

Central Line-Associated Bloodstream Infection (CLABSI): An Introduction



Presenter

Vineet Chopra, MD, MSc

Associate Professor of Medicine
Chief of the Division of Hospital Medicine
University of Michigan

Contributions by

Kristi Felix, RN, BSN, CRRN, CIC, FAPIC
Madonna Rehabilitation Hospital

Karen Jones, RN, MPH, CIC
University of Michigan

Len Mermel, DO, ScM, AM (Hon)
Medical School of Brown University

Russ Olmsted, MPH, CIC, FAPIC
Trinity Health, Livonia MI

Payal Patel, MD, MPH
University of Michigan



Learning Objectives

- Outline the impact, cost, morbidity and mortality of CLABSI
- Recognize that CLABSI is defined in different ways and there are multiple routes of developing CLABSI
- Describe a tiered approach to prevent CLABSI



What is a Central Venous Catheter (CVC)?

- Intravascular device that terminates at or close to the heart or one of the great vessels

Non-tunneled CVCs (subclavian, jugular, femoral)

Tunneled CVCs

Dialysis catheter

Peripherally inserted central catheters (PICCs)

Implanted ports



- Used increasingly to provide short-, medium- and long-term venous access in all settings



What is a CLABSI? Surveillance Definition

An infection that originates from or is related to a central venous catheter

Two definitions: surveillance and clinical

NHSN surveillance definition:

A laboratory confirmed infection where a CVC is in place for ≥ 2 calendar days prior to a positive culture and is also in place the day of or day prior to culture

Example 1:

- PICC placed June 1
- Patient febrile June 3
- PICC in place
- Cultures positive for *Staphylococcus aureus*

CLABSI

Example 2:

- PICC placed June 2nd
- Removed June 5th
- Patient febrile June 6th
- Cultures positive for Coagulase-Negative Staphylococci

CLABSI

Disclaimer: All case studies are hypothetical and not based on any actual patient information. Any similarity between a case study and actual patient experience is purely coincidental.



What is CLABSI? Clinical Definition

CLABSI occurs when these three criteria exist:

Clinical signs of infection

e.g., fever, rigors, altered mental status, hypotension

No alternate source of bloodstream infection

Positive blood culture from a peripheral vein with any one of the following:

Catheter tip/segment culture that matches organism grown from blood

At least threefold higher number of organisms grown from the catheter versus the peripheral blood culture on simultaneously drawn cultures

Growth from the catheter-drawn blood culture occurs at least two hours before growth of the same organism from a percutaneously-drawn blood culture

IDSA.2009. <https://www.idsociety.org/practice-guideline/iv-catheter/>



Burden of CLABSI

Epidemiology of CLABSI is changing

44% decrease in CLABSI between 2008-2016

- Approximately 23,500 CLABSIs were reported to NHSN from U.S. hospitals in 2016
 - Prolongs hospital stay
 - Increase morbidity
 - Raises mortality by 12-25%
- CDC estimates attributable CLABSI cost **\$48,000/episode***



Pathogenesis of CLABSI

Based on route of entry of bacteria:

Extraluminal: pathogens migrate along external surface of catheter from skin entry site

Often occurs within 7 days of insertion

Intraluminal: hub contamination, migration along internal surface of catheter

More commonly occurs >7 days, intraluminal colonization

Secondary BSI: bacteria from another source in the body infects the blood

Infusate Contamination-: introduction of pathogens from fluids infused through the catheter system



Risk Factors for CLABSI

Patient Characteristics

- Immune compromised host/neutropenic hosts
- Severe skin burns or protein calorie malnutrition
- Prolonged hospital stay prior to device placement

Provider Characteristics

- Emergency insertion
- Excessive device manipulation
- Incomplete adherence to safe insertion practices
- Failure to remove unnecessary devices
- Low nurse-to-patient staffing ratio (catheter hub care)

Device Characteristics

- Site of insertion
- Number of lumens
- Indication for use (total parenteral nutrition, chemotherapy)



Preventing CLABSI

MHA Keystone Study:

