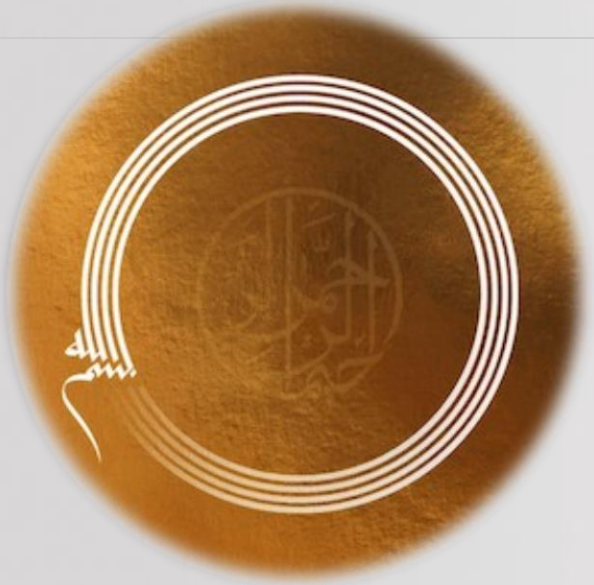
Central Line-Associated Bloodstream Infection (CLABSI)

Definition & Prevention



HELLO!

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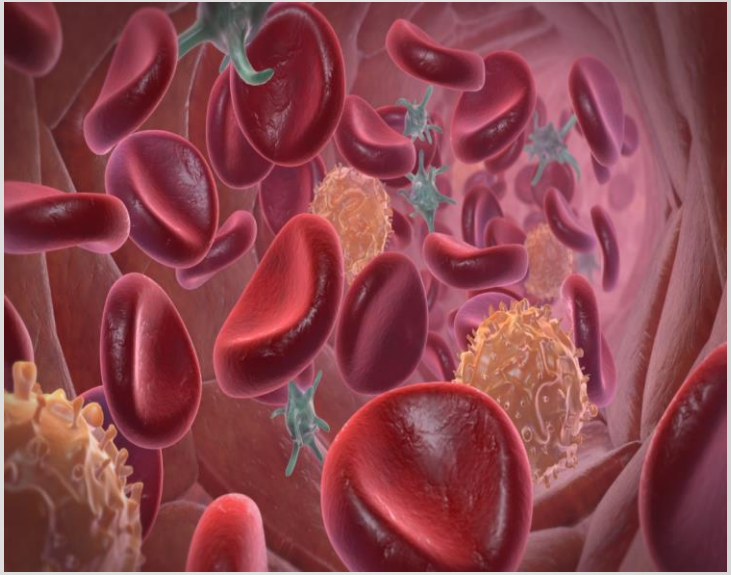


1. Definitions

Primary bloodstream infection (BSI):

A Laboratory Confirmed Bloodstream Infection (LCBI) that is not secondary to an infection at another body site

Laboratory-Confirmed Bloodstream Infection (LCBI)

must meet at least one of the following criteria :

- ***bacterial or fungal pathogen cultured from one or more blood specimens, and the pathogen is not related to an infection at another site***

LCBI

- ***A common commensal organism (eg, coagulase-negative staphylococcus) in two or more blood cultures collected on different days or from different sites and that occurs in the setting of one of the following signs or symptoms:***
  - ***Fever (>38.0°C)***
  - ***Chills***
  - ***Hypotension***

LCBI

- ***For patients ≤1 year of age, signs and symptoms include:***
  - ***Fever (>38.0°C)***
  - ***Hypothermia (<36.0°C)***
  - ***Apnea***
  - ***Bradycardia***

Central line-associated BSI (CLABSI)

A laboratory confirmed bloodstream infection(LCBI) where an eligible BSI organism is identified, and an eligible central line is present on the LCBI date of event or the day before

Eligible Central Line

A CL that has been in place for more than two consecutive calendar days

- ***On or after CL day 3 following the first access of the central line***
- ***In an inpatient location, during the current admission***
- ***Until the day after removal from the body***

2.
Clinical Manifestation

- *Fever and abrupt onset of septic physiology are the most common clinical manifestations of CLABSI*

- *Presence of inflammation or purulence at the insertion site specificity (94 to 99 percent) sensitivity (<5 percent) for CLABSI*

- *Absence of fever : due to coagulase-negative Staph (CoNS) or other relatively low virulence organisms*

- *Clinical improvement within 24 hours following catheter removal is suggestive but not sufficient for definitive diagnosis*

