THE PREVENTION OF BLOODSTREAM INFECTIONS IN *ALL* VASCULAR ACCESS DEVICES

A Lecture for APIC San Diego, CA
July 10, 2024

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Disclosures

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Bravida

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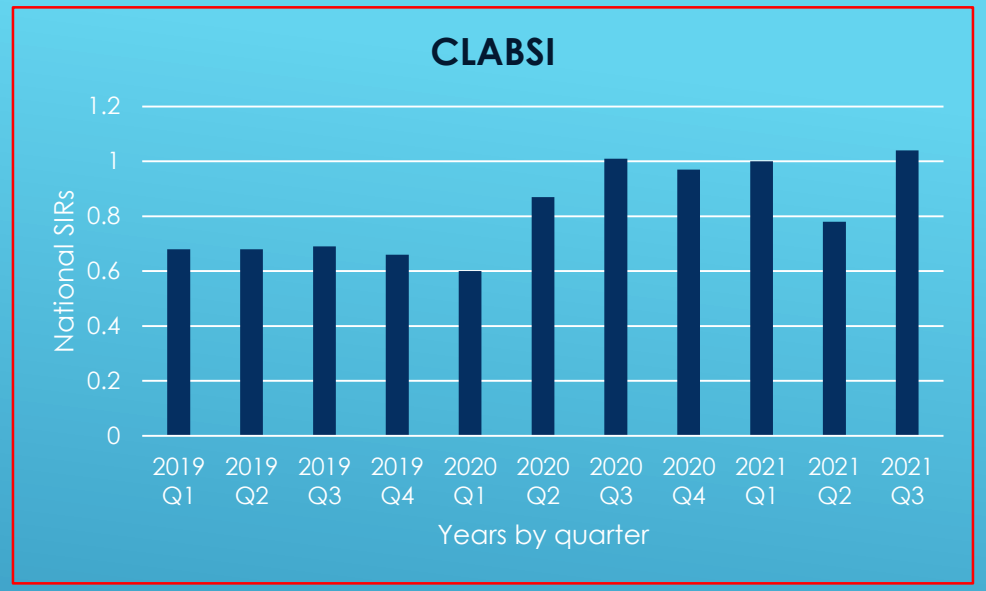
Learning Objectives

At the conclusion of this session, participants will be able to:

- Discuss the main mechanism of development of catheter-related BSIs
- Describe the impact of the Great Resignation and the COVID-19 pandemic on rates of central line-associated bloodstream infection (CLABSI)
- Discuss the pending national requirements on infection surveillance of all-cause Hospital Onset Bloodstream Infections
- Evaluate the findings of recent studies on new strategies for the prevention of Hospital Onset BSIs

Background



- CDC NHSN data indicated a 47% increase in CLABSI during the COVID 19 pandemic
- Rates have decreased by 9% between 2021 and 2022
- *What does this data not tell us?*
  - *There was considerable prevention efforts that were needed prior to the pandemic*
  - *Does not include BSI rates on other VADs*

The Great Resignation

Daily Briefing

The 'Great Resignation' is over. So why doesn't it feel like it?

Posted on January 26, 2024

Updated on January 25, 2024

According to a new analysis published in *NEJM Catalyst*, employment in healthcare settings is now higher than its pre-pandemic levels, and real wage growth is higher than inflation. However, hospitals are still struggling with employee burnout, difficulty hiring, and more — signs of deeper troubles that have not been offset by employment and wage growth.

TOPICS

Workforce

- During the pandemic, 100,000 registered nurses left the workforce
- By 2027, projections are that 900,000 more nurses intend to leave the profession
- *What does this data not tell us?*
  - *Although healthcare worker hiring has increased in the last year, what the data excludes is the impact on the application of proper IP practices via the loss of experienced front-line workers*

Need for Expansion of Surveillance and Prevention Initiatives (I)

ONGOING DISCUSSION WITHIN IP PROGRAMS TO **EXPAND BSI SURVEILLANCE** BEYOND CLABSI

NEED TO INSTITUTE **STANDARDIZED** INTERVENTIONS TO PREVENT BSIS IN ***ALL*** **VADS**

NATIONAL BSI RATES ASSOCIATED WITH **NON-CLABSI VADS** IS UNKNOWN

Need for Expansion of Surveillance and Prevention Initiatives (II)

Centers for Medicare and Medicaid Services (CMS) has proposed a new metric, **Hospital Onset Bacteremia and Fungemia (HOB)**

The **HOB** proposal would require hospitals to expand surveillance with the intent on broader reduction of BSIs regardless of causative organism or association with a medical device

WHY THE EVOLUTION TO HOB?

- *"The transition from a focus on a parochial quality measure and "on paper" improvement with CLABSI to true and broader-scale harm reduction with HOB has precedent in the transition from ventilator-associated pneumonia to ventilator-associated events:* ***a simpler and more objective definition, a broadening of the scope of harm, and new science demonstrating the preventability of these adverse events.***"

Shrank GM, et al. Hospital-onset bacteremia and fungemia: examining healthcare-associated infections prevention through a wider lens. Antimicrob Steward Healthc Epidemiol 2023.

SOURCES OF HOB

- Study of HOB events at 10 academic and 3 community hospitals in USA

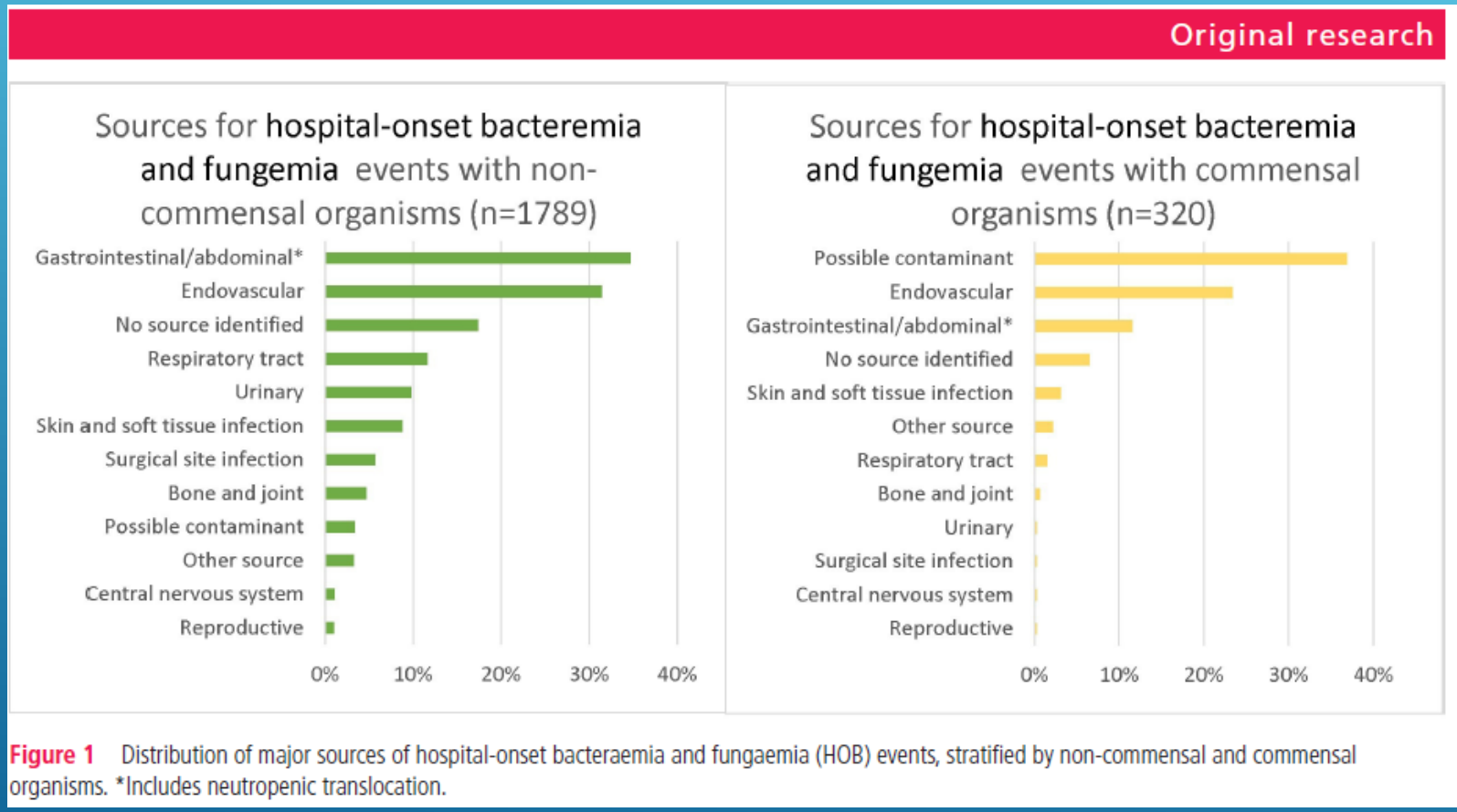


Figure 1 Distribution of major sources of hospital-onset bacteraemia and fungaemia (HOB) events, stratified by non-commensal and commensal organisms. *Includes neutropenic translocation.

Leekha S, et al. Evaluation of hospital-onset bacteraemia and fungaemia in the USA as a potential healthcare quality measure: a cross-sectional study. BMJ Qual Saf 2024. Epub ahead of print.

HOB Metric and Complementary Metrics

Category/Use	Event	Numerator	Denominator
	Measure Event		
Primary Metric	**HOB Event**	Pathogenic bacteria or fungi from blood culture on hospital day ≥4, (excluding patients with prior matching cultures and HOB events)	Inpatient Admissions
	Complementary Metrics		
Risk Adjustment, Diagnostic Stewardship, QI	**Blood Culture Utilization**	Testing Prevalence: Admissions with at least 1 blood culture Testing Intensity: Total blood cultures among patients with at least 1 blood culture	
QI	**Blood Culture Contamination**	Skin commensal organism in 1 of 2 blood cultures sets	Total blood culture sets
Risk Adjustment	**Community-Onset Bacteremia & Fungemia Event**	Pathogenic bacteria or fungi from blood culture prior to hospital day 4, (excluding patients with prior matching cultures and COB events)	Inpatient Admissions
Risk Adjustment, QI	**Matching Commensal Bacteremia Event**	Skin commensal from ≥2 blood cultures, AND ≥4 days of antibiotic treatment	Inpatient Admissions
Risk Adjustment, QI	**Non-Measure HOB Event**	HOB events among patients with conditions that highly predict non-preventability	Inpatient Admissions

#APIC2023

Stutler, E. (2023). The Future is Here! NHSN on FHIR: Modernizing HAI Surveillance National APIC Conference, Orlando, FL

"Prevention of Vascular Access Device-Associated Hospital Onset Bacteremia and Fungemia:

A Review of Emerging Perspectives and Synthesis of Technical Aspects"

E-pub publication in

- Authored by IPs, ID, and VA specialists
- Intent is to provide a comprehensive review of strategies to optimize VAD lifecycle practices, while providing new perspectives to enhance current prevention programs and assist hospitals in preparation for expansion of surveillance and prevention of VAD-HOB

- Robert Garcia, MT(ASCP), CIC, FAPIC
- Edward J. Septimus, MD
- Jack LeDonne, MD, VA-BC
- Lisa K. Sturm, MPH, CIC, FAPIC
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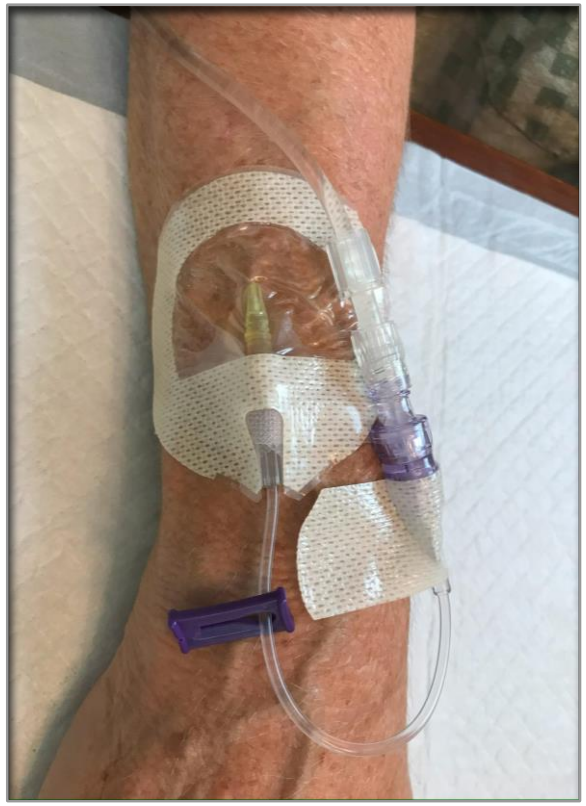
"Prevention of Vascular Access Device-Associated Hospital Onset Bacteremia and Fungemia:

A Review of Emerging Perspectives and Synthesis of Technical Aspects"

