Surveillance For Central Line-associated Bloodstream Infections (CLA-BSIs)

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Objectives

1. To discuss the Center for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) as a model for Central Line-associated Bloodstream Infection (CLA-BSI) surveillance worldwide.

Background: Impact

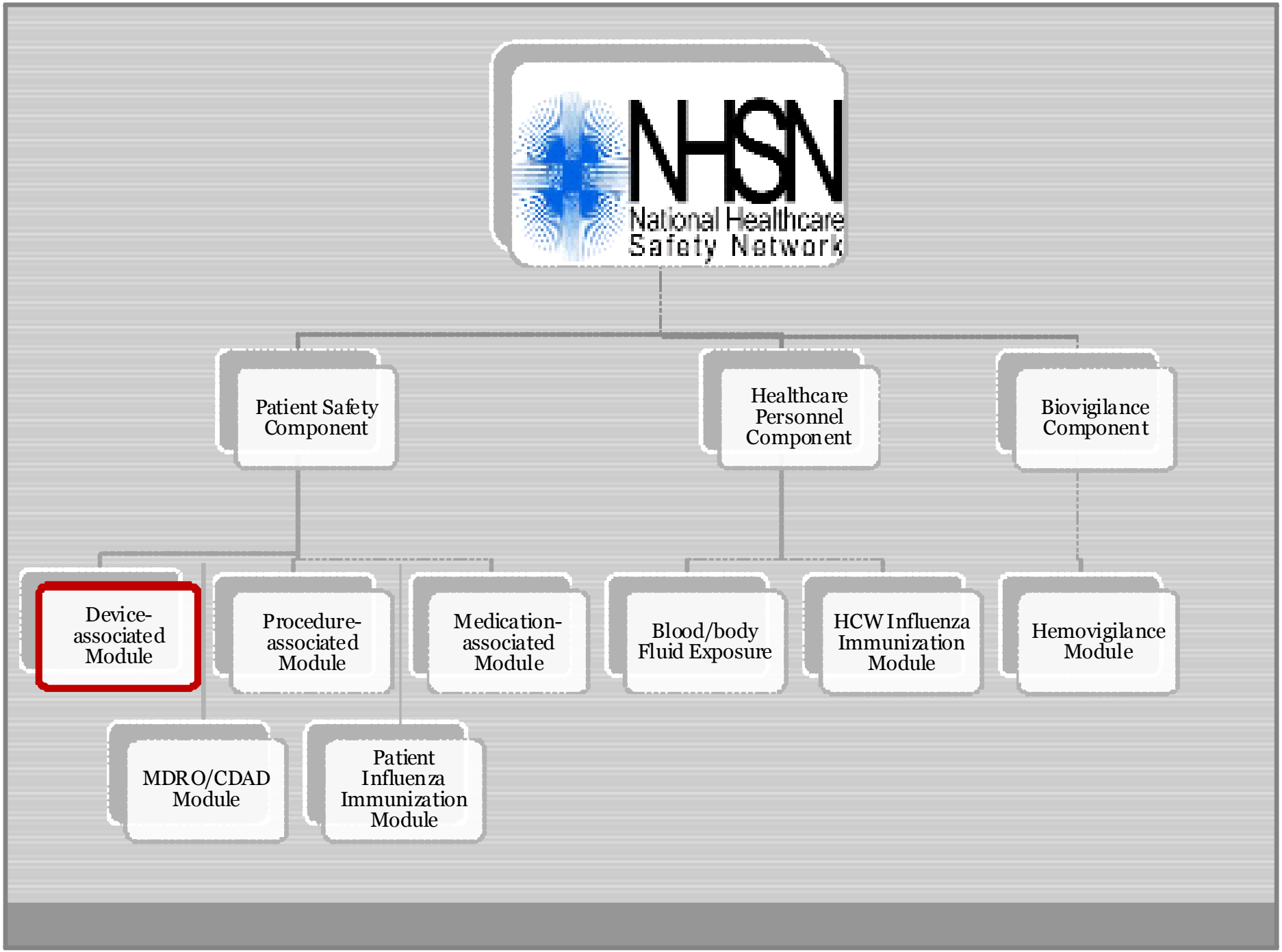
- Bloodstream infections (BSIs) are a major cause of healthcare-associated morbidity and mortality
  - Up to 35% attributable mortality
  - BSI leads to excess hospital length of stay of 24 days
- Central Line (CL) use a major risk factor for BSI
- More than 250,000 central line-associated BSIs (CLABSIs) in US yearly
- Rates of CLABSI appear to vary by type of catheter