3.
Epidemiology

July 1998 to Feb 2022

2023

Infection Control & Hospital Epidemiology (2023), 1–10
doi:10.1017/ice.2023.69

SHEA

Original Article

Multinational prospective study of incidence and risk factors for central-line–associated bloodstream infections in 728 intensive care units of 41 Asian, African, Eastern European, Latin American, and Middle Eastern countries over 24 years

Victor Daniel Rosenthal MD[1,2], Ruijie Yin MS[1], Sheila Nainan Myatra MD[3], Ziad A. Memish MD[4], Camilla Rodrigues MD[5], Mohit Kharbanda MD[6], Sandra Liliana Valderrama-Beltran MD[7], Yatin Mehta MD[8], Majeda Afeef Al-Ruzzieh MD[9], Guadalupe Aguirre-Avalos MD[10,11], Ertugrul Guclu MD[12], Chin Seng Gan MD[13], Luisa Fernanda Jiménez Alvarez MD[14], Rajesh Chawla MD[15], Sona Hlinkova MD[16,17], Rajalakshmi Arjun MD[18], Hala Mounir Agha MD[19], Maria Adelia Zuniga Chavarria MD[20], Narangarav Davaadagva MD[21], Yin Hoong Lai RN[22], Katherine Gomez RN[23], Daisy Aguilar De Moros RN[24], Chian-Wern Tai MD[25], Alejandro Sassoe Gonzalez MD[26], Lina Alejandra Aguilar Moreno MD[27], Kavita Sandhu MD[28], Jarosław Janc MD[29], Mary Cruz Aleman Bocanegra MD[30], Dincer Yildizdas MD[31], Yuliana Andrea Cano Medina MD[32], Maria Isabel Villegas Mota MD[33], Abeer Aly Omar MD[34], Wieslawa Duszynska MD[35], Amani Ali El-Kholy MD[36], Safaa Abdulaziz Alkhawaja[37], George Horhat Florin MD[38,39], Eduardo Alexandrino Medeiros MD[40], Lili Tao MD[41], Nellie Tumu RN[42], May Gamar Elanbya MD[43], Reshma Dongol RN[44], Vesna Mioljević MD[45], Lul Raka MD[46], Lourdes Dueñas MD[47], Nilton Yhuri Carreazo MD[48,49], Tarek Dendane MD[50], Aamer Ikram MD[51], Tala Kardas MS[52], Michael M. Petrov MD[53], Asma Bouziri MD[54], Nguyen Viet Hung MD[55], Vladislav Belskiy MD[56], Naheed Elahi MD[57], Estuardo Salgado MD[58] and Zhilin Jin MS[1]

- *Pooled rates of CLABSI :4.82 CLABSI per 1,000 CL days*
- *According to a review, they ranged from 1.6 to 44.6 CLABSIs per 1,000 central-line (CL) days in adult and pediatric ICUs*
- *A trend of significant reduction in the CLABSI rate per year*

- *CLABSI reduction rate is probably associated with INICC infection prevention interventions implemented during the last 24 years at these hospitals*

- *In this study, PICC was the CL with the lowest risk of CLABSI*
- *Patients admitted to pediatric oncology ICUs had the highest risk of CLABSI*

Mortality Rate

- *The INICC reported that mortality in ICU patients without any healthcare-associated infection (HAI) is 17.1%*

- *CLABSI the mortality rate is 48.2%*

Indian Journal of Pediatrics (March 2023) 90(3):289–297
https://doi.org/10.1007/s12098-022-04420-9

REVIEW ARTICLE

Infections in Critically Ill Children

Abinaya Kannan[1] · Kambagiri Pratyusha[1] · Ruchy Thakur[1] · Manas Ranjan Sahoo[1] · Atul Jindal[1]

Received: 1 June 2022 / Accepted: 13 November 2022 / Published online: 20 December 2022

2023

- *The incidence of CLABSIs*
- *0.5 to 4.0 per 1000 catheter days in developed countries*
- *14–15 per 1000 catheter days in developing countries*

- *Increasing the mortality, morbidity, length of hospital stay, and cost*

4.
Risk Factors

Host factors

- *Chronic illness*
- *Bone marrow transplantation*
- *Immune deficiency, especially neutropenia*
- *Malnutrition*
- *Previous BSI*
- *Loss of skin integrity, as with burn*

