



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)

See also: Baker OG. AJIC
1997;25:96-101.

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** #[CR-BSI; clinical/research]

- Positive semiquantitative (>15 CFU/catheter segment) or quantitative (>10³ 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 $\geq 5:1$ 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:

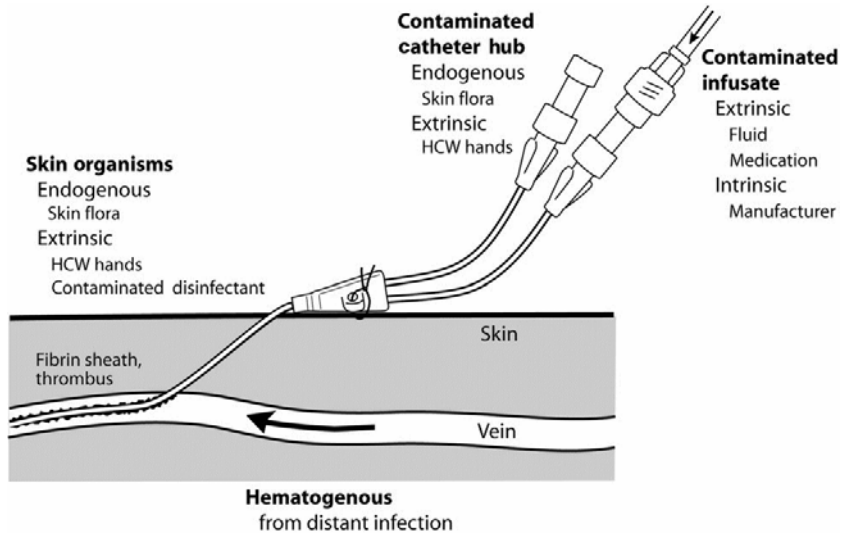
Numerator of CVC-BSI / Total Number of CVC Days X 1,000

Sample benchmark data, NNIS [CDC. AJIC 2004;32:470-85]

Type of ICU	No. of units	Central line-associated BSI rate [†]			Percentile			
		Central line-days	Pooled mean	10%	25%	50% (median)	75%	90%
Coronary	60	116,546	3.5	1.0	1.5	3.2	7.0	9.0
Cardiothoracic	48	182,407	2.7	0.0	0.9	1.8	2.7	4.9
Medical	94	312,478	5.0	0.5	2.4	3.9	6.4	8.8
Medical-surgical								
Major teaching	100	430,979	4.0	1.7	2.6	3.4	5.1	7.6
All others	109	486,115	3.2	0.8	1.6	3.1	4.3	6.1
Neurosurgical	30	56,645	4.6	0.0	0.9	3.1	5.8	10.6
Pediatric	54	161,314	6.6	0.9	3.0	5.2	8.1	11.2
Surgical	99	358,578	4.6	0.0	2.0	3.4	5.9	8.7
Trauma	22	70,372	7.4	1.9	3.3	5.2	8.2	11.9
Burn	14	43,002	7.0	—	—	—	—	—
Respiratory	6	12,593	4.8	—	—	—	—	—

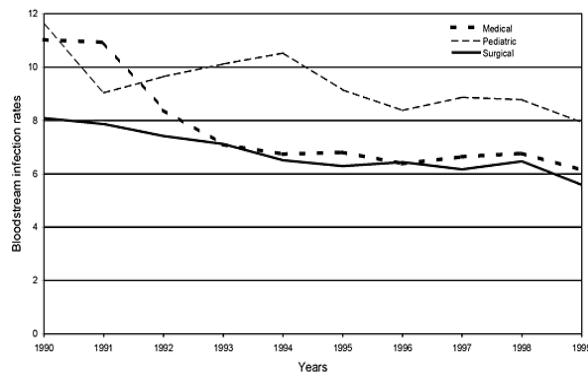
Potential sources of infection for intravascular devices

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



Gaynes R. EID 2001; 7:295-8.

Interventions to Reduce CVC-Associated Bloodstream Infections, 1999-2003, Brookdale Univ. Med. Ctr, NY

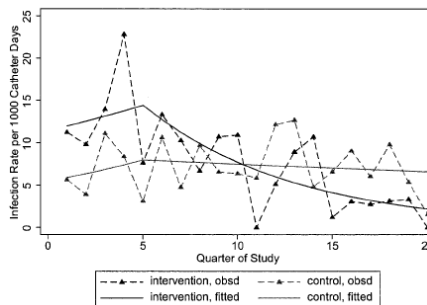
- 4 interventions to reduce central venous catheter (CVC)-related infection implemented:

<u>Intervention</u>	<u>Rate/1000 CVC days</u>
– 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

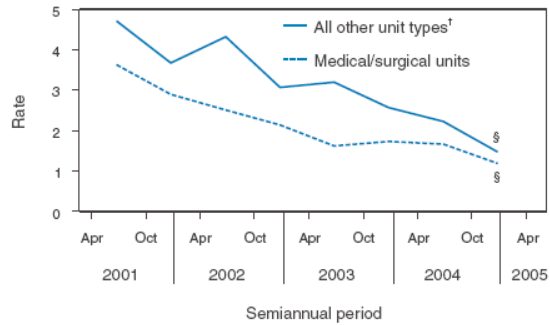


Berenholtz SM. Crit Care Med
2004;32:2014-20.

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)

FIGURE. Central line–associated bloodstream infection rate* in 66 intensive care units (ICUs), by ICU type and semiannual period — southwestern Pennsylvania, April 2001–March 2005



* Pooled mean rate per 1,000 central line days.

† Includes cardiothoracic, coronary, surgical, neurosurgical, trauma, medical, burn, and pediatric ICUs.

§ p<0.001.

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

Device-assoc.

New Developments on the Horizon for Surveillance in the 21st Century



National Nosocomial Infections Surveillance (NNIS) System