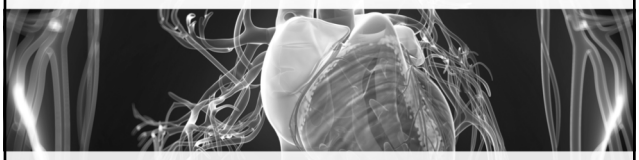
MAYO CLINIC

CLABSI Prevention – It's Not Just for Intensivists



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Disclosures

- Nothing to disclose

Objectives

- Recognize aspects and terminology of Central Line Associated Blood Stream Infections (CLABSI) reporting
- Understand implications of CLABSIs to an institution
- Identify perioperative strategies that could impact an institution's CLABSI rate

Overview

- 1 of 14 Hospital Acquired Conditions
- 30,000 to 34,000 (2016)
- Publically Reported Data
  - CDC – National Health Safety Network (NHSN)
  - CMS
  - The Leapfrog Group

Definitions

- Primary blood stream infection (BSI)
  - Laboratory Confirmed Bloodstream Infection (LCBI) that is ***NOT*** secondary to an infection at another site
  - Mucosal Barrier Injury – LCBI
    - Stem Cell transplantation
- Secondary BSI
  - A BSI seeded from another site-specific infection

Definitions

- Secondary BSI Attribution Period
  - Time period where the blood ***MUST*** be collected
  - 14 to 17 days
  - Infection Window Period (IWP)
  - Repeat Infection Timeframe (RIT)

Definitions

- Location of Attribution (LOA)
  - Inpatient location assigned to the patient on the date of the event
- Central Lines
  - Tunneled catheters
  - Implanted catheters (port)
  - Temporary catheters (PICC)
  - Umbilical catheters

Devices Not Considered Central Lines

- Arterial catheters
- Arteriovenous fistula
- Arteriovenous graft
- Atrial catheters
- Extracorporeal membrane oxygenation (ECMO)
- Hemodialysis reliable outflow (HERO) dialysis catheter
- Intra-aortic balloon pump (IABP) devices
- Non-accessed central line (not accessed nor inserted during the hospitalization)
- Peripheral IV or Midlines
- Ventricular Assist Device (VAD)

Definitions

- CDC NHSN CLABSI Definition
  - Laboratory confirmed blood stream infection (LCBI)
  - Eligible BSI organism
  - Eligible central line
  - Day of event (DOE) or day before (24hrs)

Definitions

- Catheter-related bloodstream infection (CRBSI)
  - BSI is attributed to the catheter by culture of the tip
  - Time to Differential Positivity - >120 minutes
  - ***Reporting agencies do not care!***

Ann Intern Med. 2004;140(1):18-25

Reported Data

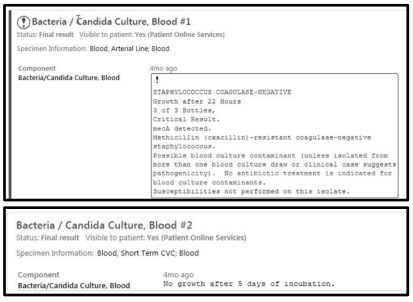
- Standardized Infection Ratio (SIR)
  - Observed HAIs / Predicted HAIs
- Predicted HAI
  - National aggregate data for HAI
  - Logistic Regression Model – SSI
  - Negative Binomial Regression Model – CLABSI, VAE, etc.

McStuffinsville Hospital

Year/Quarter	Central Line Days	Number of Infections	Number of Expected Infections	SIR
2017Q1	1561	3	2.185	1.373
2017Q2	1671	5	2.339	2.137
2017Q3	1590	4	2.370	1.687
2017Q4	1715	3	2.230	1.345
2017 YTD	6537	15	9.124	1.64

Case

- 71 y/o male s/p CABG x 2, AVR, and MVR
  - Cardiogenic shock after separation from bypass
  - Extubated POD #2
  - IABP removed on POD #3
  - POD# 5
    - Spikes fever to 38.6°
    - Leukocytosis 12.2 (8.6)
    - Low MAP
      - Norepinephrine
    - Cultures & antibiotics