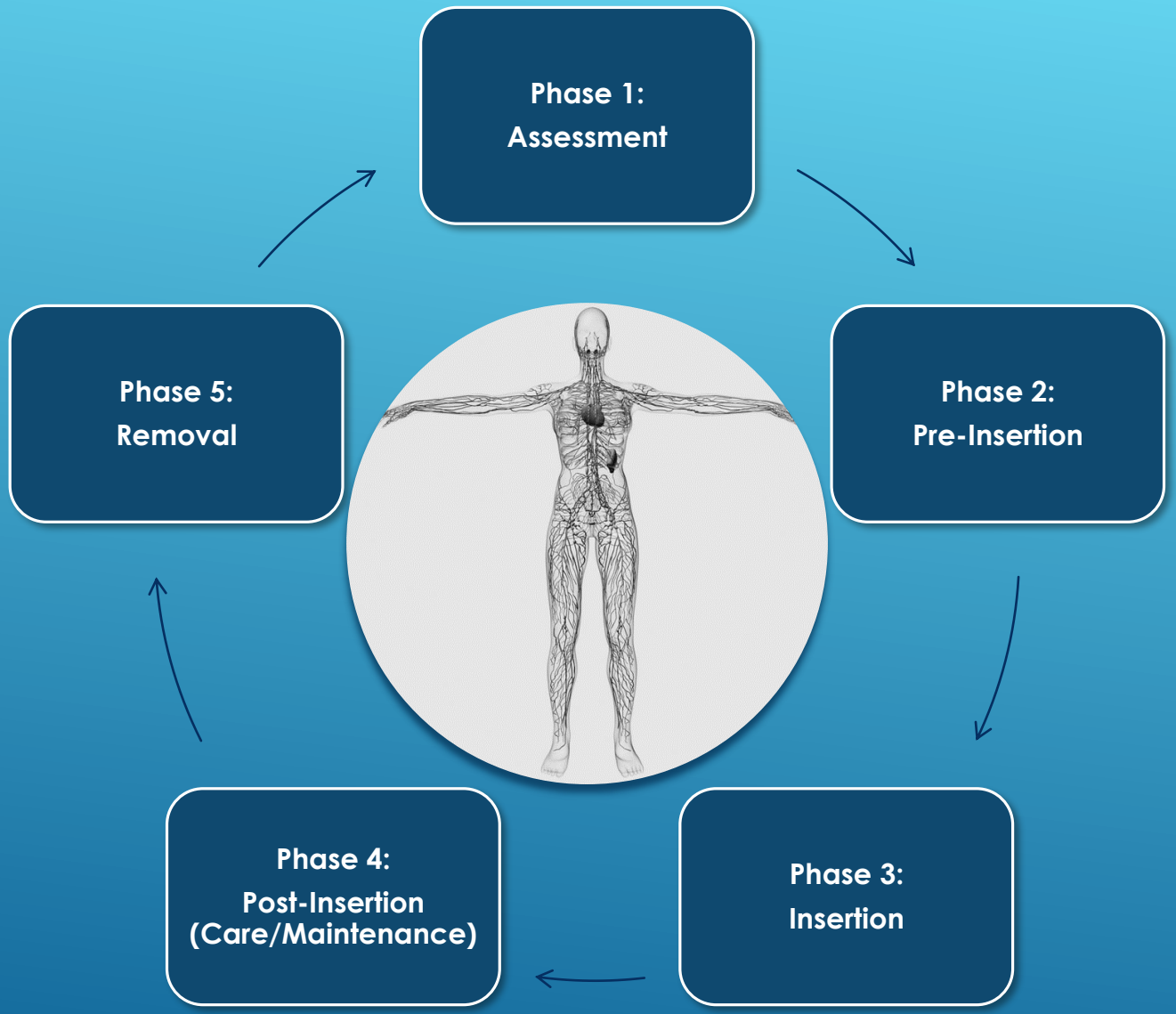
Identifies and provides insights on emerging issues in the mitigation of HOB

- Technical Aspects (Article 1):
  - Lifecycle of a VAD
  - Guideline Recommendations
  - Patient Decolonization
  - Create/Expand VATs
  - Ultrasound Transducers
  - Peripheral Intravenous Catheters
  - Advanced Antimicrobial Dressings
- Implementation Aspects (Article 2):
  - Leadership
  - Staffing
  - Diagnostic Stewardship
  - Systems and Human Factors Engineering
  - Approaches for Prevention
  - Bundle Compliance
  - Data Comprehension
  - Education of VA/IP Specialists



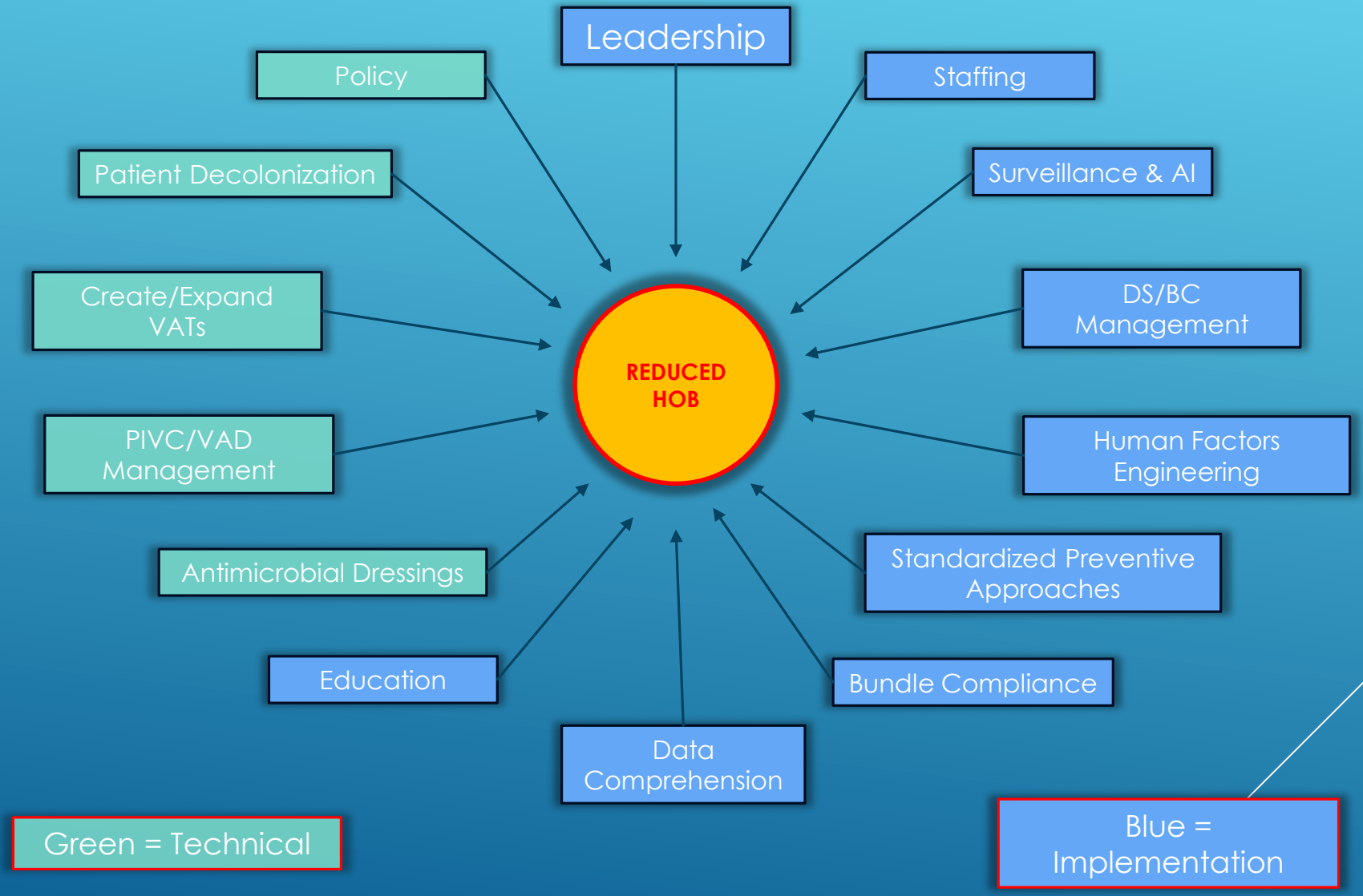
EMERGING PERSPECTIVES: TECHNICAL ASPECTS

Lifecycle of a Vascular Access Device



While specific practices in each phase may differ among various types of VAD, the primary message is that each phase represents an opportunity for infection prevention

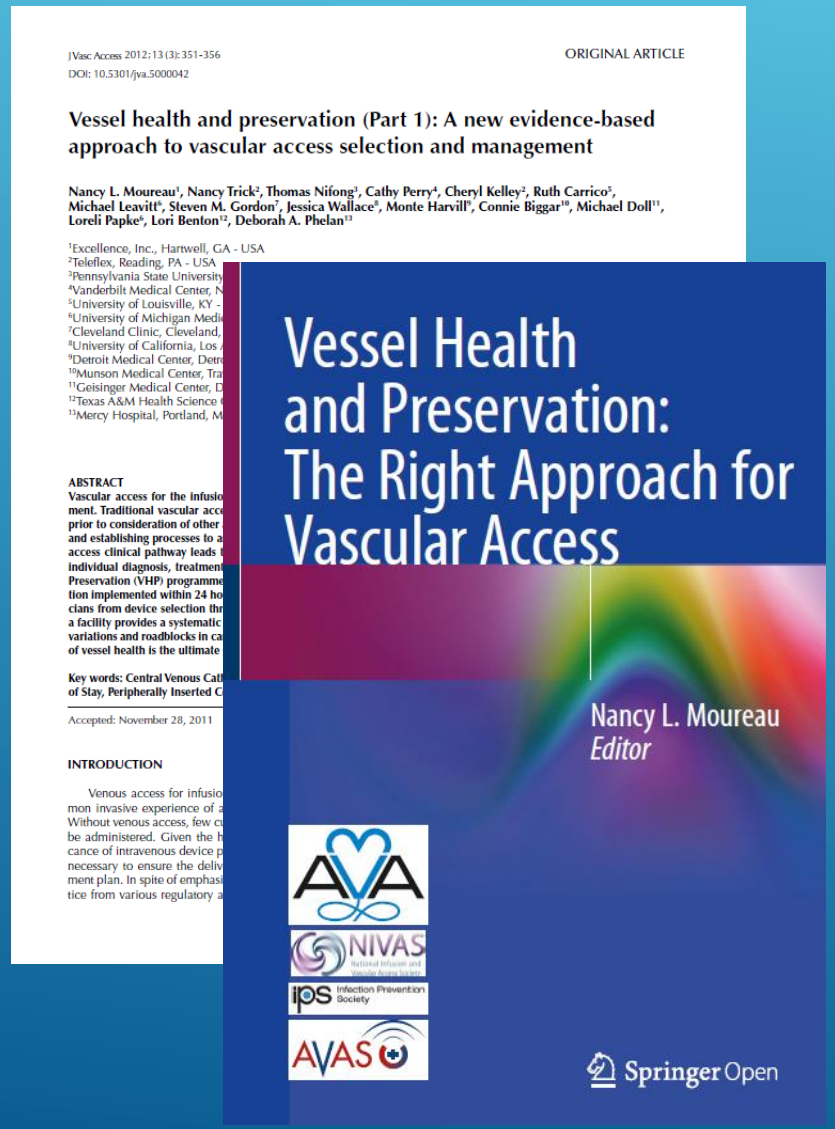
CORE COMPONENTS OF HOB PREVENTION PROGRAMS



Lifecycle of a VAD: Time Frames

Phase	Time frame
1. Assessment	From start of patient assessment to determination of need and type od VAD for insertion
2. Pre-Insertion	From hand hygiene through gathering of supplies, donning of barriers, field setup, and patient skin prepping
3. Insertion	From start of patient draping to application of insertion site dressing
4. Post-Insertion	Starts after application of initial dressing through VAD removal
5. Removal	Starts when daily assessment process indicates device is no longer needed through actual removal of the device Note: the clinician may decide to initiate an alternate device

Vascular Health & Preservation (VHP)



J Vasc Access 2012; 13 (3): 351-356
DOI: 10.5301/jva.5000042

ORIGINAL ARTICLE

Vessel health and preservation (Part 1): A new evidence-based approach to vascular access selection and management

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ABSTRACT

**Vascular access for the infusio
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prior to consideration of other
and establishing processes to a
access clinical pathway leads
individual diagnosis, treatment
Preservation (VHP) programme
tion implemented within 24 ho
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a facility provides a systematic
variations and roadblocks in ca
of vessel health is the ultimate**

**Key words: Central Venous Cat
of Stay, Peripherally Inserted C**

Accepted: November 28, 2011

INTRODUCTION

Venous access for infusio
mon invasive experience of a
Without venous access, few c
be administered. Given the h
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necessary to ensure the deliv
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tice from various regulatory a

Emerging perspectives in the mitigation of HOB BSI stress the necessity of ensuring for each patient the most appropriate device selection, optimal insertion technique, followed by standardization of post-insertion care. The concept of **Vascular Health and Preservation**, a vascular access framework, includes the primary goal to "*...drive vascular access care, regardless of the point of entry into a healthcare facility, based on a system of evidence-based practices, standards, and guidelines by means of collaborative agreement by all disciplines and care providers.*"

Focus on CVAD Practices

Phase 1 – Assessment:

- the clinician determines whether peripheral IV access appropriate or if a CVAD is necessary
- determines which device is appropriate
- evaluates the condition of the various veins of the neck, chest, extremities

Phase 2 – Pre-Insertion:

- starts with hand hygiene until maximum sterile draping is applied
- To achieve an optimal level of practice in Phase 2, each element that comprises the pre-insertion bundle must be standardized by the institution among all designated inserters

Focus on CVAD Practices

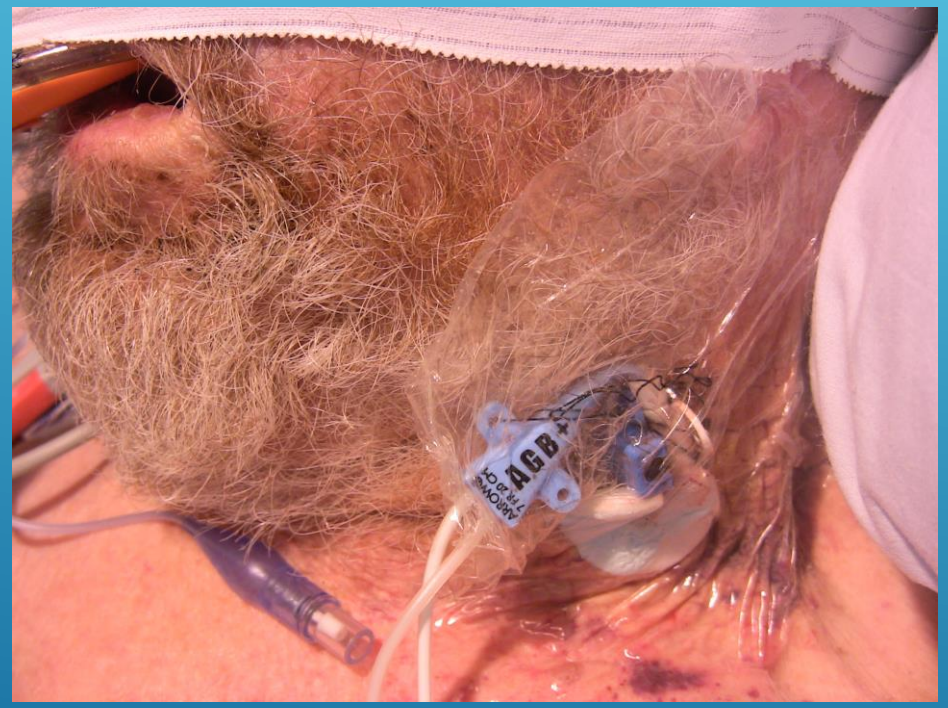
Phase 3 – Insertion: encompasses the period between the application of the sterile drapes and the application of the dressing at the end of the insertion