Pittet et al. JAMA 1994; 271 1598-1601.

Klevens et al. Public Health Reports 2007;122:160-6.

Clinical vs. Surveillance Definitions

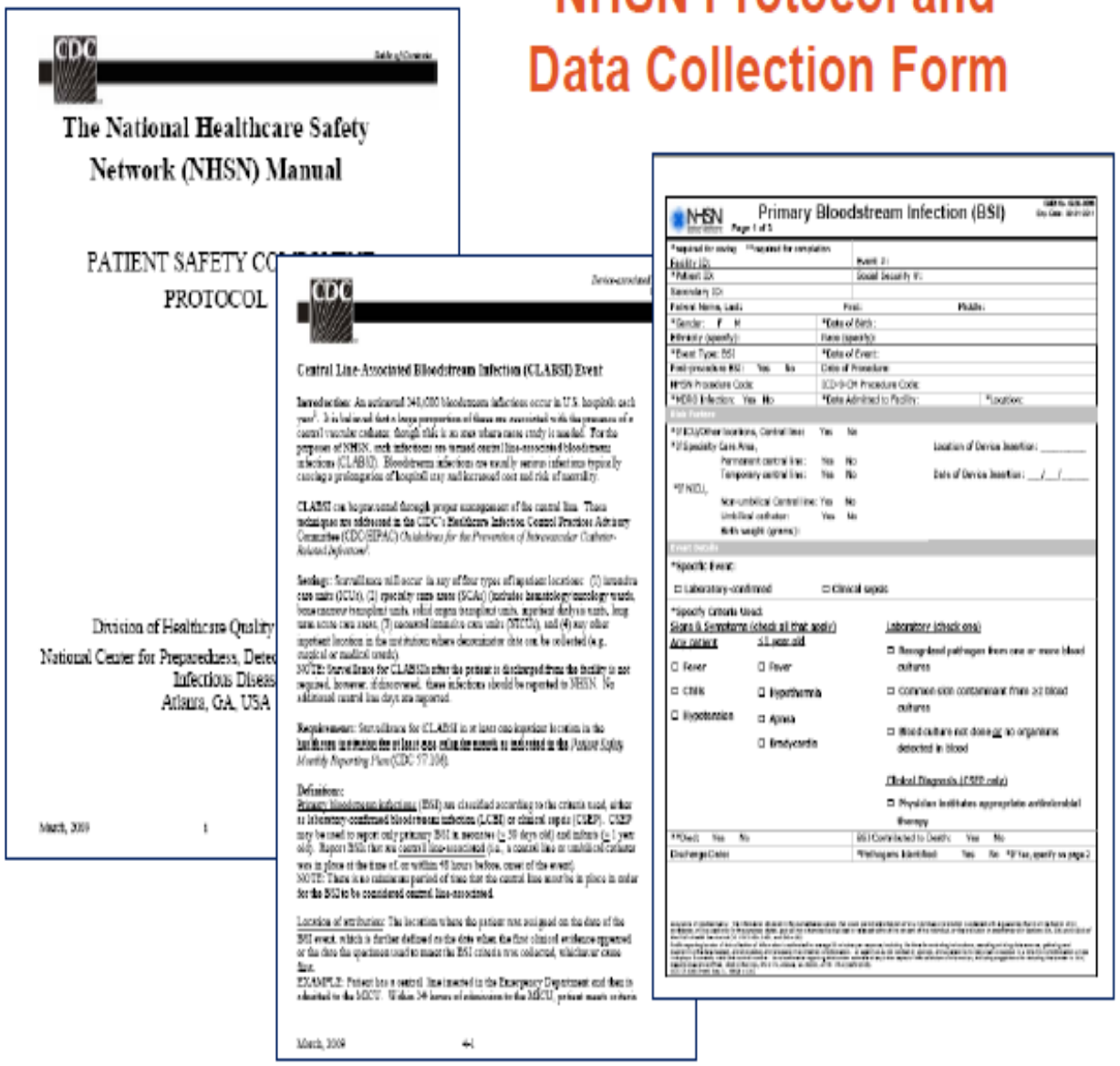
- **Clinical**
  - Individualized; used for making therapeutic decisions
- **Surveillance**
  - Population-based
  - Must be applied uniformly and consistently