Catheter factors

- *Duration of catheterization*
- *Type of catheter material*
- *Conditions of insertion*
- *Catheter-site care*
- *Skill of the catheter inserter*
- *Site of placement (femoral not in short-term central venous catheters (CVCs) in the pediatric)*
- *Repeated catheterization*

Catheter factors

- *Use for TPN or hemodialysis*
- *Nontunneled more than tunneled insertion*
- *Tunneled more than a totally implantable device(port)*
- *Multiple-lumen compared with single-lumen peripherally inserted central catheters (PICCs)*
- *Presence of septic focus elsewhere*

Other factors

Unlikely to change

- Income level of the country

- Facility ownership

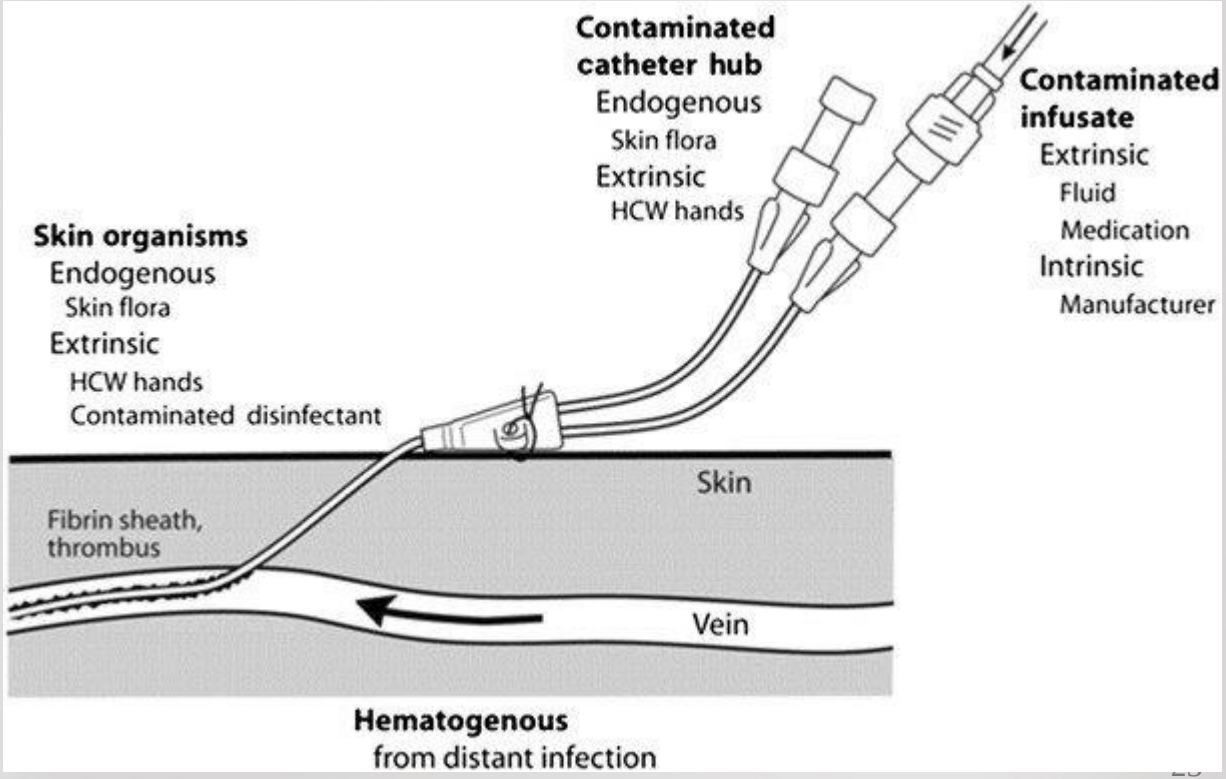
- Hospitalization type

- ICU type

Can be modified

- *CL days*
- *Use of tracheostomy*
- *Use of internal jugular or femoral lines*

Sources of Infection



- *Coagulase-negative staphylococci*
- *S. aureus*
- *Enterococci*
- *Candida species*
- *Klebsiella species*
- *Escherichia coli*
- *Enterobacter species*
- *Pseudomonas species*

5.
Diagnosis

Clinical approach

Should be suspected in patients with

- *Fever, chills, or hypotension in the setting of a catheter placed at least 48 hours prior to development of symptoms*
- *Erythema, pain, swelling, or purulence at the central line insertion site*
- *Signs and symptoms reflecting complications : including septic thrombophlebitis, endocarditis, and metastatic musculoskeletal infection*

