Understanding NHSN-CDC Definitions for Central Venous Catheter (CVC) – ASSOCIATED Bloodstream Infection (BSI): De-mystifying the “Tower of Babel”

KEYSTONE: ICU Workshop #5, Learning Intensive – Track C
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Process or Outcome Measures?

• Processes of Care:
  – Insertion technique for CVCs
  – Elevating head of bed of patients on mechanical ventilators
  – Adherence with hand hygiene by personnel
  – Proportion of personnel accepting influenza vaccine
  – Proportion of patients with appropriate preoperative hair removal


• Outcome Measures:
  – CVC-assoc. BSI
  – Ventilator associated pneumonia (VAP)
  – Cross transmission of multidrug resistant organisms (MDROs)
  – HA-influenza
  – Surgical site infection (SSI)
Central Line Definition

• Definition
  A vascular infusion device that terminates at or close to the heart or in one of the great vessels

– Great Vessels:
  • Aorta
  • Superior vena cava
  • Inferior vena cava
  • Brachiocephalic vein
  • Internal jugular vein
  • Subclavian vein
  • Pulmonary artery
  • External iliac vein
  • Common femoral vein

CLARIFICATION POINTS ON CENTRAL LINE DEFINITION

• NOTE: In neonates, the umbilical artery/vein is considered a great vessel

• NOTE: Neither the location of the insertion site nor the type of device may be used to determine if a line qualifies as a central line. The device must terminate in one of these vessels or in or near the heart to qualify it as a central line.

• NOTE: Pacemaker wires and other non-infusion devices inserted into central blood vessels or the heart are not considered central lines.
Central Line Days

- For each day of the month, at the same time each day, record the number of patients who have one or more central lines
- Central line days are collected differently for
  - ICU and other locations
  - SCA (specialty care area)
  - NICU
- Enter the total number of central line days into the NHSN application

Central Venous Catheter (CVC) – associated or related BSI rates?

Central Line Associated BSI*
[CLA-BSI; surveillance]
- Vascular access device that terminates at or close to the heart or one of the great vessels.
- BSI is considered to be associated with a central line if the line was in use during the 48-hour period before development of the BSI
- Does not require culture from the CVC device
- ALL KEYSTONE PARTICIPANTS - USE CVC-Associated BSI Rate; Your Assignment: verify this with your facility’s ICP

Central Line-Related BSI* [CR-BSI; clinical/research]
- Positive semiquantitative (>15 CFU/catheter segment) or quantitative (>10^3 CFU/catheter segment catheter) culture
- Same microorganism (species + antibiotic susceptibility profile) is isolated from the catheter segment AND peripheral blood; or simultaneous quantitative blood cultures with a >5:1 ratio CVC versus peripheral; or differential period of CVC culture versus peripheral blood culture positivity of >2 hours aka time to positivity

NHSN-CDC Site Definitions: Laboratory Confirmed BSI (LCBI)*
Any patient

Patient has a recognized pathogen cultured from one or more blood cultures and organism cultured from blood is not related to an infection at another site.

Note: LCBI is the CDC-NHSN term for this site it is the numerator for CLA-BSI rate

or

Laboratory Confirmed BSI (LCBI)*
Any Patient

Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension and signs and symptoms and positive laboratory results are not related to an infection at another site and at least one of the following:

• common skin contaminant (e.g., diphtheroids, Bacillus sp., Propionibacterium sp., coagulase-negative staphylococci, or micrococci) is cultured from two or more blood cultures drawn on separate occasions
• common skin contaminant) is cultured from at least one blood culture from a patient with an intravascular line, and the physician institutes appropriate antimicrobial therapy
• positive antigen test on blood (e.g., H. influenzae, S. pneumoniae, N. meningitidis, or Group B Streptococcus).
Clinical Sepsis (CSEP)  
Neonate/Infants - ONLY  

- Alternate criteria for BSI in neonates and infants in nurseries  
  - Well Baby Nursery (Level I)  
  - Level II Nursery  
  - Level II/III Nursery  
  - Level III Nursery  

- Not used for adults or children  
  - LCBI only choice

CVC-BSI Rate: Numerator & Denominator  

Numerator = # CLA-BSIs in a specific ICU in a month  
Denominator = # CVC days in the specific ICU for that same month

CVC-BSI Rate:  
Numerator of CVC-BSI / Total Number of CVC Days X 1,000  
Sample benchmark data, NNIS [CDC. AJIC 2004;32:470-85]

<table>
<thead>
<tr>
<th>Type of ICU</th>
<th>No. of cases</th>
<th>CVC days</th>
<th>CVC-BSIs</th>
<th>10th</th>
<th>25th</th>
<th>Median</th>
<th>75th</th>
<th>90th</th>
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<td>Cardiovascular 46</td>
<td>182,407</td>
<td>1.7</td>
<td>0.0</td>
<td>0.9</td>
<td>1.8</td>
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<td>Medical 99</td>
<td>314,478</td>
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<td>0.3</td>
<td>2.4</td>
<td>3.9</td>
<td>69</td>
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<td>Pediatric 54</td>
<td>144,316</td>
<td>4.4</td>
<td>0.9</td>
<td>3.0</td>
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<td>Surgical 99</td>
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<td>Trauma 33</td>
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<td>Respiratory 6</td>
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</table>
Potential sources of infection for intravascular devices

Clin Infect Dis 2002;34:1232-42

Snapshots of Success: The Power of the NNIS Network

- Decreases in CVC-BSI Rates Seen in All ICUs, 1990-1999.

Bloodstream infection rate = number of central venous catheter-associated BSIs/ per 1,000 central venous catheter days


• 4 interventions to reduce central venous catheter (CVC)-related infection implemented:
  – **Intervention** | **Rate/1000 CVC days**
  – Baseline | 15.0
  – Education program | 6.4
  – Silver platinum caths. | 3.3
  – Max. sterile barriers | 4.2
  – 2% CHG skin antiseptic | 1.6

• Annual cost avoidance = $ 2.5 - 4 million

Garcia R. APIC 2002 (abstr # 152), 5/20/2002

More Evidence of the Power of CVC-BSI Prevention

• Prospective cohort study, SICU & concurrent control ICU
• Bundled CVC-BSI Prevention Interventions in SICU
• CVC-BSI Decreased from 11.3 to 0.0/1,000 CVC days in SICU; control ICU 5.7 to 1.6
• Estimated 42 CVC-BSIs avoided; savings of > $1.9 million

Evidence In Action: Regional Infection Prevention Network & CVC-BSI

• Collaborative between ICUs in PA Hospitals & CDC
• 60 Hospitals
• 68% Pooled mean decrease over course of Pittsburgh Regional Healthcare Initiative (PRHI)

CDC. MMWR 2005;54(40):1013-16

Infection Prevention and Control
Evidence-based recommendations available on how to prevent:

1. Central venous catheter-related infection
2. Catheter-related urinary tract infection
3. Ventilator-associated pneumonia
4. Surgical site infection
5. Cross transmission of multi-drug resistant organisms between hospitalized patients
New Developments on the Horizon for Surveillance in the 21st Century

National Nosocomial Infections Surveillance (NNIS) System