NHSN
National Healthcare Safety Network
Patient Safety Component
Healthcare Personnel Component
Biovigilance Component
Device-associated Module
Procedure-associated Module
Medication-associated Module
Blood/body Fluid Exposure
HCW Influenza Immunization Module
Hemovigilance Module
MDRO/CDAD Module
Patient Influenza Immunization Module

Patient Safety Component Modules

Device-associated	•CLABSI •CAUTI •DE •VAP •CLIP
Procedure-associated	• SSI • PPP
Medication-associated	• AUR
MDRO/CDAD	•MDRO/CDAD Infection •Lab ID •Processes
Patient Influenza Immunization	•Method A •Method B

NHSN Protocol and Data Collection Form



The National Healthcare Safety Network (NHSN) Manual

PATIENT SAFETY CO

PROTOCOL

Division of Healthcare Quality

National Center for Preparedness, Detec

Infectious Diseas

Atlanta, GA, USA

March, 2009

Central Line-Associated Bloodstream Infection (CLABSI) Event

March, 2009

Primary Bloodstream Infection (BSI)

Prevention Strategies: Core

- Removing unnecessary CL
- Following proper insertion practices
- Facilitating proper insertion practices*
- Complying with hand hygiene recommendations
- Adequate skin antisepsis
- Choosing proper CL insertion sites
- Performing adequate hub/access port disinfection
- Providing education on CL maintenance and insertion

* Not part of 2002 HICPAC Guidelines for the Prevention of Intravascular Catheter-Related Infections

Summary of Prevention Strategies*

Core Measures

- Removing unnecessary CL
- Following proper insertion practices
- Facilitating proper insertion practices*
- Complying with hand hygiene recommendations
- Performing adequate skin cleaning
- Choosing proper CL insertion sites
- Performing adequate hub/access port cleaning
- Providing education on CL maintenance and insertion

Supplemental Measures

- Implementing chlorhexidine bathing*
- Using antimicrobial-impregnated catheters
- Applying chlorhexidine site dressings*

* Not part of 2002 HICPAC Guidelines for the Prevention of Intravascular Catheter-Related Infections

Measurement: Process Measures

- Process measures can help determine if interventions are being fully implemented
  - Ensuring interventions are being performed is itself a “core” intervention
- Potentially important process measures to consider are:
  - Hand hygiene adherence
  - Proportion of patients with CLs, and/or duration of CL use
  - Proportion of CL insertions in which maximal barrier precautions were used
- Consider using NHSN Central Line Insertion Practices (CLIP) option

Measurement: Outcome
Calculating CLABSI Rates

$$\text{CLABSI Rate}^{*} = \frac{\text{\# CLABSIs identified}}{\text{\# central line-days}} \times 1000$$

* Stratify by:

- Type of ICU/Other Location
- For special care areas
  - Catheter type (temporary or permanent)
- For neonatal intensive care units
  - Birthweight category
  - Catheter type (umbilical or central)

Measurement: Outcome
Device Utilization (DU) Ratio

$$\text{CL DU Ratio} = \frac{\text{\# central line-days}}{\text{\# patient-days}}$$

DU Ratio measures the proportion of total patient-days in which central lines were used.

