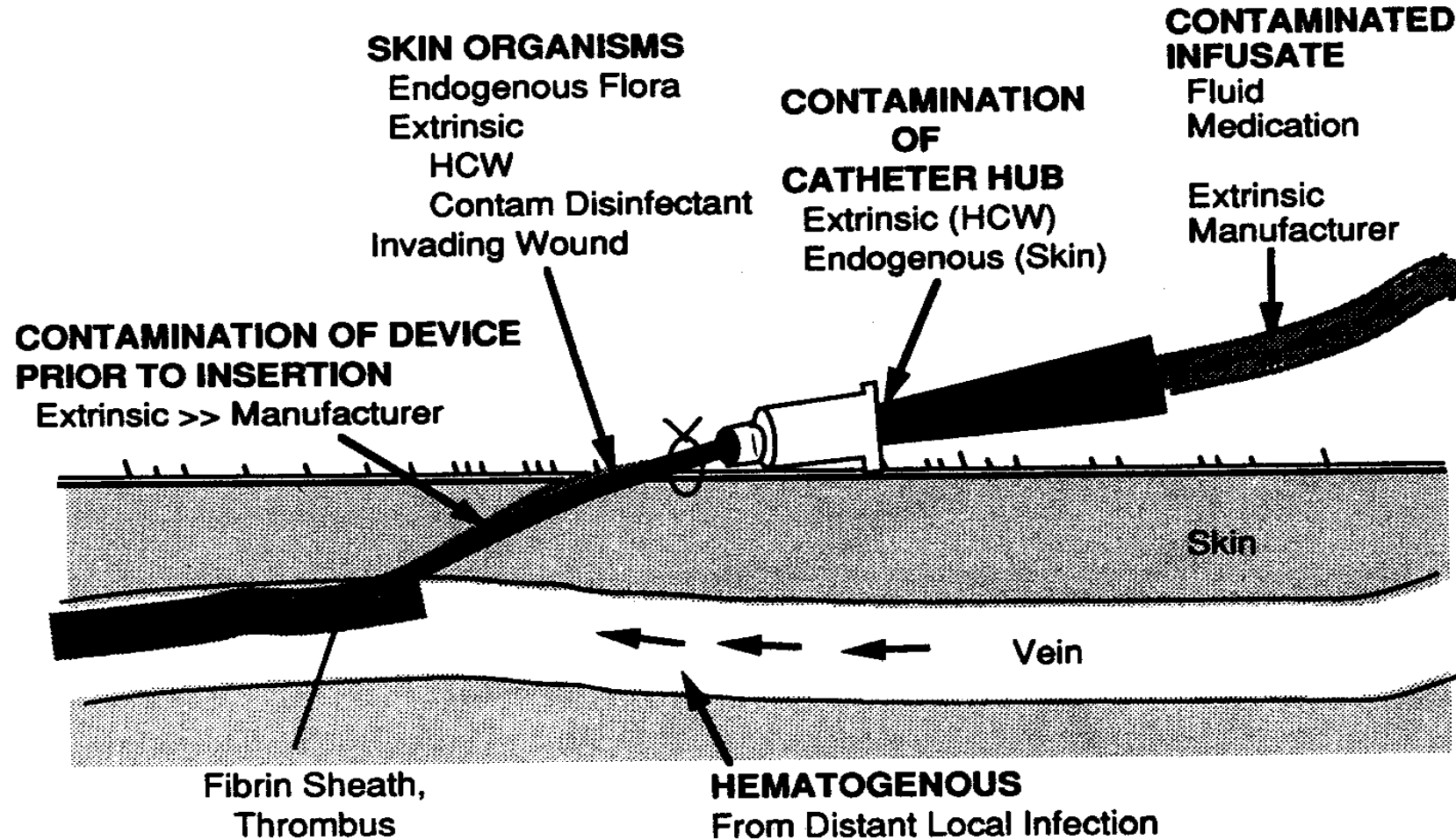
SECONDARY BSI

- catheters can become seeded via the hematogenous route from an infection at another site, such as a urinary tract infection or pneumonia

INFUSATE CONTAMINATION

- Introduction of pathogens from fluids infused through the catheter
- Faulty manufacturer