****What is done in Phase 3 Insertion has a profound impact on optimal Phase 4 Care and Maintenance practice****

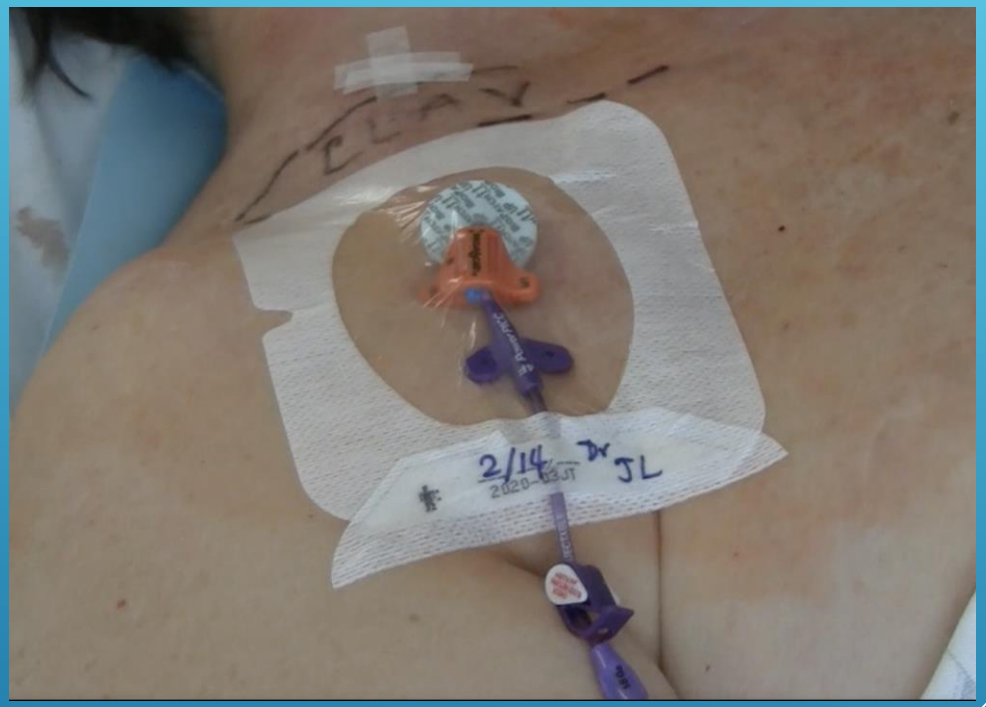
A proper CVAD insertion consists of the following:

i. minimal attempts
ii. the tip of the catheter must be positioned in the vicinity of the Cavoatrial Junction (this location minimizes the risk of thrombosis)
iii. proper exit site
iv. sutureless securement
v. antimicrobial protection (coated catheters and dressings)
vi. the application of a transparent dressing that remains intact for at least 7 days

Focus on CVAD Practices



Upward and on the Neck

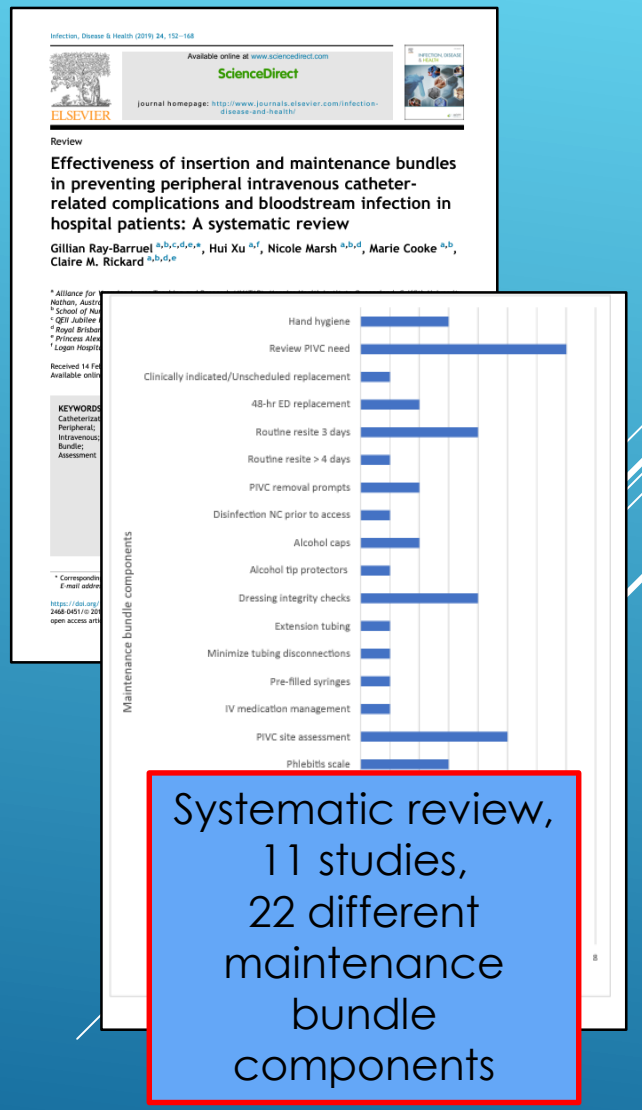


Downward and on the Chest

Focus on CVAD Practices

Phase 4 – Post-Insertion (Dressing and Care and Maintenance):

- Starts with the first dressing application and ends when the catheter is removed
- An emphasis on **maintenance of asepsis** during all VAD manipulations should be considered one of the strongest recommendations. This concept applies to all catheter access via hubs, connectors, or injection ports.
- Unscheduled (less than 7 days) dressing changes increase the risk of infection and add nursing time and supply cost to an unreimbursed procedure

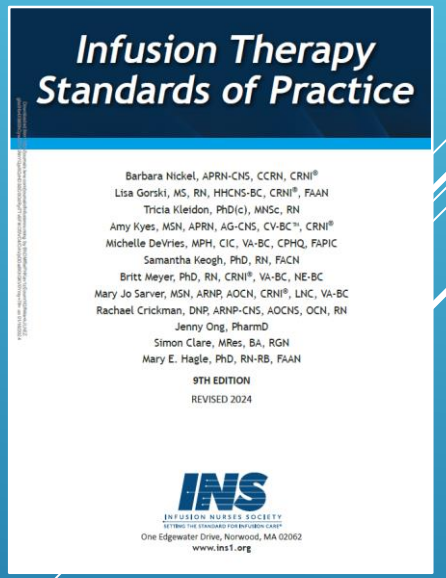


Systematic review, 11 studies, 22 different maintenance bundle components

Focus on CVAD Practices

Phase 5 – Removal:

- ***Removal*** of unnecessary medical devices is a fundamental intervention in preventing HAIs
- **Strategies** advocated to assist in removal of VADs include daily assessment of clinical need, establishing criteria to assist in clinical determination (e.g., unresolved complication, discontinuation of infusion therapy, when no longer necessary for the plan of care), and avoidance of scheduled replacement based on dwell time
- The **2024 INS *Standards of Practice*** provides a comprehensive list of recommendations addressing removal of various VADs including PIVCs, midline catheters, non-tunneled CVADs including PICCs, surgically placed CVADs, and arterial catheters



Supplementary Table 1: Emerging Perspectives for Optimizing Vascular Access Device Practices

Lifecycle Phase (Time frame)	Vessel Health & Preservation (VHP) Framework	Focus on Central Venous Access Catheters (CVAD)

1. Assessment (from start of patient assessment to determination of need and type of VAD for insertion)	• Evaluate patient risk, history, comorbidities, vein choices and options to determine if there is a genuine need for vascular access
	• Determine vein quality using a grading system that assists with insertion management
	• Determine medication suitability on the safety of the drugs and assess appropriate VAD
	• Use an algorithm for VAD choice, based on vein quality, drug choice and treatment duration
	• When conducting a risk assessment before insertion of a PIVC, question whether a more suitable alternative is available
	• Select device size based on vein size, risk, and insertion location
	• Verify minimum number of lumens required
		• During the *Assessment Phase*, there are three critical decision points to be achieved:
		  • (i) the clinician should initially determine whether peripheral intravenous access is appropriate or if the patient will require an alternate VAD
		  • (ii) the clinician determines, based on the patient's medical condition and co-morbidities, which device(s) are appropriate and which are unsuitable
		  • (iii) evaluate the condition of the various target veins to establish the likelihood of successful cannulation
		• In a patient with underlying chronic kidney disease that requires central venous access, a PICC would generally be inappropriate to avoid compromising permanent dialysis fistula options. In this example, the clinician would evaluate the condition of the various veins of the neck, chest, and extremities using ultrasound technology **[See section "Use and Disinfection of Ultrasound Transducers"]**

2. Pre-Insertion (from hand hygiene through gathering of supplies, donning of barriers, field setup, and patient skin prepping)	• Perform hand hygiene using an alcohol-based hand rub or liquid soap and water • Equipment and supplies for the VAD insertion procedure should be standardized in all areas where the procedure is performed • Skin decontamination should be standardized and reflect the manufacturer's recommendation for use	• To achieve an optimal level of practice in the *Pre-Insertion Phase*, each element that comprises a pre-insertion bundle must be standardized by the institution for each type of VAD and among all designated inserters (e.g., set-up of aseptic field prior to insertion, ensuring the use of the skin antiseptic as per manufacturer's recommendations, selection and provision of a standardized equipment and supply set in every area where such procedures are conducted) • Periodic monitoring for compliance with each element is warranted • The original 2001 Institute for Healthcare Improvement (IHI) Central Line Bundle advocated five elements: hand hygiene, chlorhexidine 2% skin preparation, maximal barrier precautions, optimal site selection (i.e., avoid the femoral vein), and daily review of line necessity. In actual practice, a *Pre-Insertion Phase* needs to be emphasized, a designated period that starts with hand hygiene until the maximum sterile draping is applied

Guideline Recommendations on the Technical Aspects of HOB BSI Prevention

Supplementary Table 2: Synthesis of Selected Technical Aspects of Vascular Access Devices

Applicable to all Vascular Access Devices				
Lifecycle Phase	**Recommendation Topic**	**CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011/2017**	**SHEA/IDSA/APIC Strategies to Prevent Central Line-Associated Bloodstream Infection in Acute-care Hospitals, 2022**	**INS Standards of Practice, 2024***
1-Assessment	Catheter selection	Select catheters on the basis of the intended purpose and duration of use, known infectious and non-infectious complications (e.g., phlebitis and infiltration), and experience of individual catheter operators (Cat IB)		Infusion therapy and vascular access decisions are collaborative (health care team, the patient/caregiver), with consideration to the patient's diagnosis and clinical presentation, vasculature, device selection, and risk versus benefit of alternative routes of therapy. (Standard) The appropriate vascular access device (VAD), peripheral or central, is selected based on the prescribed therapy or treatment regimen, anticipated duration of therapy, vascular pathway, patient's age, comorbidities, history of infusion therapy and vascular access, patient preference for VAD type and location, overall vascular health (history of difficult intravenous access, vessel, and skin health at insertion site), and ability and resources available to care for the VAD. (Standard)

Guideline Recommendations on the Technical Aspects of HOB BSI Prevention

Table 3. Summary of Vascular Access Device Recommendations

Device	PIVC	UGPIVC	MIDLINE	PICC	CVC non-tunneled	Antimicrobial CVC	Tunneled CVC	PORT
Definition	Known by several terms such as short peripheral intravenous catheter, Designed for placement in the extremities. Over the needle cannula, sizes 22 to 12 gauge, length 2-7.5cm.	Ultrasound guided peripheral intravenous cannula. Over the needle cannula, sizes 22 to 12 gauge, length usually 4-7.5cm using insertion guided by ultrasound.	Midline catheter, 8-25cm, inserted into veins of the periphery, usually the mid upper arm. Various types of insertions including traditional with modified Seldinger technique 20cm catheter or, accelerated Seldinger technique, 8-15cm over the needle catheter and wire all in one. Terminal tip does not extend into the chest.	Peripherally inserted central catheter usually inserted in the mid upper arm into the basilic or brachial veins. Terminal tip in the distal superior vena cava requires tip confirmation prior to usage either by x-ray, fluoroscopy, or ECG guidance.	Percutaneously catheter inserted most commonly into the internal jugular or subclavian vein and advanced to the distal portion of the superior vena cava. Terminal tip requires confirmation prior to usage.	Antimicrobial impregnated or coated catheter inserted into the distal portion of the superior vena cava either through the arm (PICC) or in the same method as non-tunneled CVC. Reduces risk of infection.	Percutaneously inserted catheter where the external lumen of the catheter is tunneled back to a favorable area reducing risk of bacterial migration along the insertion track. Added stabilization is conferred to this catheter when the skin grows into the Dacron cuff adherent to catheter and seated just under	Subcutaneously implanted port includes both a port reservoir and a catheter attached to the port. The catheter is inserted in the same manner as a tunneled catheter and attached to the port positioned in a pocket with skin closure on top. The port is usually positioned in an area on the

Patient Decolonization

ORIGINAL ARTICLE

Targeted versus Universal Decolonization to Prevent ICU Infection

Susan S. Huang, M.D., M.P.H., Edward Septimus, M.D., Ken Kleinman, Sc.D., Julia Moody, M.S., Jason Hickok, M.B.A., R.N., Taliser R. Avery, M.S., Julie Lankiewicz, M.P.H., Adrijana Gombosev, B.S., Leah Terpstra, B.A., Fallon Hartford, M.S., Mary K. Hayden, M.D., John A. Jernigan, M.D., et al., for the CDC Prevention Epicenters Program and the AHRQ DECIDE Network and Healthcare-Associated Infections Program*

Article Figures/Media Metrics

40 References 580 Citing Articles Letters 2 Comments

June 13, 2013
N Engl J Med 2013; 368:2255-2265
DOI: 10.1056/NEJMoa1207290

Decolonization is an evidence-based intervention that can be used to prevent HAIs including BSIs, with the goal to reduce or eliminate the bioburden on the patient, thereby reducing the risk of a subsequent infection

Since colonization can lead to infection, two overarching approaches to HAI prevention have emerged: (1) ***vertical*** approaches to reduce colonization or infection due to specific pathogens and (2) ***horizontal*** strategies to broadly reduce the burden of all pathogens

There have been at least seven trials that utilized chlorhexidine gluconate (CHG) as a skin decolonizer (with and w/o nasal decolonization), all of which demonstrated reductions in either all-cause BSIs or CLABSIs

REDUCE MRSA trial: mupirocin/CHG, universal decolonization, 74 ICUs; Result: **44% decrease in all-cause BSI**

Can we apply this concept to all VADs?