Measurement: Process CLIP Adherence Rates

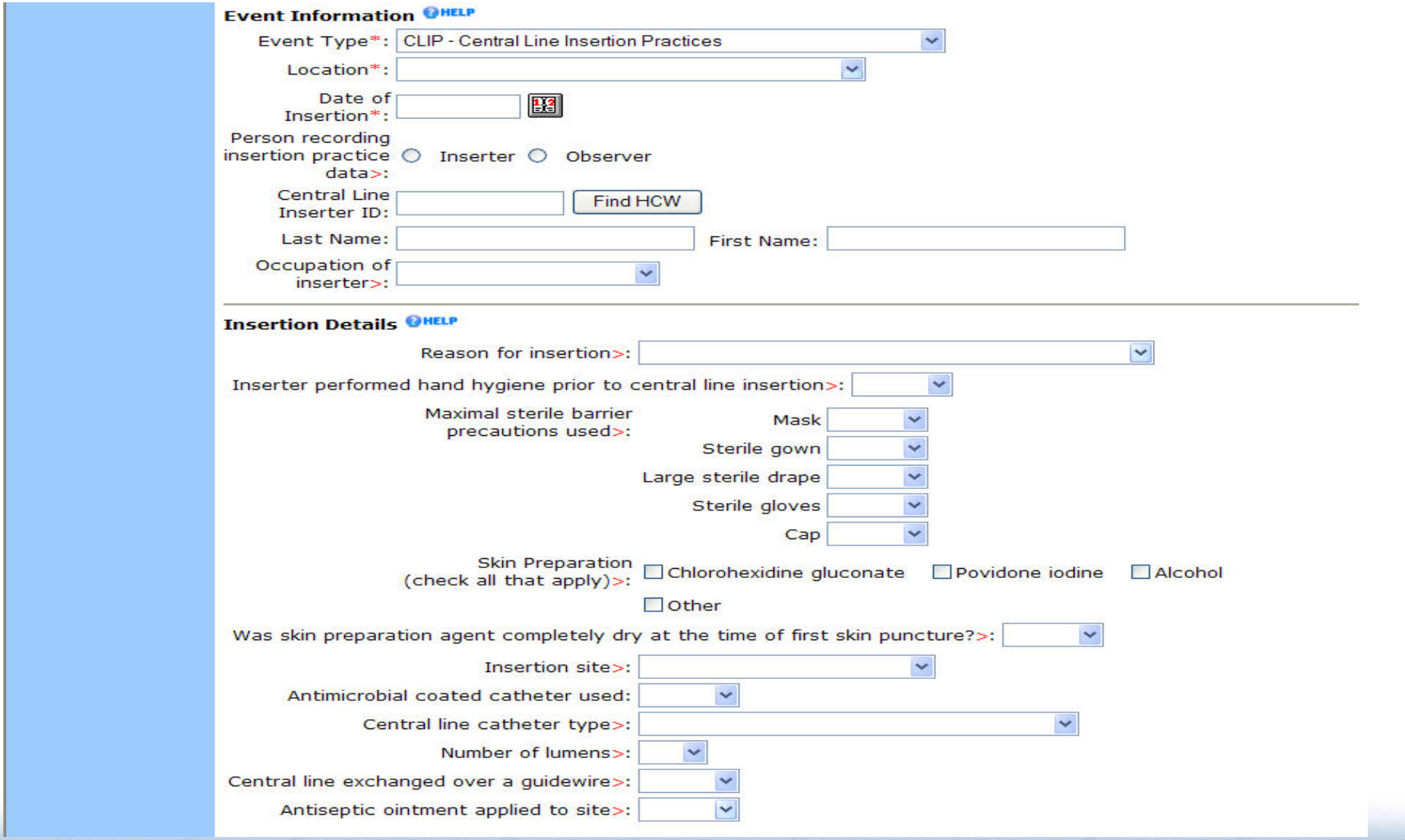
- **Using NHSN, adherence rates can be calculated for:**
  - Hand hygiene
  - Barrier precautions used including masks, sterile drape, gowns and sterile gloves
  - Skin preparation including type of agent and whether agent was allowed to dry
- **Other measures collected in the NHSN CLIP option that can be summarized include:**
  - CL type, location, and number of lumens
  - Antiseptic ointment applied to site