Process of Catheter-Related Infections



The Impact of CLABSI

90% of all catheter related BSIs are associated with central-line catheters

250,000 cases of (CLABSI) annually in the US

80,000 cases occur annually in ICU's

The attributable mortality of a CLABSI is 12-25%

The attributable cost up to \$20,000-\$56,000 per episode

COMMON ORGANISMS

GRAM POSITIVES	GRAM NEGATIVES	OTHERS
Coagulase-negative staphylococci, 34.1% Enterococci, 16%; Staphylococcus aureus, 9.9%	Klebsiella, 5.8% Enterobacter, 3.9% Pseudomonas, 3.1% E.coli, 2.7% Acinetobacter, 2.2%	Candida spp

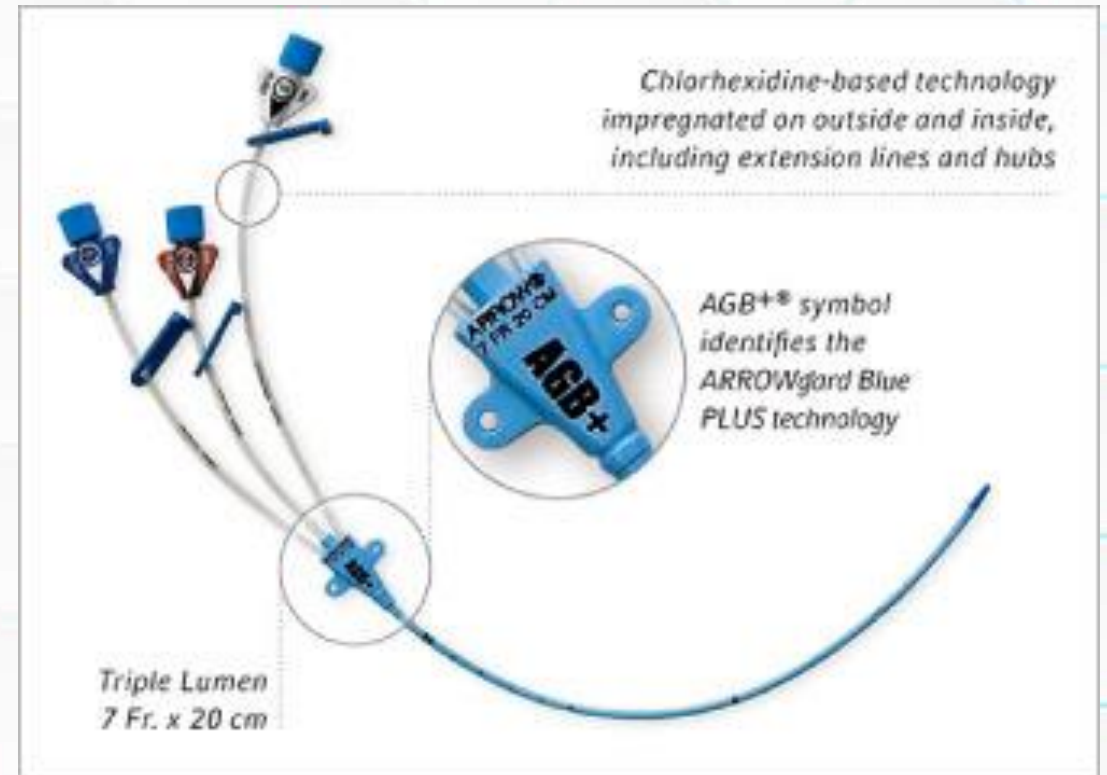
Atilla A, Doğanay Z, Kefeli Çelik H, Demirağ MD, S Kiliç S. Central line-associated blood stream infections: characteristics and risk factors for mortality over a 5.5-year period. Turk J Med Sci. 2017 Apr 18;47(2):646-652

RISK FACTORS FOR CLABSI

- Prolonged hospitalization before catheterization
- Prolonged duration of catheterization
- Heavy microbial colonization at the insertion site
- Heavy microbial colonization of the catheter hub
- Internal jugular catheterization
- Femoral catheterization in adults
- Neutropenia
- Prematurity (ie, early gestational age)
- Reduced nurse-to-patient ratio in the
- Total parenteral nutrition
- Substandard catheter care (eg, excessive manipulation of the catheter)
- Transfusion of blood products (in children)