Create/Expand Vascular Access Teams

Since 2002, the CDC has recommended specialized "IV teams" due to their "…unequivocal effectiveness in reducing the incidence of catheter-related infections and associated complications and costs"

Adedicated vascular access team (VAT) provides expert guidance in insertion, maintenance, and removal practices, as well as demonstrating "…extensive knowledge in difficult blood draws, use of ultrasound guidance, dressing protocols, daily evaluation of catheter necessity, and removal of unnecessary catheters, as well as providing recommendations on alternative devices"

Establishment of VATs has been correlated with an overall **47% reduction** in insertion related CLABSI

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Brief Report

A helping hand: The impact of a central line insertion support team

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Key Words:
Infection prevention
Central line–associated bloodstream infection
Central line maintenance
Dedicated team
Compliance rounding

As part of a central line–associated bloodstream infections prevention initiative, our academic medical center formed a dedicated nursing team to assist with central line insertions and provide support with caring for difficult lines and dressings. During the program's first 3 years, the proportion of insertion-related central line–associated bloodstream infections occurring in areas within the team's scope declined overall by 47%.
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BACKGROUND

Central line–associated bloodstream infections (CLABSI) are associated with over 28,000 deaths annually as well as prolonged hospital stays, complications, and $2 billion in health care costs.[1] Evidence-based guidelines for CLABSI prevention include (1) insertion should be observed and documented by an appropriately-trained health care provider empowered to stop the procedure for any breaches in aseptic technique; (2) patients' dressings must be kept clean, dry, and intact; and (3) clinicians should assess the need for continued intravascular access daily.[2] Dedicated teams performing line insertions[3–5] or patient rounding to assess dressings and line necessity[6–10] have proven to contribute to CLABSI prevention, but there is little information about the use of specialized support teams trained to observe and assist with line insertions.

At our 950-bed academic medical center, there are approximately 440 unique patients with central lines each month. A 2018 provider survey about current practices for central line insertion found that the majority (> 80%) of insertions were not compliant with evidence-based practices. Frequent reasons included that the second person was not present for the entirety of the procedure, they were not empowered to stop the procedure if necessary, there was no second person available at all, or documentation on the insertion did not occur. In order to address these gaps, our multidisciplinary CLABSI workgroup partnered with nursing and hospital leadership to create a specialized central line nursing team.

The central venous access device (CVAD) Liaison team launched in early 2019 with 4.5 full-time employees intended to provide 24/7 in-house clinical coverage. The team's primary responsibility is to assist at insertions by setting up the room, ensuring adherence to the checklist, observing for breaches in aseptic technique, providing guidance, and retrieving additional supplies for providers when necessary, and assisting with dressing placement. CVAD Liaisons round on patients to assess central line dressings and serve as a principal resource on central line care and maintenance, including consultations on difficult dressings and bleeding or occluded lines. They also monitor the duration of temporary central line use and follow up with clinical teams to discuss line necessity. This assessment describes the effectiveness of this program over a three-year period.

METHODS

Data for CVAD Liaison activities were collected from February 2019 through March 2022. Activities were categorized as "insertion assistance", "consultation and education", and "central line audits". The monthly average of instances the CVAD Liaison team was contacted for assistance and the monthly number of insertions the team assisted with were calculated for each fiscal year. Data on how frequently the team was contacted but not available were also tracked and averaged for each fiscal year.

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Conflicts of interest: None to report.

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Use and Disinfection of Ultrasound Transducers

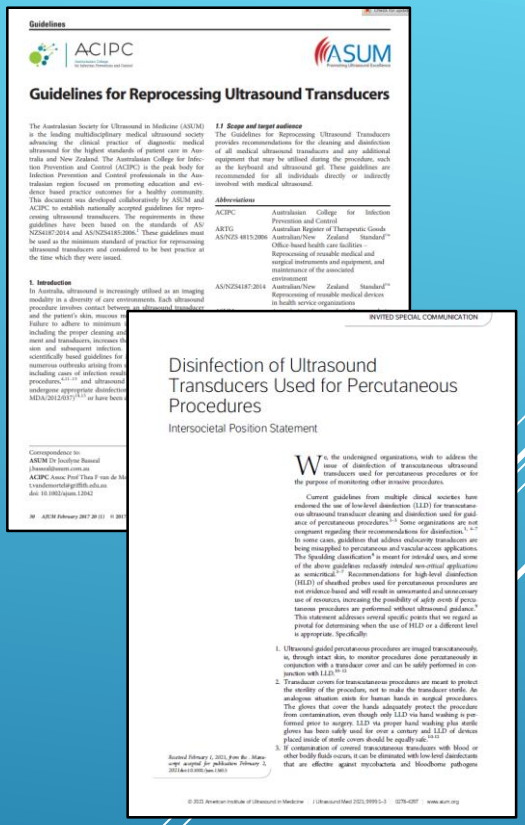
As challenges with difficult access patients increase, use of visualization technologies is necessary to gain successful VAD access

The use of **ultrasound** technology provides extensive benefits including reducing the number of cannulation attempts which may contribute to mitigation of microorganism introduction and subsequent BSI

Disinfection approaches:

Australian Society for Ultrasound in Medicine (ASUM): Based on the **Spaulding Classification**, a system that categorizes medical devices or equipment into three groups: *critical* (e.g., surgical instruments that enter sterile tissues/vascular system; requires sterilization), *semicritical* (e.g., items that contact mucous membranes or non-intact skin; need to be free of all microorganisms except small numbers of spores; use high-level disinfection [HLD] or sterilization), and *non-critical* (e.g., items that touch only intact skin and not mucous membranes; use low-level disinfection [LLD]).

American Institute of Ultrasound in Medicine (AIUM): Based on type of procedure performed, **Percutaneous vs. Endocavitary.** AIUM states "preparation of *external* transducers between patients requires a LLD process", while "preparation of *internal* transducers between patients requires routine mandatory HLD and the use of a high-quality single-use transducer cover during each examination". Endorsed by APIC, AVA, SHEA.


Guidelines

ACIPC

ASUM

Guidelines for Reprocessing Ultrasound Transducers

INVITED SPECIAL COMMUNICATION

Disinfection of Ultrasound Transducers Used for Percutaneous Procedures

Intersocietal Position Statement

Peripheral Intravenous Catheters (PIVC)

While there has been an intensive focus on infections and complications from CVADs for more than five decades, there has been a growing awareness that PIVCs can also cause significant morbidity and mortality

Researchers have identified that more than a third of the hospital onset *S. aureus* BSIs were associated with PIVCs rather than central lines

Bundled approaches to PIVC insertion and care have been developed by some hospitals, however, additional work is needed to identify an optimal bundle

Pending publication "Peripheral Intravenous Catheter Consensus Document" (AVA, INS, AACN, ECRI)

Table 1. Sources of *Staphylococcus aureus* Bacteremia

Source	Total *S. aureus* Bacteremia (n = 205), No. (%)	Hospital-Onset *S. aureus* Bacteremia (n = 45), No. (%)	Community-Onset *S. aureus* Bacteremia (n = 160), No. (%)
Soft tissue/bone	67 (32.7)	4 (8.9)	63 (39.4)
PVC	18 (8.8)	16 (35.6)	2 (1.3)
CVC or PICC	14 (6.8)	7 (15.6)	7 (4.4)
Hemodialysis	13 (6.3)	2 (4.4)	11 (6.9)
Pulmonary	8 (3.9)	0 (0.0)	8 (5.0)
Endovascular	7 (3.4)	1 (2.2)	6 (3.8)
Biliary	1 (0.5)	0 (0.0)	1 (0.6)
Urinary	3 (1.5)	0 (0.0)	3 (1.9)
Unknown	74 (36.1)	15 (33.3)	59 (36.9)

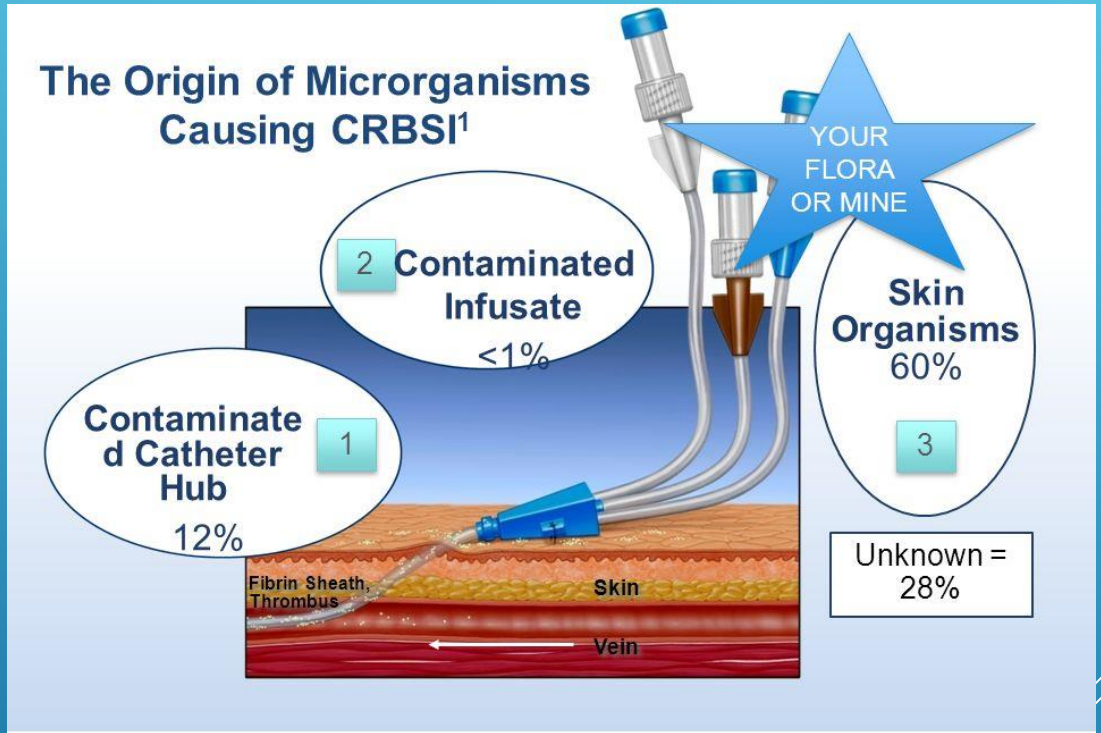
Abbreviations: CVC, central intravenous catheter; PICC, peripherally inserted central catheter; PVC, peripheral intravenous catheter.

ADVANCED ANTIMICROBIAL INTRAVENOUS DRESSINGS – MECHANISM OF TRANSMISSION

- When an IV catheter bypasses the skin barrier, a process starts whereby microorganisms colonize the catheter surface, and may enter the blood vessel, leading to systemic infection

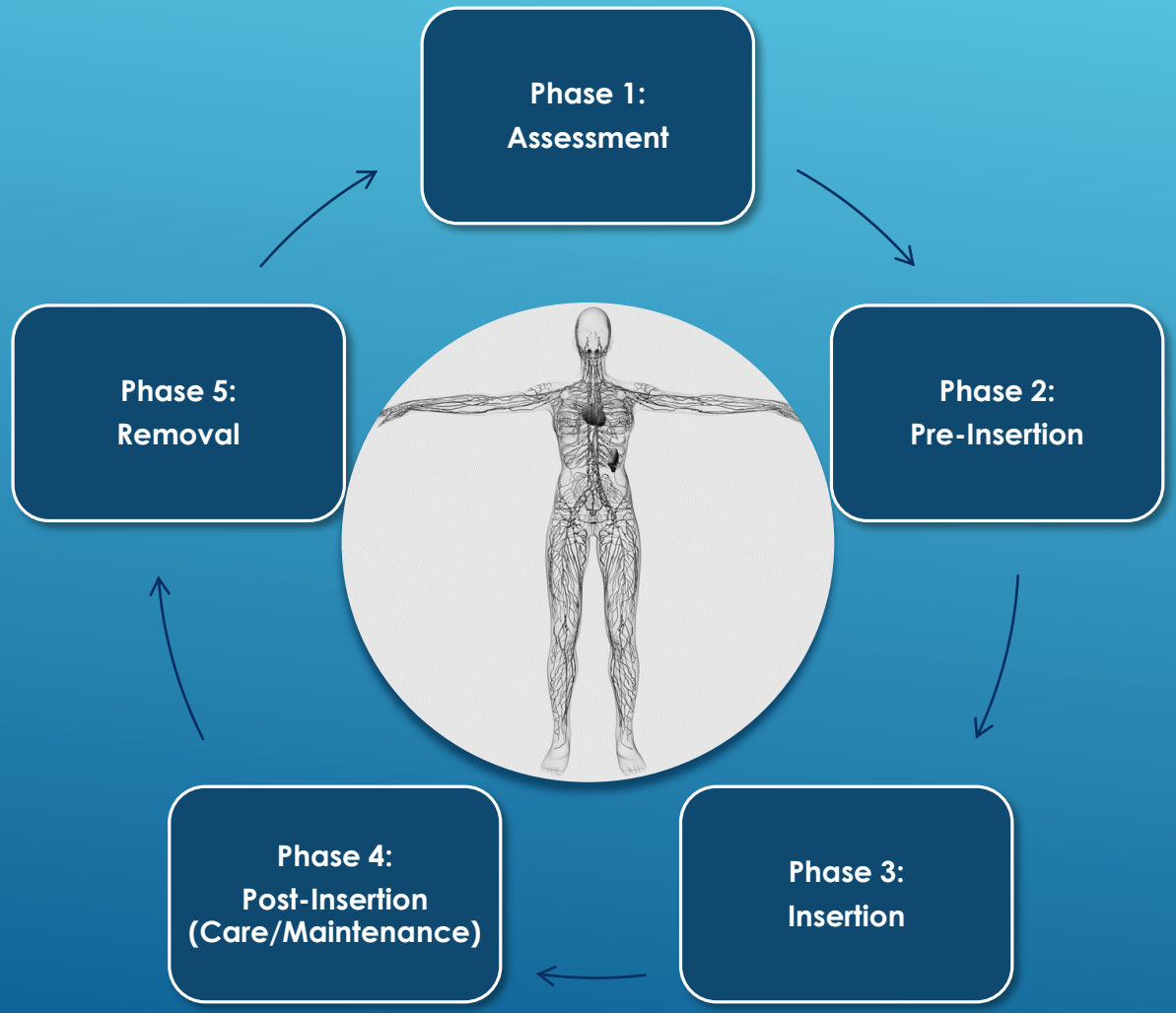
- The majority of CRBSI are associated with organisms acquired from skin sources