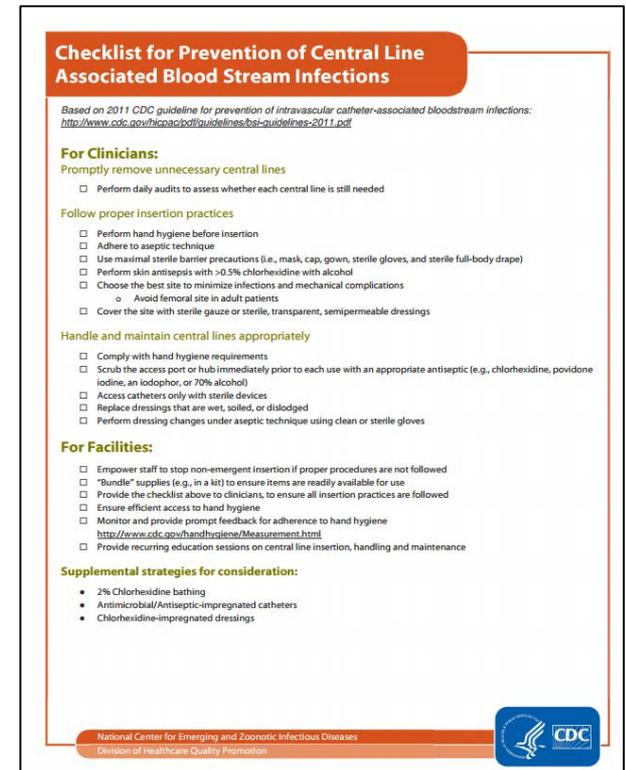
Statewide initiative in Michigan to prevent CLABSI
103 ICUs, launched Oct 2003
Made use of a “bundle” of best practices

What is a bundle?

Structured way of improving process of care and patient outcomes using a set of evidence-based interventions at the same time

Keystone Bundle Intervention:

Hand hygiene prior to catheter insertion
Use of maximal sterile barrier precautions
Use of alcohol-containing chlorhexidine for skin antisepsis before insertion
Avoidance of the femoral site
Removal of unnecessary catheters as soon as possible



Checklist for Prevention of Central Line Associated Blood Stream Infections

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

For Clinicians:

Promptly remove unnecessary central lines

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

Follow proper insertion practices

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

Handle and maintain central lines appropriately

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

For Facilities:

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

Supplemental strategies for consideration:

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

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion



(Pronovost P, *N Engl J Med*, 2006; *Central Line Infection*, Institute for Healthcare Improvement, 2016; *Checklist for Prevention of Central Line Associate Blood Stream Infections*, CDC.)



Keystone Study Decreased CLABSI Rates

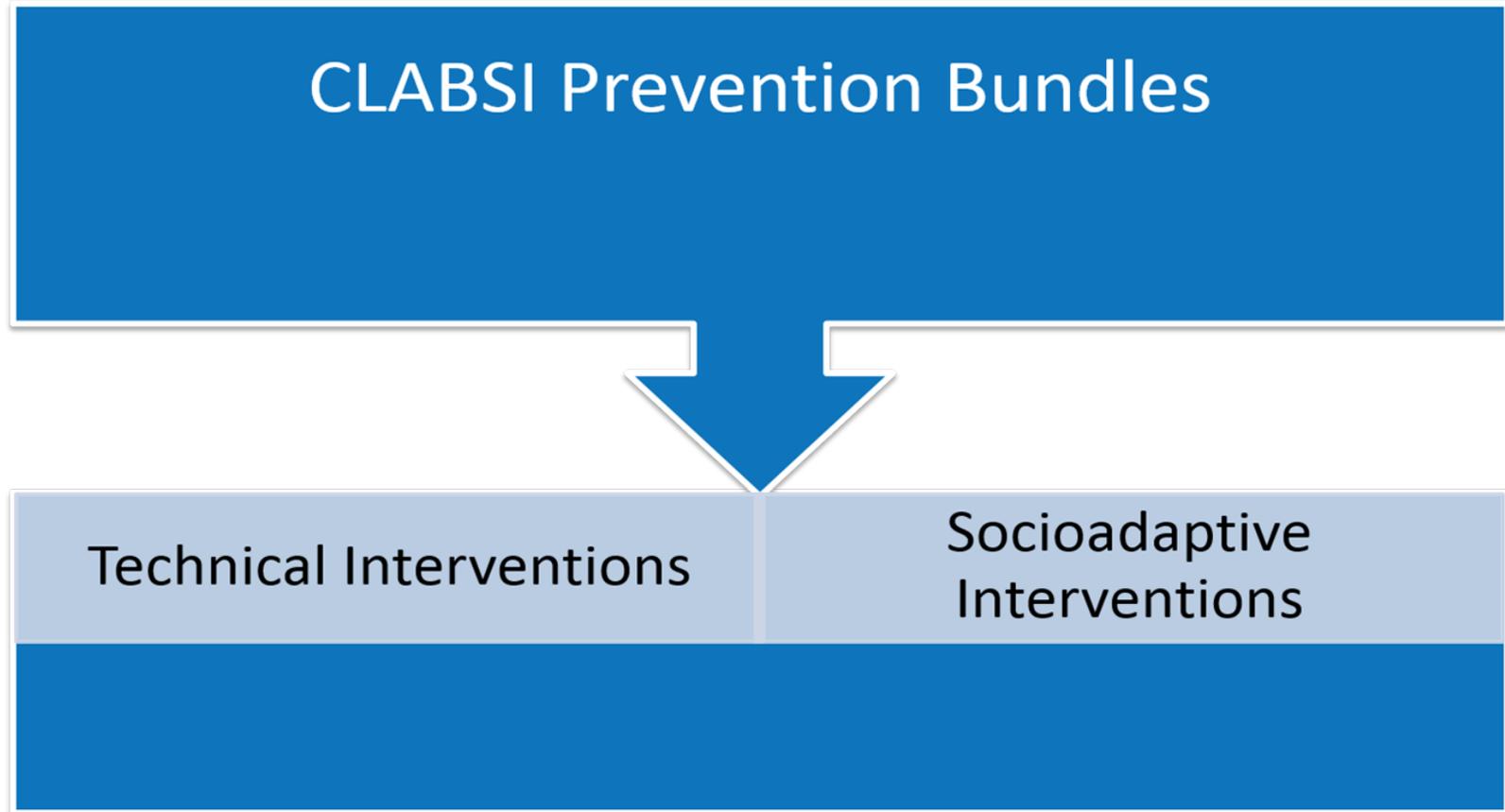
Table 3. Rates of Catheter-Related Bloodstream Infection from Baseline (before Implementation of the Study Intervention) to of Follow-up.*