Bacteria / Candida Culture, Blood #1

Status: **Final result** Visible to patient: **Yes (Patient Online Services)**

Specimen Information: **Blood, Arterial Line; Blood**

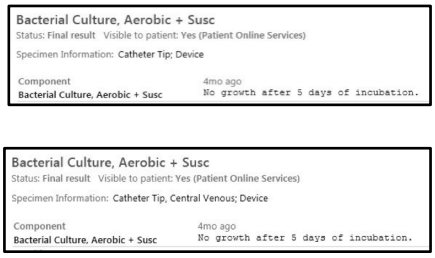
Component	4mo ago
Bacteria/Candida Culture, Blood	! STAPHYLOCOCCUS COAGULASE-NEGATIVE Growth after 22 Hours 1 of 3 Bottles, Critical Result. mecA detected. Methicillin (oxacillin)-resistant coagulase-negative staphylococcus. Possible blood culture contaminant (unless isolated from more than one blood culture draw or clinical case suggests pathogenicity). No antibiotic treatment is indicated for blood culture contaminants. Susceptibilities not performed on this isolate.

Bacteria / Candida Culture, Blood #2

Status: **Final result** Visible to patient: **Yes (Patient Online Services)**

Specimen Information: **Blood, Short Term CVC; Blood**

Component	4mo ago
Bacteria/Candida Culture, Blood	No growth after 5 days of incubation.



Bacterial Culture, Aerobic + Susc

Status: **Final result** Visible to patient: **Yes (Patient Online Services)**

Specimen Information: **Catheter Tip; Device**

Component	4mo ago
Bacterial Culture, Aerobic + Susc	No growth after 5 days of incubation.

Bacterial Culture, Aerobic + Susc

Status: **Final result** Visible to patient: **Yes (Patient Online Services)**

Specimen Information: **Catheter Tip, Central Venous; Device**

Component	4mo ago
Bacterial Culture, Aerobic + Susc	No growth after 5 days of incubation.

$45,254

Wait Just a Minute!

- Arterial lines ≠ central lines
- A primary BSI ***cannot*** be secondary to a BSI
- VASC – venous or arterial infection
  - Pus at the site ***plus*** matching organisms

Infectious risk associated with arterial catheters compared with central venous catheters*

Jean-Christophe Lucet, MD, PhD; Lila Bouadma, MD; Jean-Ralph Zahar, MD; Carole Schwebel, MD; Arnaud Geffroy, MD; Sebastian Pease, MD; Marie-Christine Herault, MD; Hakim Haouache, MD; Christophe Adrie, MD; Marie Thuong, MD; Adrien Français, RT; Maïté Garrouste-Orgeas, MD; Jean-François Timsit, MD, PhD

	Incidence per 1000 days colonization	Incidence per 1000 days CRI	
Arterial	11.4 (n=127)	0.99 (n=11)	*p*=0.8
STCVC	11.1 (n=183)	1.09 (n=18)	

Crit Care Med 2010 Vol. 38, No. 4

Arterial catheter-related bloodstream infection: incidence, pathogenesis, risk factors and prevention☆

N. Safdar [a,b,*], J.C. O'Horo [c], D.G. Maki [b]

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[b] Section of Infectious Diseases, Department of Medicine, University of Wisconsin Medical School, Madison, WI, USA
[c] Department of Pulmonary and Critical Care Medicine, Mayo Clinic, Rochester, MN, USA

Arterial Catheters	Patients	BSI Control	BSI Treatment	Colonization Control & Treatment
834	542	9	2	109

Journal of Hospital Infection 85 (2013) 189e195

Wait Just a Minute!

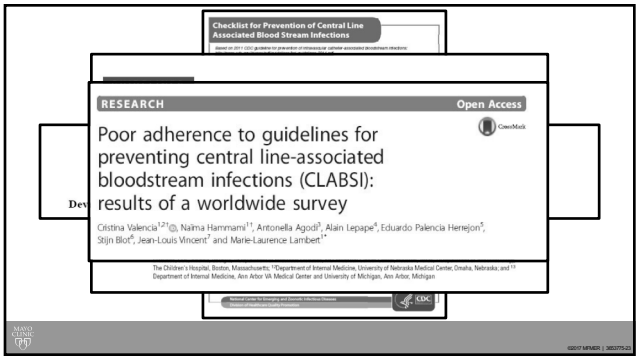
- Transfer Rule
- Exception to the LOA
- Date of event
  - Transfer
  - Discharge
  - Next day
- Infection attributed to the transferring/discharging location
- CLABSI ***cannot*** be attributed to a non-bedded location
  - Inpatient Dialysis
  - Operating Room
  - Vascular/Interventional Radiology
  - Cardiac Cath/EP Lab
  - GI/Endoscopy Suite