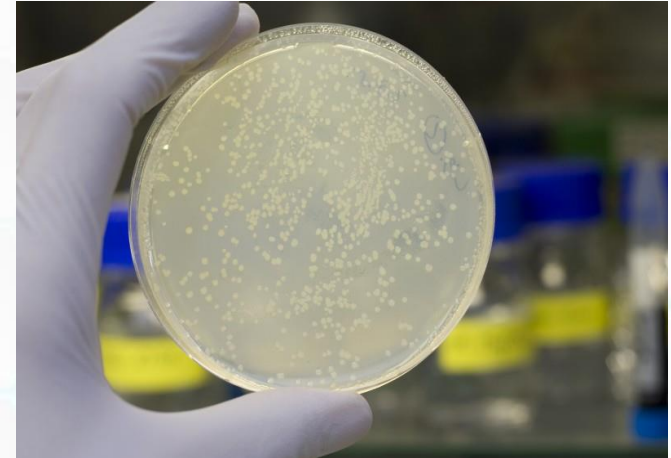
REDUCED RISK FACTORS FOR CLABSI

- Female sex
- Antibiotic administration
- Minocycline-rifampin-impregnated catheters



CRITERIA

1. Clinical signs of infection
 - e.g., fever, rigors, altered mental status, hypotension
 - redness and soreness around central line
 - pus or foul-smelling discharge around the central line
2. No alternate source of blood-stream infection
3. Positive blood culture a peripheral vein with any one of the following:
 - Catheter tip/segment culture that matches organism grown from blood
 - At least threefold higher number of organisms grown from the catheter versus the peripheral blood culture on simultaneously drawn cultures
 - Growth from the catheter-drawn blood culture occurs at least two hours before growth of the same organism from a percutaneously-drawn blood culture



Blood Cultures

- ❑ Patients with a new episode of suspected catheter-related infection should have two sets of peripheral blood samples drawn for culture.
- ❑ In rare instances where access for peripheral blood draws is limited, one set may be drawn from the line and one set may be drawn percutaneously.



C-VAD Line Cultures: Indications

- The utility of catheter cultures is controversial; nonetheless, proper technique is imperative to evaluate the data.
- The catheter tip may be submitted for semiquantitative culture if there is clinical suspicion of CLABSI.
- Routinely removed catheters should not be sent for culture.



When CLABSI is Suspected:

- If the patient is septic and CLABSI is strongly suspected to be the source, remove the catheter.
- Perform appropriate cultures
- Administer appropriate antibiotics
- Document results

STAY FOCUS BUDDY

ITS NOT THAT HARD

makeameme.org

TRIVIA TIME



makeameme.org

Which Central Line has the lowest CRBSI rate?

A close-up photograph of a person wearing a white lab coat and blue nitrile gloves. The person is holding a small, rectangular white card with the word "PREVENTION" written on it in bold, blue, sans-serif capital letters. The background is softly blurred, showing the doctor's chest and a stethoscope around their neck.

PREVENTION

CVC CARE BUNDLE

- MHA Keystone Study:
 - Statewide initiative in Michigan to prevent CLABSI 103 ICUs
 - launched Oct 2003
 - Made use of a “bundle” of best practices
- What is a bundle?
 - Structured way of improving process of care and patient outcomes using a set of evidence-based interventions at the same time

Checklist for Prevention of Central Line Associated Blood Stream Infections

Based on 2011 CDC guideline for prevention of intravascular catheter-associated bloodstream infections:
<http://www.cdc.gov/nicpac/pdf/guidelines/bsi-guidelines-2011.pdf>

For Clinicians:

Promptly remove unnecessary central lines

- Perform daily audits to assess whether each central line is still needed

Follow proper insertion practices

- Perform hand hygiene before insertion
- Adhere to aseptic technique
- Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full-body drape)
- Perform skin antiseptics with >0.5% chlorhexidine with alcohol
- Choose the best site to minimize infections and mechanical complications
 - Avoid femoral site in adult patients
- Cover the site with sterile gauze or sterile, transparent, semipermeable dressings

Handle and maintain central lines appropriately

- Comply with hand hygiene requirements
- Scrub the access port or hub immediately prior to each use with an appropriate antiseptic (e.g., chlorhexidine, povidone iodine, an iodophor, or 70% alcohol)
- Access catheters only with sterile devices
- Replace dressings that are wet, soiled, or dislodged
- Perform dressing changes under aseptic technique using clean or sterile gloves

For Facilities:

- Empower staff to stop non-emergent insertion if proper procedures are not followed
- “Bundle” supplies (e.g., in a kit) to ensure items are readily available for use
- Provide the checklist above to clinicians, to ensure all insertion practices are followed
- Ensure efficient access to hand hygiene
- Monitor and provide prompt feedback for adherence to hand hygiene
<http://www.cdc.gov/handhygiene/Measurement.html>
- Provide recurring education sessions on central line insertion, handling and maintenance

Supplemental strategies for consideration:

- 2% Chlorhexidine bathing
- Antimicrobial/Antiseptic-impregnated catheters
- Chlorhexidine-impregnated dressings

The CVC care bundle 5-evidence-based procedures as recommended by the CDC:

1

Use appropriate hand hygiene.