Study Period	No. of ICUs	No. of Bloodstream Infections per 1000 Catheter-Days			
		Overall	Teaching Hospital	Nonteaching Hospital	<200 Beds
		<i>median (interquartile range)</i>			
Baseline	55	2.7 (0.6–4.8)	2.7 (1.3–4.7)	2.6 (0–4.9)	2.1 (0–3.0)
During implementation	96	1.6 (0–4.4)†	1.7 (0–4.5)	0 (0–3.5)	0 (0–5.8)
After implementation					
0–3 mo	96	0 (0–3.0)‡	1.3 (0–3.1)†	0 (0–1.6)†	0 (0–2.7)
4–6 mo	96	0 (0–2.7)‡	1.1 (0–3.6)†	0 (0–0)‡	0 (0–0)†
7–9 mo	95	0 (0–2.1)‡	0.8 (0–2.4)‡	0 (0–0)‡	0 (0–0)†
10–12 mo	90	0 (0–1.9)‡	0 (0–2.3)‡	0 (0–1.5)‡	0 (0–0)†
13–15 mo	85	0 (0–1.6)‡	0 (0–2.2)‡	0 (0–0)‡	0 (0–0)†
16–18 mo	70	0 (0–2.4)‡	0 (0–2.7)‡	0 (0–1.2)†	0 (0–0)†