HAIs: When in Doubt, Blame Anesthesia. Could They Be Right?

by Ian Yuan, MD, and Jeffrey M. Feldman, MD, MSE

June 2016

Anesthsia Patient Safety Foundation 2016



Anesthesiology 2008; 109:399–407

Transmission of Pathogenic Bacterial Organisms in the Anesthesia Work Area

Randy W. Loftus, M.D., Matthew D. Koff, M.D.,† Corey C. Burchman, M.D.,‡ Joseph D. Schwartzman, M.D.,§ Valerie Thorum, M.T. (A.S.C.P.),‖ Megan E. Read, M.T. (A.S.C.P.),‖ Tammara A. Wood, M.T., (A.M.T.),‖ Michael L. Beach, M.D., Ph.D.#*

Anesthes. 2008;109(3):399-407. doi:10.1097/ALN.0b013e318182c855

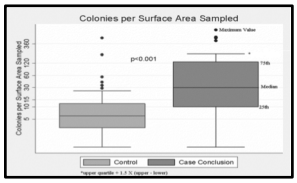


Fig. 2. Box plot illustrating increase in intraoperative contamination on the anesthesia machine as measured by colonies per surface area sampled. P < 0.001 for comparison of medians.

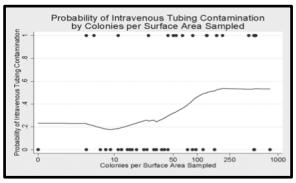
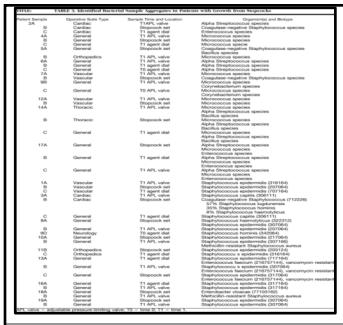


Fig. 3. Probability of obtaining bacterial growth in the stopcock as a function of the number of colonies per surface area sampled from the anesthesia machine.

Anesthes. 2008;109(3):399-407. doi:10.1097/ALN.0b013e318182c855



- *Staph* Epidermidis
- VRE
- *Enterobacter* chloacae

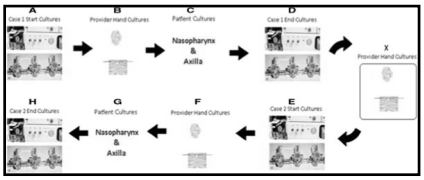
Anesthes. 2008;109(3):399-407. doi:10.1097/ALN.0b013e318182c855

Transmission Dynamics of Gram-Negative Bacterial Pathogens in the Anesthesia Work Area

Randy W. Loftus, MD,* Jeremiah R. Brown, MS, PhD,† Hetal M. Patel, BS,* Matthew D. Koff, MD, MS,* Jens T. Jensen, MS,* Sundara Reddy, MD,‡ Kathryn L. Ruoff, PhD,* Stephen O. Heard, MD,§ Thomas M. Dodds, MD,* Michael L. Beach, MD,* and Mark P. Yeager, MD*

- Identify and examine transmission of gram (-) bacteria
- Examine the link between transmission and 30 day HAIs

Anesthesia & Analgesia. 120(4):819-826, April 2015.



Organism	Hospital site	Patient culture source	Possible transmission links	PFGE confirmed link to culture	Temporal association of link	HCAI
Enterobacter aerogenes	1	Sputum	Attending physician hand	Yes	Provider to patient	Yes
Proteus mirabilis	0	Urine patient case 1	Patient nasopharynx 2nd case	Yes	Patient to patient	Yes
Serratia liquefaciens	0	Sputum	Patient nasopharynx 2nd case	Yes	Patient to self	Yes

HCAI = health care-associated infection; PFGE = pulsed-field gel electrophoresis.

ANESTHESIA & ANALGESIA

Anesthesia & Analgesia. 120(4):819-826, April 2015.