Measurement: Process
Calculating CLIP Adherence Rates

$$\text{Hand Hygiene Adherence Rate} = \frac{\text{\# hand hygiene performed for CL insertion}}{\text{\# CL insertions records completed}}$$

Adherence rates can also be measured for each of the barrier and prevention practices by using the number of CLIP records completed as the denominator.

Tools for Implementation
NHSN CLIP Option: Insertion Practices



Event Information HELP

Event Type*: CLIP - Central Line Insertion Practices

Location*:

Date of Insertion*:

Person recording insertion practice data>: Inserter Observer

Central Line Inserter ID: Find HCW

Last Name: First Name:

Occupation of inserter>:

Insertion Details HELP

Reason for insertion>:

Inserter performed hand hygiene prior to central line insertion>:

Maximal sterile barrier precautions used>:
- Mask
- Sterile gown
- Large sterile drape
- Sterile gloves
- Cap

Skin Preparation (check all that apply)>: Chlorohexidine gluconate Povidone iodine Alcohol Other

Was skin preparation agent completely dry at the time of first skin puncture?>:

Insertion site>:

Antimicrobial coated catheter used:

Central line catheter type>:

Number of lumens>:

Central line exchanged over a guidewire>:

Antiseptic ointment applied to site>:

Checklist For Clinicians

Follow proper insertion practices

1. Perform hand hygiene before insertion.
2. Adhere to aseptic technique.
3. Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full body drape).
4. Choose the best insertion site to minimize infections and noninfectious complications based on individual patient characteristics.
5. Prepare the insertion site with >0.5% chlorhexidine with alcohol.

Checklist For Clinicians

Follow proper insertion practices

6. Place a sterile gauze dressing or a sterile, transparent, semipermeable dressing over the insertion site.

7. For patients ≥18 years of age, use a chlorhexidine-impregnated dressing with an FDA-cleared label that specifies a clinical indication for reducing CLA-BSI for short term non-tunneled catheters unless the facility is demonstrating success at preventing CLA-BSI with baseline prevention practices.

Checklist For Clinicians

Handle and maintain central lines appropriately

1. Comply with hand hygiene requirements.
2. Bathe ICU patients >2 months of age with a chlorhexidine preparation on a daily basis.
3. Scrub the access port or hub with friction immediately before each use with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol).
4. Use only sterile devices to access catheters.
5. Immediately replace wet, soiled, or dislodged dressings.
6. Perform routine dressing changes using aseptic technique with clean or sterile gloves.

Checklist For Clinicians

Handle and maintain central lines appropriately

7. Change gauze dressings at least every two days or semipermeable dressings at least every seven days.
8. For patients ≥18 years of age, use a CHG-impregnated dressing with an FDA-cleared label specifying a clinical indication for reducing CLA-BSI for short-term non-tunneled catheters unless the facility is demonstrating success at preventing CLA-BSI with baseline prevention practices.
9. Change administrations sets for continuous infusions no more frequently than every 4 days, but at least every 7 days.

- If blood or blood products or fat emulsions are administered change tubing every 24 hours.
- If propofol is administered, change tubing every 6-12 hours or when the vial is changed.