Clinical approach

In the setting of suspected CLABSI

- *blood cultures should be obtained, ideally prior to the initiation of antibiotic therapy*

- *For patients with signs of clinical instability, initiation of empiric antimicrobial therapy (after blood cultures have been obtained) is appropriate*

Collecting specimens for culture

- ***Ideally, two blood cultures from peripheral veins via separate sites prior to initiation of antibiotic therapy***
- ***If is not feasible, one blood culture from a peripheral vein and the other from the catheter***
- ***blood cultures should not be drawn solely from the catheter, since colonization with skin contaminants***
- ***Catheter tip cultures are no longer recommended , given low positive predictive value***

Interpreting blood culture results

In the absence of other identifiable sources of infection

- One or more blood culture bottles positive for S. aureus, enterococci, Enterobacteriaceae (eg, Escherichia coli, Klebsiella species,Enterobacter species), Pseudomonas aeruginosa, Candida species
- Two or more blood culture bottles positive for coagulase-negative staphylococci or other common commensals (eg,Corynebacterium species [not Corynebacterium diphtheriae], Cutibacterium species, viridans group streptococci)

Interpreting blood culture for CoNS

- *The most common blood culture contaminant*
- *Most common cause of CLABSI.*
- *Samples drawn from multiple sites (both peripherally and through the suspected catheter) is the best indicator for true CLABSI due to this organism*
- *If a single catheter-drawn blood culture positive with concomitant negative peripheral BC: catheter colonization, rather than CRBSI*
- *The culture results must be interpreted in the clinical context (eg, fever without other sources)*

6.
Prevention

Infection Control & Hospital Epidemiology (2022), **43**, 553–569
doi:10.1017/ice.2022.87

SHEA

SHEA/IDSA/APIC Practice Recommendation

Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update

Niccolò Buetti MD, MSc, PhD[1,2,a], Jonas Marschall MD, MSc[3,4,a], Marci Drees MD, MS[5,6], Mohamad G. Fakih MD, MPH[7], Lynn Hadaway MEd, RN, NPD-BC, CRNI[8], Lisa L. Maragakis MD, MPH[9], Elizabeth Monsees PhD, MBA, RN, CIC[10,11], Shannon Novosad MD MPH[12], Naomi P. O'Grady MD[13], Mark E. Rupp MD[14], Joshua Wolf MBBS, PhD, FRACP[15,16], Deborah Yokoe MD, MPH[17] and Leonard A. Mermel DO, ScM[18,19]

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Recommended strategies to prevent CLABSI

- ***Essential practices*** ***Should be adopted by all acute-care hospitals***
  - *Prevention bundle (insertion)*
  - *Maintenance bundles (after insertion)*

- ***Additional approaches***

In locations and/or populations within hospitals when CLABSIs are not controlled by use of essential practices

Prevention bundle

Before insertion

1. Provide easy access to an evidence-based list of indications for CVC use (QOE: LOW)

2. Require education and competency assessment of HCP involved in insertion, care, and maintenance of CVCs (QOE: MODERATE)

3. Bathe ICU patients aged >2 months with a chlorhexidine preparation on a daily basis (QOE: HIGH)

Prevention bundle

At insertion

1. A checklist, at the time of CVC insertion (QOE:MODERATE)

2. Perform hand hygiene prior to catheter insertion or manipulation (QOE: MODERATE)

3. in the ICU setting The subclavian site is preferred to reduce infectious complications (QOE: HIGH)

4. Use an all-inclusive catheter cart or kit (QOE: MODERATE)

Prevention bundle

At insertion

5. Use ultrasound guidance for catheter insertion

(QOE: HIGH)

6. Use maximum sterile barrier precautions during CVC insertion

(QOE: MODERATE)

7. Use an alcoholic chlorhexidine antiseptic for skin preparation

(QOE: HIGH)

Maintenance bundle

1. Ensure appropriate nurse-to-patient ratio and limit use of float nurses in ICUs (QOE: HIGH)

2. Use chlorhexidine-containing dressings for CVCs in patients over 2 months of age (QOE: HIGH)

3. For non-tunneled CVCs:

- Change transparent dressings and perform site care with a chlorhexidine-based antiseptic at least every 7 days

- Chenge gauze dressings every 2 days

- immediayely if the dressing is soiled, loose, or damp

(QOE: MODERATE)

Maintenance bundle

4. Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter (QOE: MODERATE)