GUIDELINES

Guidelines for the Prevention of Intravascular Catheter-related Infections

Naomi P. O'Grady,[1] Mary Alexander,[2] Lillian A. Burns,[3] E. Patchen Dellinger,[4] Jeffrey Garland,[5] Stephen O. Heard,[6] Pamela A. Lipsett,[7] Henry Masur,[1] Leonard A. Mermel,[8] Michele L. Pearson,[9] Issam I. Raad,[10] Adrienne G. Randolph,[11] Mark E. Rupp,[12] Sanjay Saint,[13] and the Healthcare Infection Control Practices Advisory Committee (HICPAC) (Appendix 1)

[1]Critical Care Medicine Department, National Institutes of Health, Bethesda, Maryland; [2]Infusion Nurses Society, Norwood, Massachusetts; [3]Staten Island University Hospital, Staten Island, New York; [4]Department of Surgery, University of Washington, Seattle, Washington; [5]Department of Pediatrics, Wheaton Franciscan Healthcare-St. Joseph, Milwaukee, Wisconsin; [6]Department of Anesthesiology, University of Massachusetts Medical School, Worcester, Massachusetts; [7]Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland; [8]Division of Infectious Diseases, Warren Alpert Medical School of Brown University and Rhode Island Hospital, Providence, Rhode Island; [9]Office of Infectious Diseases, CDC, Atlanta, Georgia; [10]Department of Infectious Diseases, MD Anderson Cancer Center, Houston, Texas; [11]Department of Anesthesiology, The Children's Hospital, Boston, Massachusetts; [12]Department of Internal Medicine, University of Nebraska Medical Center, Omaha, Nebraska; and [13] Department of Internal Medicine, Ann Arbor VA Medical Center and University of Michigan, Ann Arbor, Michigan

CID 2011:52 (1 May)

IV Access Points

- Closed systems
  - Pressure transducers
  - Medication administration
  - IV infusions

- Needless connections
  - Spilt septum
  - Mechanical Valve

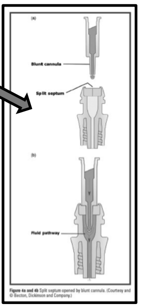


Figure 4a and 4b Split septum opened by blunt cannula. (Courtesy and © Becton, Dickinson and Company.)

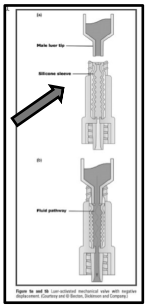


Figure 5a and 5b Luer-activated mechanical valve with negative displacement. (Courtesy and © Becton, Dickinson and Company.)

Journal of Infusion Nursing, 33: 2010
CID 2011:52 (1 May)

Health Care–Associated Bloodstream Infections Associated with Negative- or Positive-Pressure or Displacement Mechanical Valve Needleless Connectors

William R. Jarvis,[1] Cathryn Murphy,[3] Keri K. Hall,[3] Pamela J. Fogle,[2] Tobi B. Karchmer,[4,*] Glenys Harrington,[7] Cassandra Salgado,[2] Eve T. Giannetta,[3] Carol Cameron,[6] and Robert J. Sherertz[4]

Table 3. Participating Hospital Bloodstream Infection (BSI) Rates during Split Septum (SS) and Mechanical Valve (MV) Needleless Device Use Period.

Hospital, unit/ward	SS BSI rate[a]	MV BSI rate	Relative risk (95%CI)	P	Post-MV-BSI rate	Relative risk (95%CI)	P
A: Adult ICUs (n = 4)	8.47	9.84	1.16 (0.94–1.44)	.16	6.10	1.61 (1.18–2.22)	.003
B: Adult ICUs (n = 6)	3.09	8.82	2.85 (2.15–3.65)	<.001	5.29	1.67 (1.12–2.48)	.008
C							
Adult wards	2.48	3.41	1.38 (0.98–1.93)	.05	2.29	1.49 (1.04–2.11)	.02
Adult ICUs (n = 4)	3.15	3.47	1.10 (0.67–1.46)	.67	2.89	1.20 (.74–1.95)	.43
D							
Adult ICU	0	4.30	NC (0.03–999)	.60			
Adult oncology ward	2.70	6.20	2.30 (2.09–2.71)	.04			
E: Adult ICU	6.80	11.8	1.79 (1.24–2.56)	.001			
A–E: Adult ICUs (n = 16)	6.15	9.49	1.54 (1.37–1.74)	<.001	5.77[b]	1.65 (1.38–1.96)	<.001

NOTE. CI, confidence interval; ICU, intensive care unit; NC, not calculated.
[a] Rates are based on health care–associated BSIs per 1000 central venous catheter–days for all except hospital C, which used 1000 patient-days for the adult ward health care–associated BSI rate that includes the entire hospital.
[b] Includes 3 hospitals with 14 adult ICUs. Post-MV rate includes the health care–associated BSI rate only in facilities changing from MV needleless connectors to SS needleless connectors.