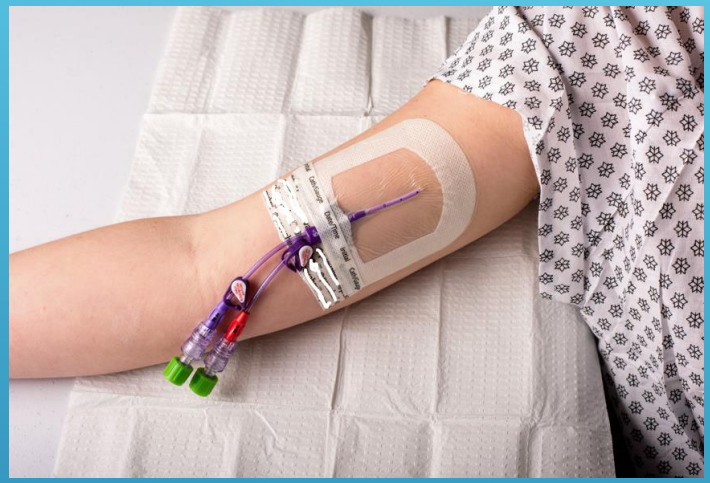
- This process occurs at *all* IV catheter sites soon after insertion, regardless of catheter type and body site



Safdar N, Maki DG. The pathogenesis of catheter-related bloodstream infection with nuncuffed short-term central venous catheters. Int Care Med. 2004; 30:62-67.

RELATIONSHIP OF VAD LIFECYCLE & IV DRESSING





Total Lifecycle Time (mins):
Assessment, Pre-Insertion, Insertion = 1%;
Care & Maintenance = 99%

Advanced Antimicrobial Intravenous Dressings - CHG

NIH Public Access
Author Manuscript
Crit Care Med. Author manuscript; available in PMC 2014 December 08.

Published in final edited form as:
Crit Care Med. 2014 July ; 42(7): 1703–1713. doi:10.1097/CCM.0000000000000319.

CHLORHEXIDINE-IMPREGNATED DRESSING FOR PREVENTION OF CATHETER-RELATED BLOODSTREAM INFECTION: A META-ANALYSIS

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Abstract

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Iran J Public Health, Vol. 48, No.5, May 2019, pp.796-807

Review Article

The Effects of Chlorhexidine Dressing on Health Care-Associated Infection in Hospitalized Patients: A Meta-Analysis

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(Received 21 Oct 2018; accepted 19 Jan 2019)

Abstract

Background: To assess the effects of chlorhexidine dressing on health care-associated infection in hospitalized patients.

Methods: We searched for English-language published randomized controlled trials (RCTs) in Cochrane Library, EMBASE and PubMed between January 1998 and January 2018. We used meta-analysis to calculate the risk ratios (RRs) and 95% confidence intervals (CIs) of the data, and using the *P* assessment to summarize the heterogeneity of RCTs and the funnel plot and Egger regression test to evaluate publication bias.

Results: A total of 13 RCTs were included in our meta-analysis, including 7353 patients and 11,931 catheters. The effects of chlorhexidine dressing on the incidence of catheter-related bloodstream infections (CRBSIs) were reported in 13 RCTs, and the incidence of CRBSIs were 1.3% (80/6160) in the chlorhexidine group and 2.5% (145/5771) in the control group. We used a forest plot to determine the risk ratio (RR) of chlorhexidine dressing on the incidence of CRBSIs, and our results showed that chlorhexidine dressing significantly reduced the incidence of CRBSIs (RR 0.55, 95% CI 0.39-0.77, *P*<0.001). Moreover, we also analyzed the effects of chlorhexidine dressing on the incidence of catheter colonization and catheter-related infections (CRIs), and our forest plot results showed that chlorhexidine dressing significantly reduced the incidence of catheter colonization (RR 0.52, 95% CI 0.40-0.67, *P*<0.001) and the incidence of CRIs (RR 0.43, 95% CI 0.28-0.66, *P*<0.001) in hospitalized patients.

Conclusion: The use of chlorhexidine dressings for hospitalized patients significantly reduce the incidence of CRBSIs, catheter colonization and CRIs.

Keywords: Chlorhexidine dressing; Catheter-related bloodstream infections; Randomized controlled trials

Introduction

Central venous catheters (CVCs) are an important source of bloodstream infections (BSIs) in hospitalized critically ill patients and are closely related to patients' mortality (1). During the hospitalization, patients complicated with catheter-related bloodstream infections (CRBSIs) and/or catheter-related infection (CRIs) caused their illness to worsen, the length of hospital stay was extended, and hospitalization expenses increased (2-4). According to data reported by the Centers for Disease Control and Prevention in US in 2009, the number of CRBSIs in the Intensive Care Unit (ICU) was 12,000-18,000, and the medical expenses generated per case were about $16,550, and the overall mortality rate was increased by 15%-25% (5).

At present, due to the limited number of antimicrobial drugs and the emergence of multi-drug

Available at: http://ijph.tums.ac.ir

Wei *et al. BMC Infectious Diseases* (2019) 19:429
https://doi.org/10.1186/s12879-019-4029-9

BMC Infectious Diseases

RESEARCH ARTICLE Open Access

Chlorhexidine-impregnated dressing for the prophylaxis of central venous catheter-related complications: a systematic review and meta-analysis

Li Wei†, Yan Li†, Xiaoyan Li†, Lanzheng Bian, Zunjia Wen* and Mei Li*

Abstract

Background: Several randomized controlled trials (RCTs) evaluated the role of Chlorhexidine-impregnated dressing for prophylaxis of central venous catheter (CVC) related complications, but the results remained inconsistent,

Infection Control & Hospital Epidemiology (2020), 41, 1388–1395
doi:10.1017/ice.2020.356

SHEA

Original Article

Effectiveness of chlorhexidine dressings to prevent catheter-related bloodstream infections. Does one size fit all? A systematic literature review and meta-analysis

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Abstract

Objective: To evaluate the effectiveness of chlorhexidine (CHG) dressings to prevent catheter-related bloodstream infections (CRBSIs).

Design: Systematic review and meta-analysis.

Methods: We searched PubMed, CINAHL, EMBASE, and ClinicalTrials.gov for studies (randomized controlled and quasi-experimental trials) with the following criteria: patients with short- or long-term catheters; CHG dressings were used in the intervention group and nonantimicrobial dressings in the control group; CRBSI was an outcome. Random-effects models were used to obtain pooled risk ratios (pRRs). Heterogeneity was evaluated using the I^2 test and the Cochran Q statistic.

Results: In total, 20 studies (18 randomized controlled trials; 15,590 catheters) without evidence of publication bias and mainly performed in intensive care units (ICUs) were included. CHG dressings significantly reduced CRBSIs (pRR, 0.71; 95% CI, 0.58–0.87), independent of the CHG dressing type used. Benefits were limited to adults with short-term central venous catheters (CVCs), including onco-hematological patients. For long-term CVCs, CHG dressings decreased exit-site/tunnel infections (pRR, 0.37; 95% CI, 0.22–0.64). Contact dermatitis was associated with CHG dressing use (pRR, 5.16; 95% CI, 2.09–12.70), especially in neonates and pediatric populations in whom severe reactions occurred. Also, 2 studies evaluated and did not find CHG-acquired resistance.

Conclusions: CHG dressings prevent CRBSIs in adults with short-term CVCs, including patients with an onco-hematological disease. CHG dressings might reduce exit-site and tunnel infections in long-term CVCs. In neonates and pediatric populations, proof of CHG dressing effectiveness is lacking and there is an increased risk of serious adverse events. Future studies should investigate CHG effectiveness in non-ICU settings and monitor for CHG resistance.

(Received 16 March 2020; accepted 18 July 2020; electronically published 16 September 2020)

During the past decade, hospitals have made significant progress in preventing catheter-related bloodstream infections (CRBSIs). Basic strategies during the insertion and maintenance of catheters have successfully reduced CRBSIs and have been incorporated into clinical practice.[1,2] Despite these advances, however, CRBSIs remain a problem. Recent data from the United States showed that CRBSI rates have been steady between 0.56 and 0.67 cases per 1,000 catheter days[3] and, in European intensive care units (ICUs), rates have oscillated between 1.7 and 4.7 cases per 1,000 catheter days.[4]

A substantial number of patients experience CRBSIs, a preventable healthcare-associated infection linked to increased mortality, length of hospital stay, and healthcare costs.[5] Thus, attention has moved to other preventive measures, including the use of chlorhexidine-impregnated dressings at the catheter insertion site.

Chlorhexidine (CHG) is an antiseptic with broad-spectrum antimicrobial activity.[6] When incorporated into catheter dressings, the burden of microorganisms on the skin decreases and CRBSIs caused by an extraluminal route might be reduced.[7] Previous meta-analyses have suggested that CHG dressings can prevent CRBSIs.[8–10] However, numerous gaps in knowledge remain and tailored recommendations are lacking. It is unclear which patients benefit the most from CHG dressings, to what extent the catheter type impacts CHG effectiveness, or whether the main types of CHG dressings available (CHG-impregnated discs or transparent dressings with an integrated CHG gel pad) are equally effective.

Numerous clinical trials have been published in recent years regarding CHG dressings, and it is time to re-evaluate the evidence

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ADDITIONAL PRESENTATION: Results from this study were accepted to be presented at the following scientific meetings: SHEA/CDC Decennial 6th International Conference on Healthcare Associated Infections and the 30th European Congress of Clinical Microbiology and Infectious Diseases.

Cite this article: Puig-Asensio M, *et al* (2020). Effectiveness of chlorhexidine dressings to prevent catheter-related bloodstream infections. Does one size fit all? A systematic literature review and meta-analysis. *Infection Control & Hospital Epidemiology*, 41: 1388–1395. https://doi.org/10.1017/ice.2020.356

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CrossMark

- Four published meta-analyses examined the effectiveness of **chlorhexidine gluconate (CHG)** dressings on reducing colonization of catheters and CRBSI
- 20 RCTs and 2 quasi-experimental studies
- Colonization: 6.5% of catheters in groups using CHG dressings and 13.2% in the control groups
- CRBSI: 1.2% rate in CHG groups and 2.3% in control groups

ADVANCED ANTIMICROBIAL INTRAVENOUS DRESSINGS

- Study comparing the *in vitro* antimicrobial performance of a chlorhexidine free base (CHX) dressing to a chlorhexidine salt (CHA) dressing
- Aim was to identify is there are differences in magnitude, rate of action, and overall antimicrobial performance
- CHX, CHA, and control dressings were evaluated for antimicrobial performance against 12 challenge microorganisms
- Various dressings were inoculated and incubated, followed by sampling at 1-, 3-, and 7-day time periods
- Time frames were chosen to reflect the CDC's clinical practice guidelines for maintenance of IV catheters
- Benchmark: 4.0 $\log_{10}$ reduction

Challenge microorganism species	Inoculum media	Plate media	Incubation temperature (°C)
Gram-positive bacteria			
Methicillin-resistant *Staphylococcus aureus* (MRSA), ATCC 33591	SCDB	SCDA	30–39
Methicillin-resistant *Staphylococcus epidermis* (MRSE), ATCC 51625	SCDB	SCDA	30–39
Multiple drug-resistant *Enterococcus faecium* (MDR), ATCC 51559	SCDB	SCDA	30–39
Vancomycin-resistant *Enterococcus faecalis* (VRE), ATCC 51299	SCDB	SCDA	30–39
Enterococcus faecium, ATCC 19434	SCDB	SCDA	35–39
Gram-negative bacteria			
Pseudomonas aeruginosa, ATCC 9027	SCDB	SCDA	35–39
Escherichia coli, ATCC 8739	SCDB	SCDA	35–39
Serratia marcescens, ATCC 8100	SCDB	SCDA	30–35
Yeasts			
Candida albicans, ATCC 10231	SDEX	SDEX	20–25
Candida parapsilosis, ATCC 14054	SDEX	SDEX	20–25
Candida tropicalis, ATCC 750	SDEX	SDEX	20–25
Fungus			
Aspergillus brasiliensis, ATCC 16404	SDEX	SDEX	20–25

ATCC—American type culture collection; SCDA—soybean casein digest agar; SCDB—soybean casein digest broth; SDEX—sabouraud dextrose agar