For Healthcare Organizations:

1. Educate healthcare personnel about indications for central lines, proper procedures for insertion and maintenance, and appropriate infection prevention measures.
2. Designate personnel who demonstrate competency for the insertion and maintenance of central lines.
3. Periodically assess knowledge of and adherence to guidelines for all personnel involved in the insertion and maintenance of central lines.
4. Provide a checklist to clinicians to ensure adherence to aseptic insertion practices.

For Healthcare Organizations:

5. Re-educate personnel at regular intervals about central line insertion, handling and maintenance, and whenever related policies, procedures, supplies, or equipment changes.
6. Empower staff to stop non-emergent insertion if proper procedures are not followed.
7. Ensure efficient access to supplies for central line insertion and maintenance (i.e. create a bundle with all needed supplies).
8. Use hospital-specific or collaborative-based performance measures to ensure compliance with recommended practices.

Supplemental strategies for consideration:

1. Antimicrobial/antiseptic-impregnated catheters.

2. Antiseptic impregnated caps for access ports.

CDC NHSN CLA-BSI Reporting Requirements

- In addition to ICUs, report CLA-BSI from all patient care locations which are mapped as adult and pediatric wards:
  - Medical
  - Surgical
  - Medical/surgical

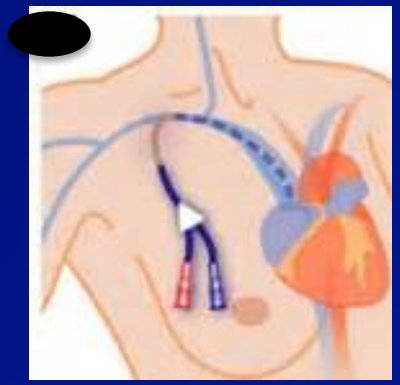
http://www.cdc.gov/nhsn/PDFs/Newsletters/vol9-3-eNL-Sept-2014.pdf

BSI Key Terms

- **Date of Event-** the date when the first element used to meet the NHSN site-specific infection criterion occurs for the first time in the Infection Window Period.
- **Infection Window Period**- 7-day period in which all infection criterion must be met. It includes the date of the first positive diagnostic test.
- **POA**- date of event occurs on the day of admission or day after admission. POA period continues to include day of admission, 2 days before and the day after admission
- **HAI**- date of event occurs on or after the 3rd of admission
- **RIT**- 14-day timeframe during which no new infections of the same type are reported

BSI Key Terms (cont'd)

•**Central Lines-** intravascular catheter that terminates at or close to the heart or in one of the GREAT VESSELS which is used for infusion, blood withdrawal or hemodynamic monitoring.



http://www.bing.com/images/search?q=cdc+images+of+central+lines&id=16DAB993866C6BC32CDA6BCC95A25F4CFC6D24A6&FORM=IQFRBA&adlt=strict

–Great Vessels

- Aorta
- Pulmonary arteries
- Superior vena cava
- Inferior vena cava
- Brachiocephalic veins
- Internal jugular veins
- Subclavian veins
- External iliac veins
- Common iliac veins
- Femoral veins
- Umbilical artery and veins in neonates