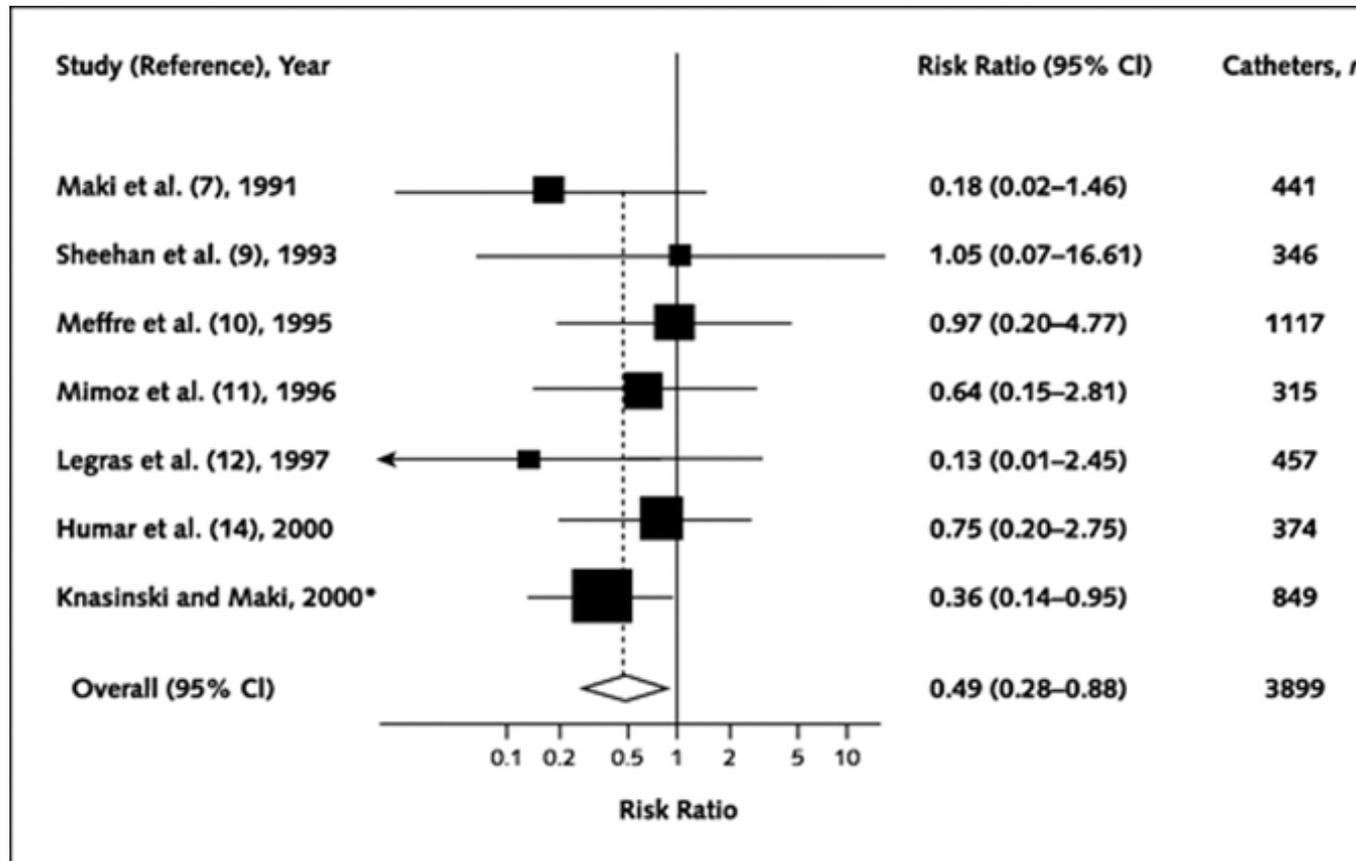
(Pronovost P, *N Engl J Med*, 2006)



Active Ingredients of the CLABSI Bundle



Evidence for Technical Element: Chlorhexidine vs Povidone



Meta-analysis: Among patients with CVC, chlorhexidine prep reduced risk of CRBSI by 49% vs Povidone

(Chaiyakunapruk N, *Ann Intern Med*, 2002)



Socioadaptive Intervention: Not Just About Having A Bundle

Socioadaptive Interventions include:

- Clinician education
- Designated Physician and Nursing Team Leader
- Central-line cart in each ICU
- Insertion Checklist
- Nurse empowerment to stop procedure if best practices are not followed
- Adherence to best practices
- To frontline staff, feedback provided regarding rates of CLABSI



Socioadaptive Changes are Important

Question: does adopting a bundle alone lead to CLABSI prevention?

In 250 hospitals, CLABSI rate was 2.1 per 1000 catheter days and 49% had a bundle policy

CLABSI rates decreased only when units:

Had a bundle policy

Monitored compliance

Demonstrated $\geq 95\%$ compliance



(Furuya EY, PLoS One, 2011)



Tiers of CLABSI Prevention Practices*

TIER 1 Standardize Supplies, Procedures and Processes

(complete all interventions: review and audit compliance with Tier 1 measures prior to moving to Tier 2)

Assess appropriateness and need for Central Venous Catheter (CVC)

Select appropriate site of insertion; avoid use of femoral site

Ensure proper aseptic insertion using maximal sterile barriers and ultrasound guidance

Ensure proper care and maintenance of CVC; e.g. proper hand hygiene, adequate staffing, disinfection of connector, secure/intact dressing

Optimize prompt removal of clinically unnecessary CVCs

(If CLABSI rates remain elevated, start with CLABSI Guide to Patient Safety (GPS) and Target Assessment for Prevention (TAP) Strategy and then proceed with additional interventions)