ADVANCED ANTIMICROBIAL INTRAVENOUS DRESSINGS

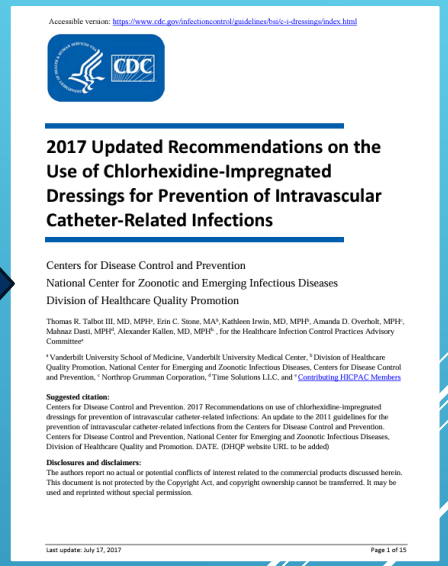
Challenge organism		Starting titer (CFU/ sample)	Cover film negative control mean log_{10} reduction				PrevahexCHX mean log_{10} reduction			SurgiClear mean log_{10} reduction			Mean log_{10} reduction colour temperature scale
			0-Hour	1-Day	3-Day	7-Day	1-Day	3-Day	7-Day	1-Day	3-Day	7-Day	
Gram (+) Bacteria	MRSA	2.4×10^6	0	0.66	1.51	2.65	6.05	6.18	6.38	3.56	4.43	2.76	
	MRSE	1.3×10^6	-0.18	2.96	1.71	1.97	5.93	6.02	6.1	3.52	5.12	6.1	-2
	E. faecium (MDR)	1.1×10^6	-0.04	-0.11	2.41	2.55	6.09	5.63	5.67	2.66	4.69	3.21	-1
	E. faecalis (VRE)	1.8×10^6	0	-0.09	4.01	2.4	6.24	6.21	6.44	2.77	4.72	6.44	0
	E. faecium	4.3×10^6	-0.01	1.16	2.94	3.71	6.42	6.07	6.55	3.11	6	6.51	1
Gram (-) Bacteria	*P. aeruginosa*	2.0×10^6	-0.05	-1.22	-0.92	1.48	6.3	6.26	6.3	5.21	6.3	6.17	2
	E. coli	4.3×10^6	0.01	-0.79	-0.13	3.86	6.22	6.64	6.64	6.64	6.64	6.64	3
	S. marcescens	8.6×10^6	-0.01	2.89	4.63	4.63	6.28	6.93	6.46	5.1	6.93	6.93	4
Yeasts	*C. albicans*	1.2×10^6	-0.04	0.14	1.85	3.77	6.07	6.07	6.07	2.23	2.74	6.07	5
	C. parapsilosis	3.3×10^6	-0.04	-0.04	-0.21	-0.12	5.11	5.91	5.79	0*	1.64	2.73	6
	C. tropicalis	4.7×10^6	0.03	0.17	1.26	1.31	6.49	6.58	6.5	2.69	3.32	3.95	7
Fungus	*A. brasiliensis*	3.7×10^6	0.04	0.41	0.46	0.5	2.99	3.89	3.75	1.72	1.67	1.74	

Fig 1. Summary of the mean *in vitro* log10 reduction values of the two antimicrobial dressing types and the polymer cover film control at 1-, 3-, and 7-day time points. Colour-temperature indicates magnitude of microbial log10 reduction observed. Mean *in vitro* log10 reduction values ≥4.0 log_{10} are presented in shades of green which increase in darkness with magnitude, while log10 reduction values <4.0 log10 transition from shades of light yellow to red with decreasing magnitude. *Actual experimental value was 'too numerous to count' (TNTC) and is thus presented here as '0.00' for data analysis purposes since the TNTC outcome indicates no organism reduction and the approximation of this value as '0.00' is likely to be a conservative estimate for the actual value

- **Magnitude**: The CHX dressing demonstrated a superior *in vitro* antimicrobial effect at 67% of the experimental time points than the CHA dressing, with at least equivalent efficacy at all other time points
- **Rate of Action**: the CHX dressing had a more rapid action than the CHA dressing particularly at the 1-day time point; the CHX dressing achieved a >5 log_{10} reduction at the 7-day time point, whereas the CHA dressing demonstrated such reduction in only seven test organisms
- **Chlorhexidine content**: **CHA adhesive film has 36% greater chlorhexidine mole content**. *So why was it not as effective as CHX?*

Advanced Antimicrobial Intravenous Dressings

CDC: For patients aged 18 years and older: **Chlorhexidine-impregnated dressings** with an FDA-cleared label that specifies a clinical indication for reducing catheter-related bloodstream infection (CRBSI) or catheter-associated blood stream infection (CABSI) are recommended to protect the insertion site of short-term, nontunneled central venous catheters. (Category IA)


Accessible version: https://www.cdc.gov/infectioncontrol/guidelines/bsi/c-i-dressings/index.html

2017 Updated Recommendations on the Use of Chlorhexidine-Impregnated Dressings for Prevention of Intravascular Catheter-Related Infections

Centers for Disease Control and Prevention
National Center for Zoonotic and Emerging Infectious Diseases
Division of Healthcare Quality Promotion

Thomas R. Talbot III, MD, MPH[a], Erin C. Stone, MA[b], Kathleen Irwin, MD, MPH[c], Amanda D. Overholt, MPH[c], Mahnaz Dasti, MPH[d], Alexander Kallen, MD, MPH[b], for the Healthcare Infection Control Practices Advisory Committee[e]

[a] Vanderbilt University School of Medicine, Vanderbilt University Medical Center, [b] Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, [c] Northrop Grumman Corporation, [d] Time Solutions LLC, and [e] Contributing HICPAC Members

Suggested citation:
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. DATE. (DHQP website URL to be added)

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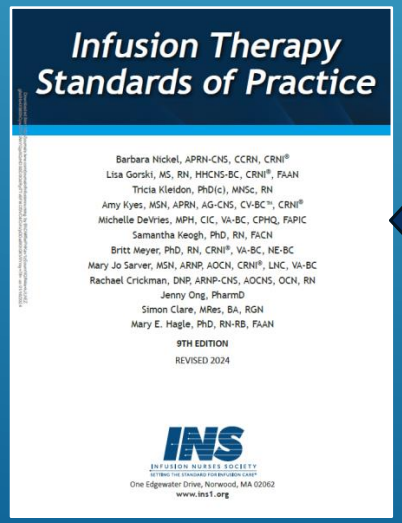
Last update: July 17, 2017 Page 1 of 15

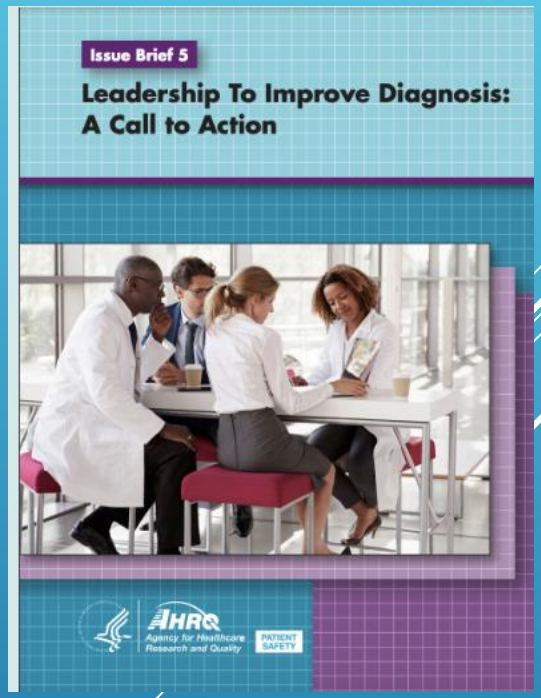
INS: Change transparent semipermeable membrane (TSM) dressings at **least every 7 days** (except neonatal patients) or immediately if dressing integrity is disrupted (eg, lifted/detached on any border edge or within transparent portion of dressing; visibly soiled; presence of moisture, drainage, or blood) or evidence of compromised skin integrity under the dressing, and following manufacturer's instruction for use. (III)



EMERGING PERSPECTIVES: IMPLEMENTATION ASPECTS

Leadership

- Successful outcomes in IP programs will largely depend on dedicated support provided by hospital executives, managers, and clinical leaders
- Due to the complexity in controlling HOB in all VADs, several key management practices will need to be included:
    1. setting of **organizational IP priorities** whereby goals are established and shared among managers and front-line staff
    2. establishing an **information-sharing system** within the organization that allows relevant infection data to be relayed, displayed, and discussed in a timely manner with clinicians and those performing direct patient care, and
    3. provides **management coaching** activities that include staff feedback and re-education sessions emphasizing best practices for IP
- Within IP programs, directors will need to ensure they are adding additional VAD risks to their annual infection control risk assessment. Based on this information, there will be a need to analyze staffing structures, including the skill level of IP staff



Staffing

- A potential expansion of reportable LabID events will inevitably trigger the opportunity for prevention of other device-related BSIs
- The evolving role of the infection preventionist coupled with national events affecting the healthcare industry provides substantial affirmation for enhancing IP and control resources
- The number of IP personnel for required and effective prevention functions in healthcare institutions needs re-evaluation based on increasing roles and responsibilities.
- Studies contributing to a better understanding of resource development: MegaSurvey conducted by APIC, the Preventing Infections Through Appropriate Staffing (PITAS) survey

APIC®
Association for Professionals in Infection Control and Epidemiology

WHAT IS DIAGNOSTIC STEWARDSHIP?

- ***Diagnostic Stewardship*** is a coordinated system or user-based interventions designed to promote evidence-based utilization of diagnostic tests, with the primary goals of improving value and care quality and safely reducing costs

- DS involves modifying the process of ordering, performing, and reporting diagnostic tests in order to direct appropriate antimicrobial therapy

- The Microbiology laboratory provides information that identifies if a patient is infected, what the pathogen is, and which antibiotics may be effective in treatment of true infection

Septimus EL. Antimicrobial Resistance: An antimicrobial/diagnostic stewardship and infection prevention approach. Med Clin N Am 2018;102:819-29.
Morgan DJ, et al. Diagnostic Stewardship – Leveraging the laboratory to improve antimicrobial use. JAMA 2017;318:607-8.

KEY CONSIDERATIONS

DS

Goal	Key question	Key considerations and potential strategies
Right test	Is the test appropriate for the clinical setting?	Sensitivity and specificity Predictive values Testing volumes Diagnostic yield Laboratory feasibility Cost Clinical impact
Right patient	Will the clinical care of the patient be affected by the test result?	Laboratory test utilization committee Automatic laboratory reflex CPOE decision support Appropriate use criteria Indication selection Prior authorization Benchmarking Specimen rejection
Right time	Will the result be available in time to optimally affect care?	Time to specimen receipt Centralized vs point-of-care testing On-demand vs batched testing Specimen preparation time Run time Result reporting time

AS

Goal	Key question	Key considerations and potential strategies[a]
Right interpretation	Will the clinician understand the test result?	Result report language Selective reporting of relevant results AS prospective audit and feedback AS real-time decision support
Right antimicrobial	Will the clinician appropriately modify antimicrobials based on the test result?	Clinical practice guidelines EMR-based decision support with result reporting AS prospective audit and feedback AS real-time decision support
Right time	Will the clinician act upon the test result promptly?	EMR reporting Results called with readback reporting AS prospective audit and feedback AS real-time decision support

[a]AS, antimicrobial stewardship.

Messacar K, et al. Implementation of rapid molecular infectious disease diagnostics: the role of diagnostic and antimicrobial stewardship. J Clin Micro 2017;55:715-23.

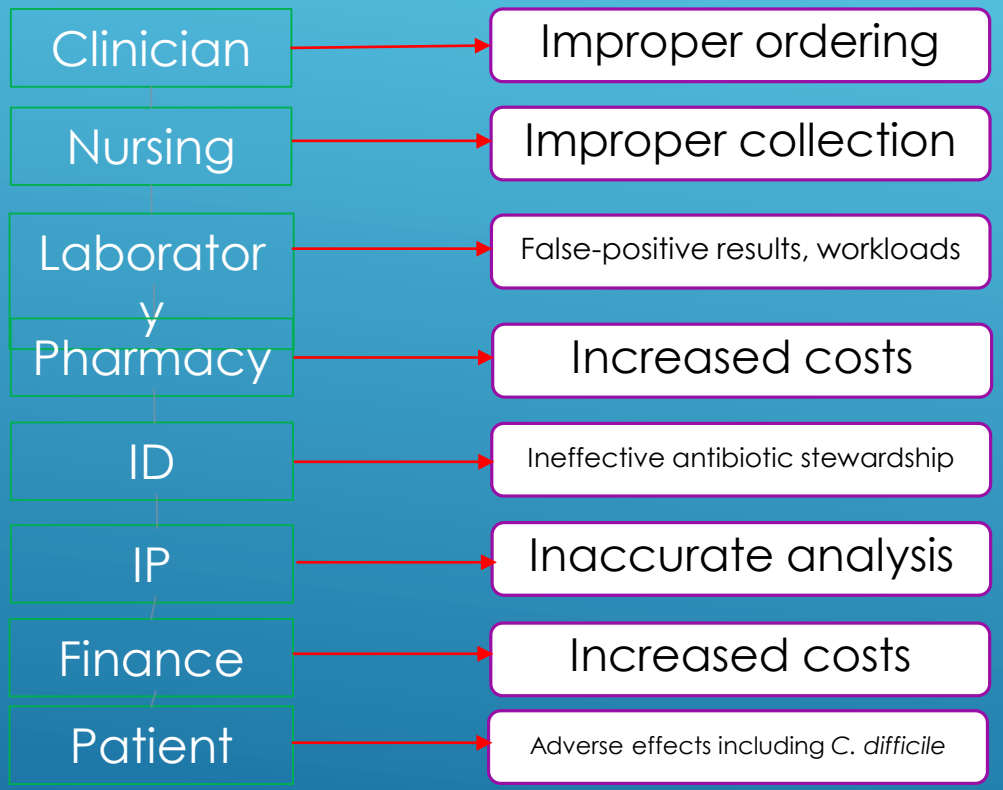
THE PURPOSE OF BLOOD CULTURES

THE EFFECTS ON HEALTHCARE WHEN PROPER BLOOD CULTURE MANAGEMENT IS NOT IMPLEMENTED

Systematic review on costs (BC Contamination):

- Pharmacy:
  - $210-$12,611
- Labs:
  - $2397-$11,151
- Hospital costs:
  - $16,200-$111,627
- LOS: 1-22 days

Dempsey C, et al. Economic health care costs of BC contamination, AJIC 2018



PRINCIPAL INTERVENTION #1

- **Implementing Evidence-Based Decision Aids**

- An initial, but critical, consideration in optimizing the accuracy of BC results related to VAD HOB surveillance is the establishment of a decision process to assist clinicians in determining ***when*** BCs should be ordered

- A 2021 survey of US acute care hospitals to determine prevalence of technical interventions aimed at preventing central line-associated bloodstream infection (CLABSI), indicated that only 23% of respondents reported strategies to reduce routine BCs.