Infusions

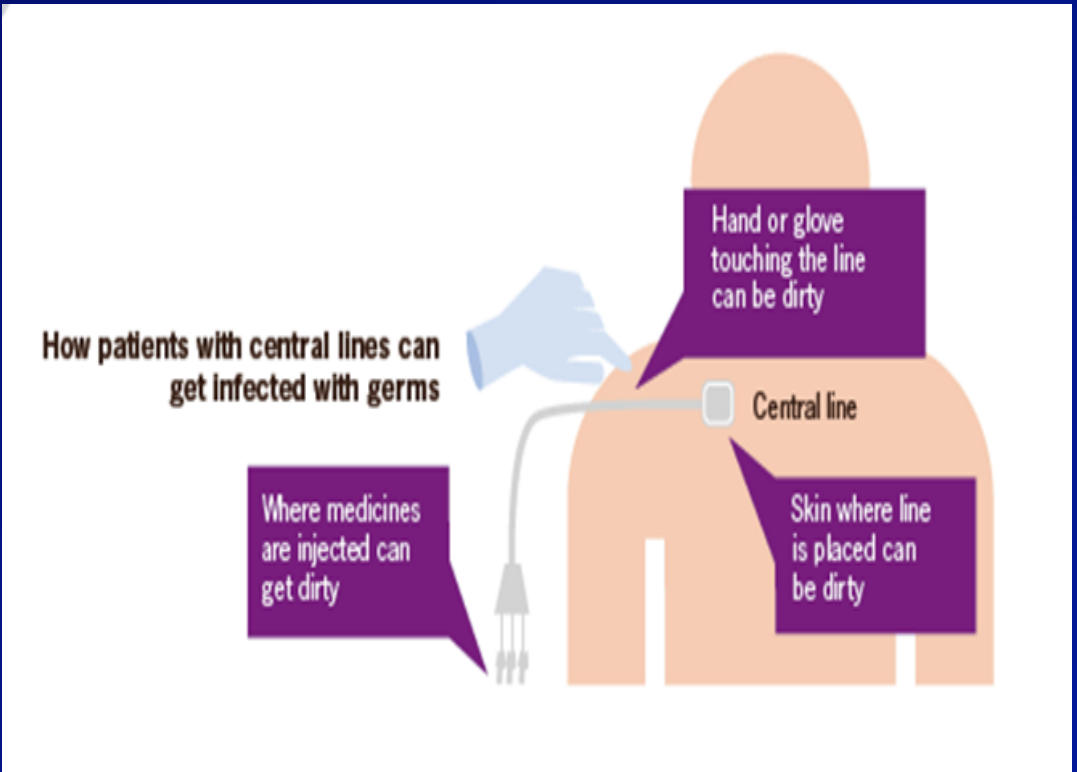
- Introduction of a solution through a catheter lumen into a blood vessel

Includes:

- Continuous infusions such as nutritious fluids or medications.
- Intermittent infusions such as flushed or IV antimicrobial administration.
- Administration of blood or blood products in the case of transfusion or hemodialysis.

Types of Central Lines

- Temporary Central Lines
- A non-tunneled, non-implanted catheter

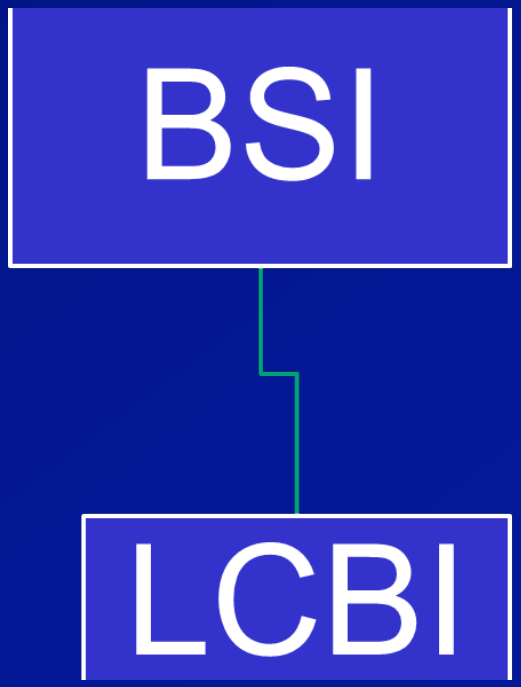


- Permanent Central Lines
- Tunneled catheters, including certain dialysis catheters
- Implanted catheters (including ports)

Central Line-associated Bloodstream Infection (CLA-BSI)

CLA-BSI surveillance utilizes the Major Event Type: BSI

Specific Event Type: Laboratory Confirmed Bloodstream Infection (LCBI)



Central Line-Associated Bloodstream Infection (CLA-BSI)

- **Central line-associated BSI (CLA-BSI**): A laboratory-confirmed bloodstream infection (LCBI) where central line (CL) or umbilical catheter (UC) was in place for >2 calendar days on the date of event, with day of device placement being Day 1,
- **AND**
- A CL or UC was in place on the date of event or the day before. If a CL or UC was in place for >2 calendar days and then removed, the date of event of the LCBI must be the day of discontinuation or the next day.