Perform needs assessment with CLABSI GPS and TAP Strategy

Tier 2 Enhanced Practices

Conduct multidisciplinary rounds to audit for necessity of continued CVC use

Feed back CLABSI and CVC utilization metrics to frontline staff in "real time"

Observe and document competency and compliance with CVC insertion and maintenance

Use additional approaches as indicated by risk assessment (e.g., antimicrobial coated CVC)

Full or mini root cause analysis of CLABSI



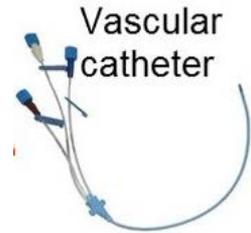
Tier 1: First Steps to CLABSI Prevention



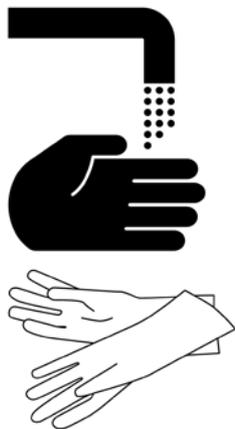
Assess appropriateness and need for all CVCs

Select appropriate site of insertion

Avoid the use of the femoral site



Ensure proper aseptic insertion using maximal sterile barriers and ultrasound guidance



Ensure proper care and maintenance of CVC

Proper hand hygiene

Adequate staffing

Disinfect connectors

Intact dressing

Optimize prompt removal of clinically unnecessary CVCs

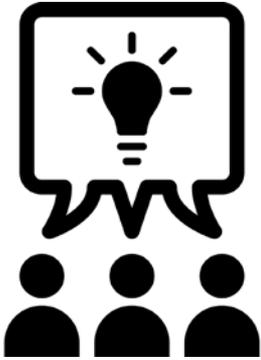


Tier 2: Enhanced Practices



Perform CLABSI needs assessment with the Guide to Patient Safety (GPS)* and/or CDC Targeted Assessment for Prevention (TAP) Strategy

Tier 2:



Conduct multidisciplinary rounds to audit for necessity of continued CVC use

Provide real-time feedback on CLABSI and CVC utilization metrics to frontline staff

Observe and document competency and compliance with CVC insertion and maintenance



Use additional approaches as indicated by risk

Conduct a full or mini root-cause analysis (RCA) of all CLABSIs

** This tool is modeled on the CAUTI GPS and was adapted by a team that included subject matter experts affiliated with the University of Michigan and Department of Veterans Affairs and funding support from the Agency for Healthcare Research and Quality (AHRQ) and the Centers for Disease Control and Prevention (CDC).*



Summary

Despite progress, CLABSI remains a costly, morbid and lethal condition

Prevention of CLABSI should include both technical and socioadaptive elements

Guidance using these strategies will be provided in a tiered format to help you implement quality CLABSI prevention interventions



References

Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and non-central line-associated Bloodstream Infection). Device-associated Module, BSI. Centers for Disease Control and Prevention, CDC. January 2019. Available at

http://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf

Central Line Infection. Institute for Healthcare Improvement, IHI. 2016. Available at

<http://www.ihl.org/topics/centrallineinfection/Pages/default.aspx>

Chaiyakunapruk N, Veenstra DL, Lipsky BA, et al. Chlorhexidine compared with providone-iodine solution for vascular catheter-site care: a meta-analysis. *Ann Intern Med.* 2002; 136(11): 792-801.

Checklist for Prevention of Central Line Associate Blood Stream Infections. Centers of Disease Control and Prevention, CDC. Available at <https://www.cdc.gov/hai/pdfs/bsi/checklist-for-clabsi.pdf>

Chopra V, Shojania K. Recipes for checklists and bundles: one part active ingredient, two parts measurement. *BMJ Qual Saf.* 2013; 22(2): 93-6.

Furuya EY, Dick A, Perencevich EN, et al. Central line bundle implementation in US intensive care units and impact on bloodstream infections. *PLoS One.* 2011; 6(1): e15452.



References (cont'd)

Marschall J, Mermel LA, Fakih M, et al. Strategies to prevent central line-associated bloodstream infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol*. 2014; 35(7): 753-71.

Mermel LA, Allon M, Bouza E, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2009; 49(1): 1-45.

Pronovost P, Nedham D, Berenholtz S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med*. 2006; 355(26): 2725-32.

Vital Signs: Central Line-Associated Blood Stream Infection –United States, 2001, 2008 and 2009. *MMWR Morb Mortal Wkly Rep*. 2011; 60(8): 243-8.