- There is compelling evidence however, that such interventions improve clinical decision-making when considering BC orders. In the DISTRIBUTE (DIagnostic STewaRdship Improves Blood cUlTurEs) quality improvement study, an algorithm for ordering BCs was provided to clinicians in conjunction with education concerning the avoidance of orders for solitary BCs. Participants received feedback on BC rates and the appropriateness of their decisions.

- The algorithm specified that if the BC is being ordered for a new clinical event, BCs are recommended based on the probability of bacteremia (high, moderate, or low). BCs were not recommended for scenarios with a low probability of bacteremia. In this study, BC best practices in a medical intensive care unit (ICU) and medicine wards at a large academic center **reduced BC utilization by 18% and 30%, respectively**.

Pisney L, Camplese L, Greene MT, et al. Practices to prevent central line-associated bloodstream infection: A 2012 survey of infection preventionists in US hospitals. Infect Control Hosp Epidemiol 2024; Published online 2024:1-5. doi:10.1017/ice.2024.53 Fabre V, Klein E, Salinas AB, et al. A diagnostic stewardship intervention to improve blood culture use among adult nonneutropenic inpatients: The DISTRUBUTE Study. J Clin Micro 2020;58:1-8.

PRINCIPAL INTERVENTION #2

- **Standardizing Evidence-Based Methods for Proper Collection of BCs**

- Hospitals should review and standardize how BCs are collected in consideration of the primary benefits that can be achieved and its relevance to conducting accurate surveillance for VAD HOB: the recovery of true pathogens (i.e., avoidance of false-negative BCs), increasing the surveillance accuracy of catheter-associated BSI events, and a voidance of blood culture contamination (BCC).

- BCC triggers a cascade of detrimental consequences that creates further issues of global importance to hospitals: improper antimicrobial treatment of the patient potentially leading to adverse drug reactions, emergence of antibiotic-resistant organisms (AROs), prolonged venous access increasing risk for associated infection, disruption of the natural microbiome leading to Clostridioides difficile infection, additional unnecessary testing, increased laboratory and pharmaceutical costs, and lost reimbursement and financial penalties as may occur with misinterpretation of reportable HAIs.

Boyce JM, Nadeau J, Dumigan D, et al. Obtaining blood cultures by venipuncture versus from central lines: impact on blood culture contamination rates and potential effect on central line-associated bloodstream infection reporting. Infect Control Hosp Epidemiol 2013;34:1042-1047. Dempsey C, Skoglund E, Muldrew KL, et al. Economic health care costs of blood culture contamination. Am J Infect Control 2019;47:963-967.

Diagnostic Stewardship & Blood Culture Management

The accurate determination of reportable BSI events relies on establishing standardized procedures in the collection of laboratory specimens

Principle known as ***Diagnostic Stewardship***

Important concepts for a blood culture management program:

Evidence-based decision aids: establish a decision process to assist clinicians in determining *when* BCs should be ordered

Reasons for proper collection: identifying *true* pathogens, increasing surveillance accuracy of reportable catheter-associated BSI events, avoidance of BC contamination

Limit collection from intravascular catheters: evidence suggests higher contamination rates when drawing BCs via VADs

Employ proper protocols for mitigating BC contamination: pre-analytic, analytic, post-analytic phases

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Major article

Multidisciplinary team review of best practices for collection and handling of blood cultures to determine effective interventions for increasing the yield of true-positive bacteremias, reducing contamination, and eliminating false-positive central line–associated bloodstream infections

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Key Words:
Blood culture
Blood culture collection
Blood culture contamination
Central line associated bloodstream infection
Bacteremia
Venipuncture

Background: A literature search was conducted using keywords for articles published in English from January 1990 to March 2015. Using criteria related to blood culture collection and handling, the search yielded 101 articles. References used also included Microbiology Laboratory standards, guidelines, and textbook information.

Results: The literature identified diverse and complex issues surrounding blood culture practices, including the impact of false-positive results, laboratory definition of contamination, effect on central line–associated bloodstream infection (CLABSI) reporting, indications for collecting blood cultures, drawing from venipuncture sites versus intravascular catheters, selection of antiseptics, use of needleless connectors, inoculation of blood culture bottles, and optimizing program management in emergency departments, education, and implementation of bundled practice initiatives.

Conclusions: Hospitals should optimize best practice in the collection, handling, and management of blood culture specimens, an often overlooked but essential component in providing optimal care of patients in all settings and populations, reducing financial burdens, and increasing the accuracy of reportable CLABSI. Although universal concepts exist in blood culture practices, some issues require further research to determine benefit. Institutions undertaking a review of their blood culture programs

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Conflicts of interest: None to report.

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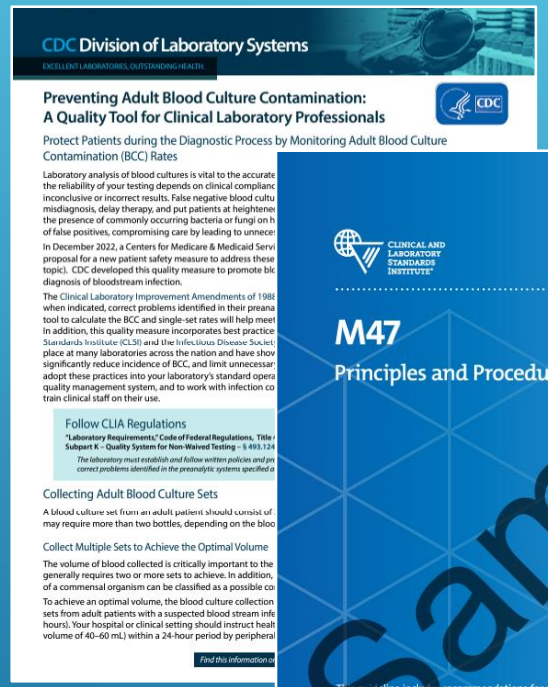
http://dx.doi.org/10.1016/j.ajic.2015.06.030

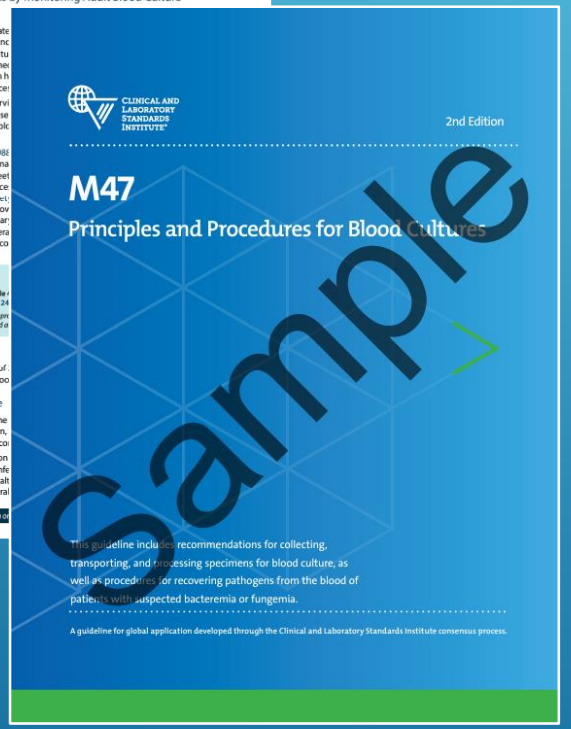
PRINCIPAL INTERVENTION #3

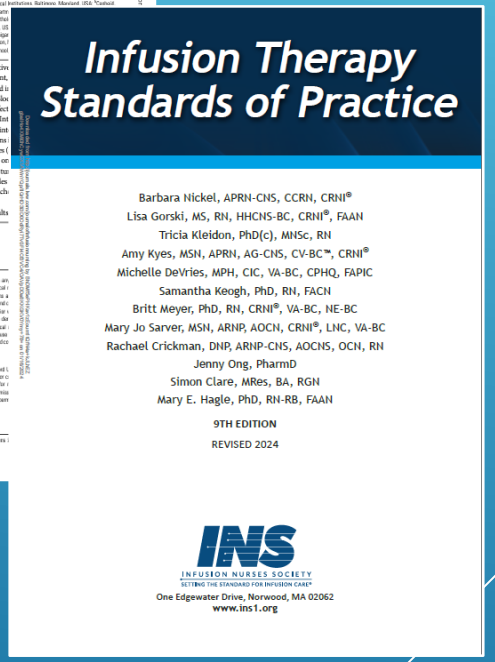
- **Diversion of the First Portion of Blood Theoretically Removes the Contaminating Organism from the Remaining Aliquot of Blood**
  - Efforts have been made to implement BCC reduction strategies that unify proper drawing techniques and novel engineering controls. Studies cited in a systematic review and meta-analysis on blood diversion interventions indicate the two most frequently used devices used in addressing BCC are commercially available products or a lithium heparin waste tube. Use of these items across nine studies resulted in reduced BCC rates ranging from 0.0% to 2.6%.
  - Regardless of the type of device used, the meta-analysis indicated that using a separate item to divert the initial aliquot of blood during venipuncture was associated with a significant reduction in BCC rate compared with a standard procedure of collection.
  - Current guidelines advocate a new BCC baseline of ≤ 1%

Callado GY, Lin V, Thottacherry E, et al. Diagnostic Stewardship: A systematic review and meta-analysis of blood culture diversion devices used to reduce blood culture contamination and improve the accuracy of diagnosis in clinical settings. Open Forum Infect Dis 2023.

GUIDELINES ADDRESSING DIVERSION







Systems and Human Factors Engineering

As IP science "…moves from evidence generation to translation into practice, an effective framework to promote, facilitate, and evaluate the implementation of evidence-based strategies in IP is needed"

Human factors engineering (HFE) considers the *complexity* of modern healthcare (e.g., the number of VAD inserters, types of catheters, catheter access) and the *ambiguity* or uncertainty of the system (e.g., the skill levels of VAD inserters, compliance with elements of a prevention bundle)

HFE "…is the scientific discipline concerned with understanding the interactions among humans and other elements of a system in order to improve system performance and well-being"

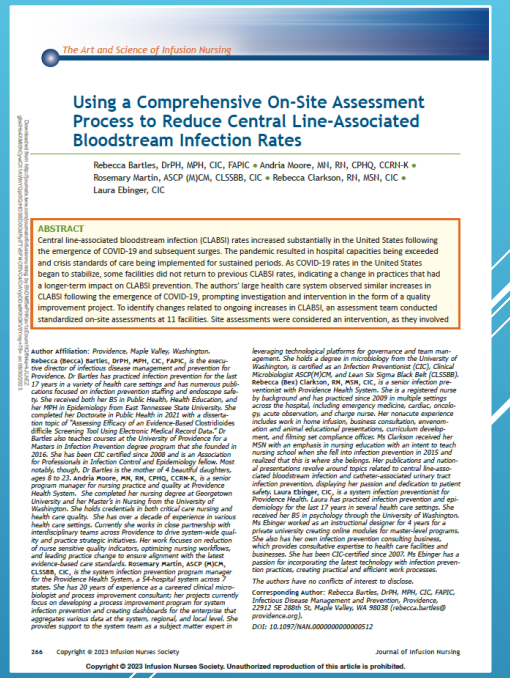
Approaches for Prevention

How the infection preventionist ***translates*** knowledge as contained in published guidelines into ***actual*** practice is fundamental in achieving successful outcomes

Tiered BSI prevention approaches, such as those that consider the "**lifecycle**" of a VAD, start by emphasizing high-quality, low-intensity, and lower cost elements; if these fail to lower infections, interventions requiring more resources and human capital are then introduced

Success in application of practices and interventions using IP implementation concepts and frameworks varies widely depending on **organization factors** such as operational support, informatics resources, experience, willingness to change, and safety culture

Bartles study, CLABSI reduction, 11 hospitals: included a pre-assessment, w/onsite interviews and observations, communicating potential root causes of infection management and staff based on assessment findings, institution of Lean and Six Sigma models to develop and implement a targeted intervention…result: a network-wide **70% reduction** in infection rate



The Art and Science of Infusion Nursing

Using a Comprehensive On-Site Assessment Process to Reduce Central Line-Associated Bloodstream Infection Rates

Rebecca Bartles, DrPH, MPH, CIC, FAPIC • Andria Moore, MN, RN, CPHQ, CCRN-K • Rosemary Martin, ASCP (M)CM, CLSSBB, CIC • Rebecca Clarkson, RN, MSN, CIC • Laura Ebinger, CIC

ABSTRACT

Central line-associated bloodstream infection (CLABSI) rates increased substantially in the United States following the emergence of COVID-19 and subsequent surges. The pandemic resulted in hospital capacities being exceeded and crisis standards of care being implemented for sustained periods. As COVID-19 rates in the United States began to stabilize, some facilities did not return to previous CLABSI rates, indicating a change in practices that had a longer-term impact on CLABSI prevention. The authors' large health care system observed similar increases in CLABSI following the emergence of COVID-19, prompting investigation and intervention in the form of a quality improvement project. To identify changes related to ongoing increases in CLABSI, an assessment team conducted standardized on-site assessments at 11 facilities. Site assessments were considered an intervention, as they involved

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Rebecca (Becca) Bartles, DrPH, MPH, CIC, FAPIC, is the executive director of infectious disease management and prevention for Providence. Dr Bartles has practiced infection prevention for the last 17 years in a variety of health care settings and has numerous publications focused on infection prevention staffing and endoscope safety. She received both her BS in Public Health, Health Education, and her MPH in Epidemiology from East Tennessee State University. She completed her Doctorate in Public Health in 2021 with a dissertation topic of "Assessing Efficacy of an Evidence-Based Clostridioides difficile Screening Tool Using Electronic Medical Record Data." Dr Bartles also teaches courses at the University of Providence for a Masters in Infection Prevention degree program that she founded in 2016. She has been CIC certified since 2008 and is an Association for Professionals in Infection Control and Epidemiology fellow. Most notably, though, Dr Bartles is the mother of 4 beautiful daughters, ages 8 to 23. Andria Moore, MN, RN, CPHQ, CCRN-K, is a senior program manager for nursing practice and quality at Providence Health System. She completed her nursing degree at Georgetown University and her Master's in Nursing from the University of Washington. She holds credentials in both critical care nursing and health care quality. She has over a decade of experience in various health care settings. Currently she works in close partnership with interdisciplinary teams across Providence to drive system-wide quality and practice strategic initiatives. Her work focuses on reduction of nurse sensitive quality indicators, optimizing nursing workflows, and leading practice change to ensure alignment with the latest evidence-based care standards. Rosemary Martin, ASCP (M)CM, CLSSBB, CIC, is the system infection prevention program manager for the Providence Health System, a 54-hospital system across 7 states. She has 20 years of experience as a careered clinical microbiologist and process improvement consultant; her projects currently focus on developing a process improvement program for system infection prevention and creating dashboards for the enterprise that aggregates various data at the system, regional, and local level. She provides support to the system team as a subject matter expert in leveraging technological platforms for governance and team management. She holds a degree in microbiology from the University of Washington, is certified as an Infection Preventionist (CIC), Clinical Microbiologist ASCP(M)CM, and Lean Six Sigma Black Belt (CLSSBB). Rebecca (Bex) Clarkson, RN, MSN, CIC, is a senior infection preventionist with Providence Health System. She is a registered nurse by background and has practiced since 2009 in multiple settings across the hospital, including emergency medicine, cardiac, oncology, acute observation, and charge nurse. Her nonacute experience includes work in home infusion, business consultation, envenomation and animal educational presentations, curriculum development, and filming set compliance offices. Ms Clarkson received her MSN with an emphasis in nursing education with an intent to teach nursing school when she fell into infection prevention in 2015 and realized that this is where she belongs. Her publications and national presentations revolve around topics related to central line-associated bloodstream infection and catheter-associated urinary tract infection prevention, displaying her passion and dedication to patient safety. Laura Ebinger, CIC, is a system infection preventionist for Providence Health. Laura has practiced infection prevention and epidemiology for the last 17 years in several health care settings. She received her BS in psychology through the University of Washington. Ms Ebinger worked as an instructional designer for 4 years for a private university creating online modules for master-level programs. She also has her own infection prevention consulting business, which provides consultative expertise to health care facilities and businesses. She has been CIC-certified since 2007. Ms Ebinger has a passion for incorporating the latest technology with infection prevention practices, creating practical and efficient work processes.