5. Remove nonessential catheters (QOE: MODERATE)

6. Routine replacement of administration sets not used for blood, blood products, or lipid formulations can be performed at intervals up to 7 days (QOE: HIGH)

7. Perform surveillance for CLABSI in ICU and non-ICU settings (QOE: HIGH)

Additional Approaches

***1. Use antiseptic- or antimicrobial-impregnated CVCs** (QoE: HIGH in adult QOE: MODERATE in pediatric)*

***2. Use antimicrobial lock therapy for long-term CVCs** (QOE: HIGH)*

***3. Use recombinant tissue plasminogen activating factor (rt-PA) once weekly after hemodialysis in patients undergoing hemodialysis through a CVC** (QOE: HIGH)*

Additional Approaches

4. Utilize infusion or vascular access teams for reducing CLABSI rates (QOE: LOW)

5. Use antimicrobial ointments for hemodialysis catheter insertion sites (QOE: HIGH)

6. Use an antiseptic-containing hub/connector cap/port protector to cover connectors (QOE: MODERATE)

Should Not Be Considered A Routine Part

of CLABSI Prevention

- Antimicrobial prophylaxis for short-term or tunneled catheter insertion or while catheters are in situ (QOE: HIGH)

- Replace CVCs or arterial catheters (QOE: HIGH)

Unresolved Issues

- *Routine use of needleless connectors*
- *Surveillance of other types of catheters (eg, peripheral arterial or peripheral venous catheters)*
- *Standard, nonantimicrobial transparent dressings*
- *The impact of using chlorhexidine-based products on bacterial resistance to chlorhexidine*
- *Sutureless securement*
- *Necessity of mechanical disinfection of a catheter hub, needleless connector, and injection port before accessing the catheter when antiseptic-containing caps are being used*

7-11-2024

Wiping Out Central Line Associated-Bloodstream Infections: Cleaning High Touch Surfaces in the PICU

Emily Heth
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- *in 40-bed PICU within a Level 1*
- *PICU employs approximately 150 nurses and 50 other team members*
- *This PICU experienced over 3,000 admissions in 2022*
- *Thoroughly clean high touch surfaces* *door handles, light switches, nurse server handles, countertop, electronics such as keyboard, scanner, and mouse, IV pumps and pole, bed rails, the patient's monitor*
- *Clinical significance was exemplified as the PICU remained CLABSI-free for over 100 days after the study period ended*

March 2024

Original Article

Initiation of interdisciplinary prevention rounds: decreasing CLABSIs in critically ill children

Matthew Linam MD, MS[1,2], Lisette Wannemacher BSN, RN, CPN[2], Angela Hawthorne RN[2], Christina Calamaro PhD, PPCNP-BC[2,3], Patrick Spafford MD[2] and Karen Walson MD[2]

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Inf Prevention rounds reduced CLABSIs in the NICU and PICU by:

- ***Reinforcing best practices***
- ***Encouraging proactive strategies***
- ***Fostering communication between members of the healthcare team***

March 2023

Article published online: 2023-03-30

Effectiveness of Chlorhexidine-Impregnated Central Venous Catheter Dressing for Preventing Catheter-Related Bloodstream Infections in Pediatric Patients: A Systematic Review and Meta-Analysis Study

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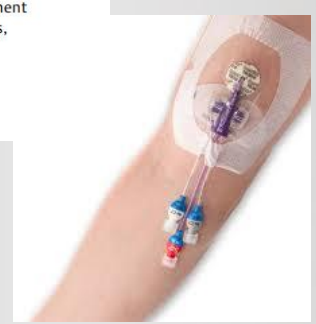
J Pediatr Infect Dis 2023;18:116–126.



8 studies, 1,584 catheters in 1,556 patients were added to the meta-analysis

2022
2713 A → 42 → 16

Contents lists available at ScienceDirect

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State of the Science Review

Antiseptic barrier caps to prevent central line-associated bloodstream infections: A systematic review and meta-analysis

Veerle E.L.M. Gillis MD *, Marijn J. van Es MSc, Yannick Wouters MD, PhD, Geert J.A. Wanten MD, PhD

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- ***available evidence suggests that ABCs are effective***
- ***poor methodological quality of most available studies***

The impact of central line bundles

European Journal of Pediatrics (2023) 182:4625–4632
https://doi.org/10.1007/s00431-023-05141-7

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Best Practice: Implementation of a Central Line Bundle to Reduce Central Line-Associated Bloodstream Infections

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THANKS!

Any questions?