Speaker Notes



Speaker Notes: Slide 1

Welcome to the first of the central line-associated bloodstream infection, or CLABSI, prevention modules. This module, titled “Central Line-Associated Bloodstream Infection: An Introduction” will provide background information on what constitutes a central venous catheter, the definition and burden of CLABSI and strategies for preventing this infection. This module will serve to set the stage for subsequent modules in this course.



Speaker Notes: Slide 2

This module was developed by national infection prevention experts devoted to improving patient safety and infection prevention efforts.



Speaker Notes: Slide 3

After completing this module, you will be able to:

- Outline the impact, cost, morbidity and mortality of CLABSI;
- Recognize that CLABSI is defined in different ways and there are multiple routes of developing CLABSI; and
- Describe a tiered approach to prevent CLABSI.



Speaker Notes: Slide 4

A central venous catheter, or CVC, is an intravascular device that terminates at or close to the heart or one of the great vessels at the chest. Therefore, central venous catheters include a number of devices, such as:

- Non-tunneled central venous catheters, such as those placed in subclavian, jugular or femoral veins;
- Tunneled central venous catheters;
- Dialysis catheters;
- Peripherally inserted central catheters, also called PICCs; and
- Implanted ports.



Speaker Notes: Slide 4 Continued

Central venous catheters are useful because they provide easy venous access for varying time periods – such as days, weeks or months of treatment.



Speaker Notes: Slide 5

As described earlier, CLABSI stands for central line-associated bloodstream infection. It is an infection that either originates from or is related to a central venous catheter. CLABSI can be defined a number of ways, which sometimes creates confusion. There are two major definitions of CLABSI that are important to review. The first is the surveillance definition which will be used throughout this presentation. This definition comes from the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN) and states that a CLABSI occurs when a patient has a laboratory confirmed infection with a central venous catheter in place for two or more calendar days prior to the culture and is also in place the day of or the day prior to culture.



Speaker Notes: Slide 5 Continued

Surveillance definitions are designed to study and identify trends in a population. The application of these standardized criteria, and only these criteria, in a consistent manner allows confidence in aggregation and analysis of data. Alternatively, clinical diagnoses are patient specific. Unlike surveillance definitions, ALL available diagnostic data are considered in a clinical diagnosis, including additional clinical, epidemiological and laboratory data not used for NHSN surveillance. Therefore, a clinical diagnosis may be made even when a surveillance definition may not be met. Failure to meet a surveillance definition should never impede or override clinical judgment during diagnosis, management or treatment of patients. Nor should failure to meet clinical definitions result in non-reporting to NHSN infections meeting the NHSN surveillance criteria.



Speaker Notes: Slide 5 Continued

For example, suppose a patient has a PICC placed on June 1st and then they become febrile on June 3rd. The patient's blood is cultured while the PICC remains in place. The cultures are positive for *Staphylococcus aureus*.

By definition, this meets CLABSI criteria because the infection is confirmed and the CVC, in this case a PICC, was in place before and during the culture.

Here's another example:

Suppose a patient has a PICC placed June 2nd and removed on June 5th. The patient develops a fever the following day and the cultures are positive for a Coagulase-negative Staphylococci.



Speaker Notes: Slide 5 Continued

This is also a CLABSI even though the PICC was no longer in place when the fever developed and the cultures were taken. The definition applies because the culture was positive with a PICC in place for two days and was removed a day prior to the cultures.



Speaker Notes: Slide 6

The clinical definition of CLABSI is similar to the surveillance definition, but there are a few key differences.

The clinical definition comes from the Infectious Diseases Society of America (IDSA) and Society of Healthcare Epidemiology of America (SHEA) 2009 Catheter Related Bloodstream Infection Guidelines. This is the most commonly recognized definition. It stipulates that three criteria have to be present for a CLABSI to be diagnosed:

First, the patient has to have clinical signs of an infection. So, for example, fever, rigors, altered mental status, or low blood pressure.



Speaker Notes: Slide 6 Continued

Second, there should be no alternate source for bloodstream infection.

And third, there must be a positive blood culture from a peripheral vein with any of the following:

- A catheter tip culture that matches the organism grown from blood.
- At least a three-fold higher number of organisms grown from the catheter versus the peripheral blood culture on simultaneously drawn cultures.
- Or growth from the catheter-drawn blood culture which occurs at least two hours before growth of the same organism from a percutaneously-drawn blood culture.