The authors have no conflicts of interest to disclose.

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Bundle Compliance

- Drafting, dissemination, and education of IP protocols alone is often insufficient in achieving sustained improvements
- Long-term success requires measuring the level of ***compliance with individual components*** that comprise intervention bundles, followed by identifying barriers related to specific elements that are deemed below acceptable standards
- This contention is well supported in a study conducted in 984 ICUs whereby reductions in CLABSI events were related when a ≥95% compliance level with bundle components was reached rather than related to bundle implementation
- **Data in, Data out.** Documentation in the EMR is crucial for all procedures of a bundle

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY JULY 2016, VOL. 37, NO. 7

ORIGINAL ARTICLE

Central Line–Associated Bloodstream Infection Reduction and Bundle Compliance in Intensive Care Units: A National Study

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OBJECTIVES. To describe compliance with the central line (CL) insertion bundle overall and with individual bundle elements in US adult intensive care units (ICUs) and to determine the relationship between bundle compliance and central line–associated bloodstream infection (CLABSI) rates.

DESIGN. Cross-sectional study.

PARTICIPANTS. National sample of adult ICUs participating in National Healthcare Safety Network (NHSN) surveillance.

METHODS. Hospitals were surveyed to determine compliance with CL insertion bundle elements in ICUs. Corresponding NHSN ICU CLABSI rates were obtained. Multivariate Poisson regression models were used to assess associations between CL bundle compliance and CLABSI rates, controlling for hospital and ICU characteristics.

RESULTS. A total of 984 adult ICUs in 632 hospitals were included. Most ICUs had CL bundle policies, but only 69% reported excellent compliance (≥95%) with at least 1 element. Lower CLABSI rates were associated with compliance with just 1 element (incidence rate ratio [IRR] 0.77; 95% confidence interval [CI], 0.64–0.92); however, ≥95% compliance with all 5 elements was associated with the greatest reduction (IRR, 0.67; 95% CI, 0.59–0.77). There was no association between CLABSI rates and simply having a written CL bundle policy nor with bundle compliance <75%. Additionally, better-resourced infection prevention departments were associated with lower CLABSI rates.

CONCLUSIONS. Our findings demonstrate the impact of transferring infection prevention interventions to the real-world setting. Compliance with the entire bundle was most effective, although excellent compliance with even 1 bundle element was associated with lower CLABSI rates. The variability in compliance across ICUs suggests that, at the national level, there is still room for improvement in CLABSI reduction.

Infect Control Hosp Epidemiol 2016;37:805–810

Central line–associated bloodstream infections (CLABSIs) lead to significant morbidity, mortality, and cost among hospitalized patients.[1,2] Over the past decade, numerous interventions have been implemented to prevent CLABSIs, and between 2008 and 2013 CLABSI rates have decreased by 46% across the United States.[3] Among the various CLABSI prevention efforts, one of the most widely adopted is the central line (CL) insertion bundle promoted by the Institute for Healthcare Improvement (IHI) and other groups.[4]

A care bundle is a set of evidence-based interventions that are intended to be implemented together, under the theory that bundled interventions are more effective than separate individual interventions. The components of the CL insertion bundle include the following practices: (1) hand hygiene prior to insertion; (2) maximal barrier precautions; (3) chlorhexidine skin antisepsis; (4) optimal site selection (ie, avoidance of femoral vein in adults); and (5) daily review of line necessity. Several studies have reported on the positive impact of the CL bundle when implemented as part of collaboratives, including the Keystone intensive care unit (ICU) project in Michigan ICUs[5] and the VA ICU project participating in the IHI campaign.[6] Both collaboratives reported significant decreases in CLABSI rates after implementation of the CL bundle.

The CL bundle has now been adopted by most hospitals across the United States; in fact, its components are required of all accredited hospitals by The Joint Commission as part of its National Patient Safety Goal to prevent CLABSIs.[7] However, data regarding compliance with the bundle elements across US ICUs, as well as the impact on CLABSI rates, are limited

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Data Comprehension and Practice Change

Despite effective audit and feedback of quality data, inconsistencies exist in responses related to clinician behavior.

One goal in program modification should be to increase the ***Comprehension*** of relevant concepts, e.g., infection rates such as SIRs

Achieving such a goal has potential policy relevance by aiding efforts to make quality metrics more effective in influencing medical decision-making and promoting necessary practice changes

In one study, researchers used an 11-item comprehension instrument that contained questions related to metric assessment (e.g., which is better: a higher or lower SIR?), which helped identify specific factors that when modified into a comprehension scale may prove to be most relevant in driving practice change

PLOS ONE

RESEARCH ARTICLE

A comprehension scale for central-line associated bloodstream infection: Results of a preliminary survey and factor analysis

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Competing interests: The authors have declared that no competing interests exist.

Abstract

Background

Central line-associated bloodstream infections (CLABSI) are associated with significant morbidity and mortality. This condition is therefore the focus of quality initiatives, which primarily use audit and feedback to improve performance. However, feedback of quality data inconsistently affects clinician behavior. A hypothesis for this inconsistency is that a lack of comprehension of CLABSI data by decision makers prevents behavior change. In order to rigorously test this hypothesis, a comprehension scale is necessary. Therefore, we sought to develop a scale to assess comprehension of CLABSI quality metric data.

Methods

The initial instrument was constructed via an exploratory approach, including literature review and iterative item development. The developed instrument was administered to a sample of clinicians, and each item was scored dichotomously as correct or incorrect. Psychometric evaluation via exploratory factor analyses (using tetrachoric correlations) and Cronbach's alpha were used to assess dimensionality and internal consistency.

Results

97 clinicians responded and were included. Factor analyses yielded a scale with one factor containing four items with an eigenvalue of 2.55 and a Cronbach's alpha of 0.82. The final solution was interpreted as an overall CLABSI "comprehension" scale given its unidimensionality and assessment of each piece of data within the CLABSI feedback report. The cohort had a mean performance on the scale of 49% correct (median = 50%).

Conclusions

We present the first psychometric evaluation of a preliminary scale that assesses clinician comprehension of CLABSI quality metric data. This scale has internal consistency,

Education of VA Specialists and Infection Preventionists

- Important education points:
  - Research shows an inverse relationship between experience and complication rates
  - To address patient safety and liability concerns, standardized training practices and tools must be developed to ensure practitioner competency with safe practices during invasive procedures
  - VAS need to participate in HAI Prevention Committees
- VAS and IPs may obtain certification via Vascular Access Certification Corp
- The Infusion Nurses Society Certified Registered Nurse Infusionist (CRNI) certification

VACC
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Conclusion

- The emerging perspectives presented today outline IP and VA topics supported by recent research relevant to the prevention of BSIs in a surveillance setting that includes expanding efforts to all VADs

- The areas of focus provide insights on potential new avenues of intervention that when integrated into quality improvement initiatives should prove to be beneficial in mitigating VAD HOB events which are associated with serious, and often life-threatening, complications

References

- CDC NHSN HAI Progress Reports. Current Hhttps://www.cdc.gov/hai/data/portal/progress-report.htmlAI Progress Report | HAI | CDC
- The Great Resignation is over, so why doesn't it feel like it? https://www.advisory.com/daily-briefing/2024/01/26/great-resignationhe 'Great Resignation' is over. So why doesn't it feel like it? (advisory.com)
- Centers for Medicare and Medicaid Services. FY 2023 Hospital Inpatient Prospective Payment System (IPPS) and Long Term Care Hospitals (LTCH PPS) Proposed Rule - CMS-1771-P. https:// www.cms.gov/newsroom/fact-sheets/fy-2023-hospital-inpatient-prospective-payment-system-ipps-and-long-term-care-hospitals-ltch-pps.
- McAlearney AS, Gaughan AA, DePuccio MJ, MacEwan SR, Hebert C, Walker DM. Management practices for leaders to promote infection prevention: lessons from a qualitative study. Am J Infect Control. 2021;49:536-541.
- Agency for Healthcare Research and Quality. Leadership to improve diagnosis: A call to action. AHRQ Publication No. 20(21)-0040-5-EF, June 2021. https://www.improvediagnosis.org/publications/improvedx-july-2021/from-the-field-coalition-member-ahrq-calls-for-focus-on-healthcare-leadership-to-improve-diagnostic-safety/#:~:text=The%20Agency%20for%20Healthcare%20Research%20and%20Quality%20%28AHRQ%29,healthcare%20leaders%20can%20drive%20improvements%20in%20diagnostic%20safety
- Madden GR, Weinstein RA, Sifri CD. Diagnostic Stewardship for healthcare-associated infections: opportunities and challenges to safely reduce test use. Infect Control Hosp Epidemiol. 2018;39:214-218.
- Garcia R, Spitzer E, Beaudry J, Beck C, DiBlasi R, Gilleeny-Blabac M, et al. Multidisciplinary team review of best practices for collection and handling of blood cultures to determine effective interventions for increasing the yield of true-positive bacteremias, reducing contamination, and eliminating false-positive central line-associated bloodstream infections. Am J Infect Control. 2015;43:1222-1237.

References

- Drews FA, Visnovsky LC, Mayer J. Human Factors Engineering contributions to infection prevention and control. Human Factors. 2019;61:693-701.
- Bartles R, Moore A, Martin R, Clarkson R, Ebinger L. Using a comprehensive on-site assessment process to reduce central line-associated bloodstream infection rates. Infusion Nurses Soc. 2023;46:266-271.
- Futuya EY, Dick AW, Herzig CT, Pogorzelska-Maziarz M, Larsen E, Stone P. Central line-associated bloodstream infection reduction and bundle compliance in intensive care units: a national study. Infect Control Hosp Epidemiol. 2016;37:805-810.
- Govindan S, Iwashyna TJ. Do clinicians understand quality metric data? An evaluation in a Twitter-derived sample. J Hosp Med. 2017;12:18-22.
- Huang SS, Septimus E, Platt R. Targeted decolonization to prevent ICU infections. N Engl J Med. 2014;369:1470-1471.
- Summerlin-Long S, DiBlase LM, Padgett M, Mack J, Clark C, Teal L, et al. A helping hand: the impact of a central line insertion support team. Am J Infect Control. 2023. Online ahead of print. https://www.ajicjournal.org/action/showPdf?pii=S0196-6553%2823%2900609-06090.pdf.
- Vascular Access Certification Corporation. Vascular Access Certification and Recertification Candidate Handbook 2023. https://www.vacert.org.
- Infusion Nurses Certification Corporation. CRNI Exam. https://www.ins1.org/crni/exam/overview.
- Mastrandra G, Giuliani R, Graps EA. International good practices on central venous catheters' placement and daily management in adults and on educational interventions addressed to healthcare professionals or awake/outpatients. Results of scoping review compared with the existence Italian good practices. Front Med. 2022;9:943164. doi: 10.3389/frmed.2022.943164.
- Timsit JF, Bouadma L, Ruckly S, Schwebel S, Garrouste-Orgeas M, Bronchard R, et al. Dressing disruption is a major risk factor to catheter related infections. Crit Care Med. 2012;40:1707- 1714.

References

- Brescia F, Pitirutti M, Ostroff M, Spencer TR, Dawson RB. The SIC protocol: A seven-step strategy to minimize complications potentially related to the insertion of centrally inserted central catheters. J Vass Access. 2021;24:185-190.
- The Australasian Society for Ultrasound in Medicine. Guidelines for Reprocessing Ultrasound Transducers. AJUM. 2017;20:30-40.
- American Institute of Ultrasound in Medicine. Guidelines for Cleaning and Preparing External- and Internal-Use Ultrasound Transducers and Equipment Between Patients as Well as Safe Handling and Use of Ultrasound Coupling Gel. https://www.aium.org/resources/official-statements/view/guidelines-for-cleaning-and-preparing-external--and-internal-use-ultrasound-transducers-and-equipment-between-patients-as-well-as-safe-handling-and-use-of-ultrasound-coupling-gel.
- Centers for Disease Control and Prevention. 2017 Updated Recommendations on the Use of Chlorhexidine-Impregnated Dressings for Prevention of Intravascular Catheter-Related Infections. https://www.cdc.gov/infectioncontrol/pdf/guidelines/bsi-guidelines-H.pdfc.gov. Accessed December 23, 2023.
- Holinga G, McGuire JE. *In vitro* antimicrobial effects of chlorhexidine diacetate versus chlorhexidine free base dressings. J Wound Care. 2020;29(Sup5A):522-528.

Thank you!

Questions & Answers

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