2

Use chlorhexidine for skin preparation.

3

Use full-barrier precautions during central venous catheter insertion.

4

Optimal catheter site selection, with subclavian vein as the preferred site for non-tunnelled catheters.

5

Daily review of line necessity with prompt removal of unnecessary lines.

1. HAND HYGIENE

- Important first step in preventing CLABSI
- When caring for CVCs, hand hygiene should be performed:
 - ❖ before and after palpating catheter insertion sites.
 - ❖ before donning gloves and gown.
 - ❖ before and after inserting, replacing, accessing, or dressing a catheter
 - ❖ after removing gloves



2. MAXIMAL BARRIER PRECAUTIONS

- use of a cap, mask, sterile gloves and sterile long sleeved gowns by the operator or those assisting in the insertion.
- Maximal barrier precautions also includes covering the patient with a large sterile drape, with a small opening for the site of insertion
- The assistant who helps to drop items into the field should wear cap and mask.



3. CHLORHEXIDINE FOR SKIN PREPARATION

- recommended that the skin is to be disinfected with > 0.5% chlorhexidine in 70 % alcohol based preparation before catheter insertion and during dressing changes.
- involves scrubbing chlorhexidine in a back and forth motion for 30 seconds
- antiseptic solution must be allowed to dry completely before puncturing the site.
- Can also use Chlorhexidine gluconate 2% in alcohol or if contraindicated use 5% povidone iodine in alcohol



Aseptic Technique: Goals

- Remove transient organisms and soil from the skin.
- Reduce the number of resident microbial flora and inhibit their rebound growth.
- Create a sterile working surface that acts as a barrier between the insertion site and any possible source of contamination.

4. OPTIMAL CATHETER SITE SELECTION

- Weigh the risk and benefits of placing a device
 - infectious complications VS mechanical complications
- Optimal subclavian site
- Avoid femoral in obese patients
- catheters used for haemodialysis and pheresis
 - jugular or femoral vein rather than a subclavian vein to avoid venous stenosis



5. DAILY REVIEW OF LINE NECESSITY



- To prevent unnecessary delays in removing lines that are clearly not needed for the care of the patient
- Remove a central line as soon as it is no longer needed
- the healthcare worker should also look into the followings:
 - The CVC dressing is intact and changed
 - The CVC hub decontamination has been performed before each hub access
 - Hand hygiene has been performed before and after all CVC maintenance/ access procedure.

MAINTENANCE OF CVS

- Access CVC only with sterile devices
- Flush the central line before and after administration of injections
- “Scrub the hub” vigorously for at least 5 seconds with an appropriate antiseptic and allow to dry prior to every access
- Minimize the interruptions of the CVC
 - Maintain a closed system as much as possible
 - Minimize frequency of tubing disconnects and flushing
- Do not use haemodialysis catheters for blood drawing or applications other than haemodialysis except during dialysis or under emergency circumstances.

CVC INFUSION TUBING

- CVC infusion tubing or administration sets should be changed per established guidelines.
- For administration sets not used for blood, blood products or lipids, tubing should be changed at intervals no more frequently than every 96 hours but at least seven days.
- Hub, connector or ports should be changed at least as frequently as the administration set, but no more frequently than every 72 hours, unless specified by the manufacturer.

DRESSINGS

- Dressings should be inspected daily
- Apply a sterile dressing to the insertion site before the sterile barriers are removed.
- Transparent dressings are preferred to allow visualization of the site.
- Document date and time of dressing
- Do not use topical antibiotic ointment or creams on insertion sites, except for dialysis catheters
 - potential to promote fungal infections and antimicrobial resistance



DRESSINGS

- If the insertion site is oozing, apply a gauze dressing instead of a transparent dressing.
- Replace dressings used on short-term CVC sites
 - every 2 days for gauze dressings
 - at least every 7 days for transparent dressings, except in those paediatric patients in which the risk for dislodging the catheter outweighs the benefit of changing the dressing
- Replace dressings when the dressing becomes damp, loosened, soiled or after lifting the dressing to inspect the site.