Please note that the 2009 clinical guideline is under review with a projected publication of Fall 2019.



Speaker Notes: Slide 7

An important aspect to understand is that the epidemiology of CLABSI is changing. This slide illustrates why it is still important to study CLABSI. While we have witnessed substantial reductions in CLABSI, 44 percent between 2008 and 2016, approximately 33,500 CLABSIs were reported to NHSN in 2016. These infections prolong hospital length of stay, increase morbidity and raise mortality anywhere from 12 to 25 percent.

CLABSIs are also costly. The CDC estimates that a single case can cost as much as \$48,000 or more per episode.



Speaker Notes: Slide 8

It is important to understand the pathogenesis of CLABSI to better target prevention efforts.

There are four routes of transmission in determining CLABSI cause:

1. First, extraluminal – or around the catheter. In this scenario, pathogens from the skin migrate from the puncture site along the catheter down into the bloodstream. Extraluminal CLABSI, also called insertion-related CLABSI, often occurs within seven days of CVC insertion.
2. Second is intraluminal – or an infection that occurs from within the catheter, such as when the catheter is not properly disinfected and bacteria migrate into the bloodstream from the catheter itself. This occurs when catheters dwell for longer periods, such as beyond seven days.



Speaker Notes: Slide 8 Continued

3. Third, secondary BSI— or infection that involves the catheter coming from another source, such as pneumonia or a urinary tract infection. In these cases, the catheter is implicated, but is not the cause of infection.
4. And fourth, infusate contamination —this is when the infusion itself contains bacteria leading to a bloodstream infection, for example in outbreaks related to contaminated IV flushes or injectable medications.

For surveillance purposes, ensure that NHSN reporting instructions are followed for reporting bloodstream infections that are suspected to arise from a different primary infection site.



Speaker Notes: Slide 9

Available evidence suggests that there are several risk factors for CLABSI that can be divided into three categories: patient, provider and device-characteristics.

Certain patient characteristics and comorbidities can increase a patient's risk of getting a CLABSI. These include if the patient is immune compromised or neutropenic, if the patient has severe skin burns or protein calorie malnutrition and if the patient has a prolonged hospital stay prior to having the device placed.

Provider characteristics are risk factors related to healthcare professional insertion and maintenance of the central venous catheter.



Speaker Notes: Slide 9 Continued

So for example, incomplete adherence to safe insertion practices, improper site or dressing care, and failure to remove a device that is no longer necessary or insufficient nurse-to-patient staffing ratios have all been linked to an increased risk of CLABSI. Finally, device characteristics are also risk factors that are related to central venous catheter use and insertion. For example, the insertion site of the central venous catheter, the number of lumens and the indication for the use of the CVC can all contribute to a patient's risk of developing a CLABSI. These risk factors will be discussed in more detail in the second and third modules of this course.



Speaker Notes: Slide 10

How can we prevent CLABSI?

A seminal study is the Michigan Hospital Association Keystone Center Study, which was a state-wide initiative that involved 103 Michigan ICUs conducted by Dr. Peter Pronovost and colleagues from Johns Hopkins. A hallmark of this study was the use of a bundle of evidence-based practices.

But what exactly is a bundle?

One way to think of a bundle is as a series of evidence-based interventions that, when applied consistently and at the same time, improve both processes of care and patient outcomes.



Speaker Notes: Slide 10 Continued

The Keystone Bundle consisted of five elements:

1. Hand hygiene prior to catheter insertion;
2. Use of maximal sterile barrier precautions;
3. Use of alcohol-containing chlorhexidine for skin antiseptis before insertion;
4. Avoiding the femoral site; and
5. Removal of unnecessary catheters as soon as possible.



Speaker Notes: Slide 11

The Keystone study was powerful and showed that a set of evidence-based practices applied as a bundle could reduce CLABSI rates. This slide, taken from the published study, shows that median rates of infection fell during implementation of the bundle across all ICUs and remained low throughout the 18-month study period.



Speaker Notes: Slide 12

How does the bundle achieve its effect? What is the “active ingredient?”

One way to think about how the bundle reduces CLABSI is to break the elements of the bundle down into technical interventions – or those that involve tools or techniques such as using chlorhexidine for skin antisepsis – versus socioadaptive interventions such as hand hygiene and removal of catheters.



Speaker Notes: Slide 13

The most important technical element of the bundle is alcohol containing chlorhexidine. Although this study is a bit older, this is a systematic review that clearly shows that compared to povidone iodine, skin disinfection with chlorhexidine reduces the risk of CLABSI by almost 50 percent. Thus, hospitals can reduce CLABSI rates by replacing povidone iodine in the catheter tray or cart with chlorhexidine to effectively experience these changes.