Central Line-Associated Bloodstream Infection (CLABSI) cont'd

- If patient is admitted or transferred into a facility with an implanted central line (port) in place, and that is the patient's only central line, the day of first access in an inpatient location is considered Day 1.
- Access is defined as line placement, infusion or withdrawal through the line. Such lines continue to eligible for CLA-BSI once they are accessed until patient is discharged or line is discontinued.

Associating Central Line (CL) Use to BSI

Patient A is eligible for a CLA-BSI beginning on March 31, through April 6, since a CL was in place for some portion of each calendar day until April 6. A BSI with date of event on April 6 would be a CLA-BSI since the CL had been in place greater than 2 days and was removed the day before the date of event.

	March 31 (Hospital day 3)	April 1	April 2	April 3	April 4	April 5	April 6
Patient A	Central Line **Day 3**	Central Line **Day 4**	Central Line removed **(CL Day 5)**	Central Line replaced **(CL Day 6)**	Central Line **Day 7**	Central Line removed **Day 8**	No Central Line
Patient B	Central Line **Day 3**	Central Line **Day 4**	Central Line removed **(CL Day 5)**	No Central Line	Central Line replaced **(CL Day 1)**	CL **Day 2**	CL **Day 3**

Positive Blood Cultures

•One or more blood cultures means that at least one bottle from a blood draw is reported as having at least one organism

•Recognized pathogen does not include organisms considered as common commensals by NHSN,

- Bacillus spp., Corynebacterium, Staph epi or hominis, etc

Blood Culture Specimens

All blood culture specimens must be included in surveillance if participating in NHSN CLA-BSI surveillance:

Venipuncture

Vascular catheter

Cannot be considered a contaminant unless a single unmatched common commensal is reported.

"Sameness" of Common Commensals

- Assume that the organisms are the same if the organism from one culture is identified to both genus and species and the companion culture is identified to only the genus.
- Antibiograms are not used to determine "sameness".
- Always report the most resistant organism.

Culture Report	Companion Culture Report	Report as…
Coagulase-positive staphylococci	*S. aureus*	*S. aureus*
S. epidermidis	Coagulase-negative staphylococci	*S. epidermidis*
Enterococcus spp.	*E. faecium*	*E. faecium*
Bacillus spp. (not *anthracis*)	*B. cereus*	*B. cereus*
S. salivarius	Strep viridans	*S. salivarius*

Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infections (MBI-LCBI)

- Subset of LCBI criteria
- Must meet LCBI 1, 2 or 3 prior to applying the MBI-LCBI criteria
- If an MBI-LCBI is reported, and a subsequent BC occurs during the RIT of the MBI-LCBI with an organism that is excluded from the MBI criteria, the primary MBI-LCBI event is edited to become an LCBI and the organism is added to the event
- A single common commensal does not exclude from meeting MBI-LCBI criteria.
- List of Eligible Enterobacteriaceae is available on the NHSN website
- MCI-LCBI was removed from the **2016 CLA-BSI metrics**

"…and organism cultured from blood is not related to an infection at another site…"

- BSI that is associated with an infection at another site is referred to as a Secondary BSI and is never reported into NHSN.
- CLA-BSI may not be secondary to an infection at another site, it is always a **primary BSI**
- Primary BSI is identified by ruling out all non-blood sites as the source of the BSI

Conclusions

1. The CDC's NHSN is an excellent model for HAI surveillance throughout the world.
2. However, even this system does not collect data on many confounding variables that can influence HAI rates.
3. As we progress in our efforts to eliminate HAIs, more robust data that facilitates risk adjustment needs to be collected in our HAI surveillance systems.
4. This will make our HAI surveillance systems more scientific!