REPLACEMENT OF CVC

- Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections.
- Do not remove CVCs or PICCs on the basis of fever alone.
- Use a guidewire exchange to replace a malfunctioning non-tunneled catheter OR to downsize a catheter (i.e pulmonary artery catheter) if no evidence of infection is present
- Do not use guide wire exchanges routinely for non-tunnelled catheters to prevent infection or when suspected of infection
- Use new sterile gloves before handling the new catheter when guidewire exchanges are performed

OTHER CONSIDERATIONS

- 2% chlorhexidine baths
- Use a CVC with the minimum number of ports or lumens
- Use totally implantable access devices for patients who require longterm, intermittent vascular access
- Do not use guide wire exchanges routinely for non-tunnelled catheters to prevent infection or when suspected of infection
- When adherence to aseptic technique cannot be ensured (i.e., catheters inserted during an emergency), replace the catheter as soon as possible, i.e. within 48 hours

Checklist for Prevention of Central Line Associated Blood Stream Infections

Based on 2011 CDC guideline for prevention of intravascular catheter-associated bloodstream infections:

<https://www.cdc.gov/infectioncontrol/guidelines/bsi/index.html>

Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update

<http://www.jstor.org/stable/10.1086/676533>

For Clinicians:

Follow proper insertion practices

- Perform hand hygiene before insertion.
- Adhere to aseptic technique.
- Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full body drape).
- Choose the best insertion site to minimize infections and noninfectious complications based on individual patient characteristics.
 - Avoid femoral site in obese adult patients.
- Prepare the insertion site with >0.5% chlorhexidine with alcohol.
- Place a sterile gauze dressing or a sterile, transparent, semipermeable dressing over the insertion site.
- For patients 18 years of age or older, use a chlorhexidine impregnated dressing with an FDA cleared label that specifies a clinical indication for reducing CLABSI for short term non-tunneled catheters unless the facility is demonstrating success at preventing CLABSI with baseline prevention practices.

Handle and maintain central lines appropriately

- Comply with hand hygiene requirements.
- Bathe ICU patients over 2 months of age with a chlorhexidine preparation on a daily basis.
- Scrub the access port or hub with friction immediately prior to each use with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol).
- Use only sterile devices to access catheters.
- Immediately replace dressings that are wet, soiled, or dislodged.
- Perform routine dressing changes using aseptic technique with clean or sterile gloves.
 - Change gauze dressings at least every two days or semipermeable dressings at least every seven days.
 - For patients 18 years of age or older, use a chlorhexidine impregnated dressing with an FDA cleared label that specifies a clinical indication for reducing CLABSI for short-term non-tunneled catheters unless the facility is demonstrating success at preventing CLABSI with baseline prevention practices.
- Change administration sets for continuous infusions no more frequently than every 4 days, but at least every 7 days.
 - If blood or blood products or fat emulsions are administered change tubing every 24 hours.
 - If propofol is administered, change tubing every 6-12 hours or when the vial is changed.

Promptly remove unnecessary central lines

- Perform daily audits to assess whether each central line is still needed.

For Healthcare Organizations:

- Educate healthcare personnel about indications for central lines, proper procedures for insertion and maintenance, and appropriate infection prevention measures.
- Designate personnel who demonstrate competency for the insertion and maintenance of central lines.
- Periodically assess knowledge of and adherence to guidelines for all personnel involved in the insertion and maintenance of central lines.
- Provide a checklist to clinicians to ensure adherence to aseptic insertion practices.
- Reeducate personnel at regular intervals about central line insertion, handling and maintenance, and whenever related policies, procedures, supplies, or equipment changes.
- Empower staff to stop non-emergent insertion if proper procedures are not followed.
- Ensure efficient access to supplies for central line insertion and maintenance (i.e. create a bundle with all needed supplies).
- Use hospital-specific or collaborative-based performance measures to ensure compliance with recommended practices.

Supplemental strategies for consideration:

- Antimicrobial/Antiseptic impregnated catheters
- Antiseptic impregnated caps for access ports



ADVICE TO PATIENTS



- Pay attention to the bandage and the area around it.
 - To inform the healthcare worker if the dressing comes off or if the bandage or area around it is wet or dirty
- To inform 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.

TRANSFER OF CARE



- the initial indication for the CVC
- Why does the patient still need the central line?
- If the CVC is being used for antibiotic infusions, be sure to share the date the antibiotic was started, the duration of treatment, the antibiotic dose, and the reason for the antibiotic treatment.
- the date that the CVC was placed
- the date the dressing and administration tubing were last changed
- report any issues with patency of the lumens

THE AIM OF THIS TALK

- To improve the CLABSI rate
- By implementing evidence-based practices, 65 to 70 percent of CLABSIs can be prevented

END OF PRESENTATION



THANK YOU FOR YOUR ATTENTION

(NO QUESTION, PLEASE)