Speaker Notes: Slide 14

Socioadaptive interventions reflect behavioral changes that have to take place in order to ensure that the bundle has its intended impact. These changes are much harder to integrate and in the Keystone study included a number of elements such as:

- Clinician education;
- Having a designated physician and nurse team leader;
- Having a central-line cart in each ICU;
- Using insertion checklists when placing CVCs;
- Empowering nurses to stop central line catheter insertions if best practices were not followed;
- Adhering to those identified best practices; and
- Providing feedback to staff regarding CLABSI rates.



Speaker Notes: Slide 15

Socioadaptive interventions are important, because simply having a bundle is not enough. Rather, changes have to occur within an organization, to truly change the behavior of staff and clinicians and lead to true and sustained practice change.

A study by Furuya and colleagues nicely illustrates this point. In a study spanning 250 hospitals, the investigators found that approximately half of them reported having a bundle for CLABSI prevention. Additionally, the baseline rate of infection was 2.1 infections per 1,000 catheter days across the sites.



Speaker Notes: Slide 15 Continued

When the investigators looked at sites where infection rates declined, they found that infections only decreased when sites had a bundle, monitored compliance with the bundle elements and then demonstrated compliance with 95 percent of the interventions within the bundle.



Speaker Notes: Slide 16

This presentation will discuss two tiers of CLABSI prevention efforts that contain both technical and socio adaptive interventions. The first Tier are those interventions best supported by the evidence that are effective at preventing CLABSI in the hospital setting. These are the activities that all acute care hospitals should be doing.

Tier 2 is composed of interventions to try if CLABSI incidence remains higher than desired, despite the implementation of Tier 1 interventions. Tier 2 interventions are more complicated to implement or may be more controversial, but could be helpful to prevent CLABSI when added to Tier 1 interventions.



Speaker Notes: Slide 17

The first step of the Tier 1 interventions to prevent CLABSI involves assessing the appropriateness and need for all central venous catheters; a patient can't develop a CLABSI if they don't have a central line. If a CVC is indicated, it is important to ensure the appropriate site is selected during insertion and that proper aseptic technique is followed using maximal sterile barriers and ultrasound guidance. Next, it's important to have policies and procedures in place to guarantee proper catheter care and maintenance. This includes proper hand hygiene, adequate staffing, disinfection of connectors and checking that catheter dressings are dry and intact. Lastly, it's important to optimize removal of the catheter as soon as clinically indicated.



Speaker Notes: Slide 18

The next steps are to re-examine your CLABSI surveillance data and the barriers to implementation of the Tier 1 interventions. The CLABSI Guide to Patient Safety, or CLABSI GPS, and TAP Strategy are tools that can help with this assessment. The tools walk through a number of prevention elements and help you score their implementation at your facility.

If your CLABSI incidence remains higher than expected despite implementing Tier 1, you can add multidisciplinary rounds to audit the necessity of continued central line use. Rounding can also be used to share CLABSI feedback data with frontline staff.



Speaker Notes: Slide 18 Continued

Nurse and physician leaders should work with infection prevention to share such feedback about individual infections and when they are identified and feedback should include not just CLABSI rates but also utilization data regarding central venous catheters. Rounding can also be helpful to audit and monitor insertion and maintenance compliance. Staff placing CVCs should receive initial and recurrent appropriate training and education. Likewise, it's important to ensure that staff responsible for maintaining CVCs have received both initial and recurrent training and can demonstrate competence in the use of maintenance supplies and procedures.



Speaker Notes: Slide 18 Continued

If CLABSI rates remain elevated, then consider using additional approaches as indicated by individual risk, such as antimicrobial coated central venous catheters, bathing patients over two months of age with chlorhexidine, etc.

If CLABSI rates remain elevated despite these Tier 1 and 2 interventions, then a root cause analysis should be performed to identify next steps for improvement. You should assess how your facility is doing and regularly examine your CLABSI.



Speaker Notes: Slide 19

In summary, despite progress, CLABSI remains a costly, morbid and lethal condition. CLABSI prevention must include both technical and socio-adaptive elements. Guidance using these strategies will be provided in a tiered format in the subsequent modules to help you implement quality CLABSI prevention interventions.



Speaker Notes: Slide 20

No notes.



Speaker Notes: Slide 21

No notes.