CID 2009:49 (15 December)

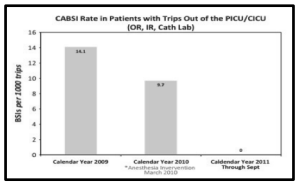
Pediatric Anesthesia

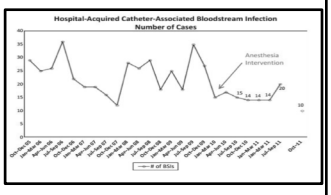
ORIGINAL ARTICLE

Modification of anesthesia practice reduces catheter-associated bloodstream infections: a quality improvement initiative

- Seattle Children's Hospital
- 7 days post procedure
- AWE contamination of access points
- Airway management
- Peripheral IV insertion
- Medication administration
  - Scrub hub
  - Manifold
- "Clean" and "Dirty" zones

Pediatric Anesthesia 23 (2013) 588–596





Pediatric Anesthesia 23 (2013) 588–596

Take Home Points

- CLABSI ≠ CRBSI
- Beyond the bundle
  - Arterial catheters
  - IV access points
  - Closed systems

MAYO CLINIC

Patch.Richard@mayo.edu

Chlorhexidine-Impregnated Sponges and Less Frequent Dressing Changes for Prevention of Catheter-Related Infections in Critically Ill Adults

A Randomized Controlled Trial

JAMA, March 25, 2009—Vol 301, No. 12

60%

Randomized C... led ...rial ...f C...h...xidine Dressing and Highly Ad...sive ...r...sing ...or Prev...t... Catheter-relat... Inf...ti...s i... Critica... I... A...lts

Jean-François Timsit[1,2], Olivier M... ...no Mour... ...ertrand Souw...e[5], Mai... ...uste-Orgeas[6], Serge Alfandari[7], Gaétan Plantefeve[8], Régis Bronchard[9], Gilles Troche[10], ...my Gauzit[11], Marion Antona[12], Emmanuel Canet[13], Julien Bohe[14], Alain Lepape[14], Aurélien Vesin[1], Xavier Arrault[15], Carole Schwebel[2], Christophe Adrie[16], Jean-Ralph Zahar[17], Stéphane Ruckly[1], Caroline Tournegros[2], and Jean-Christophe Lucet[18]

Incidence of central venous catheter hub contamination

Julie L. Holroyd [a,1], Terrie Vasilopoulos [b,1], Mark J. Rice [c], Kenneth H. Rand [d], Brenda G. Fahy [e,*]

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[b] Department of Anesthesiology and Orthopedics and Rehabilitation, University of Florida College of Medicine, Gainesville, FL, USA
[c] Department of Anesthesiology, Vanderbilt University School of Medicine, Nashville, TN, USA
[d] Department of Pathology, Immunology and Laboratory Medicine, University of Florida, Gainesville, FL, USA
[e] Department of Anesthesiology, University of Florida College of Medicine, Gainesville, FL, USA

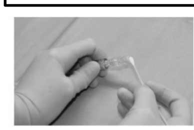
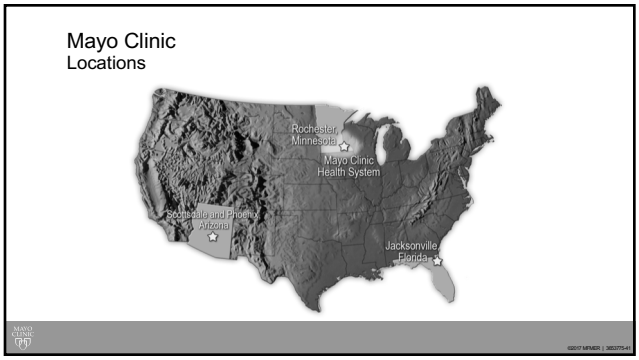


Fig. 1. Culturing of outside surface of needleless connector hub with cotton-tipped applicator.

Fig. 3. Manifold connector showing a single lumen device with multiple ports that allow several infusions to be administered through the same lumen of the catheter.

Journal of Critical Care 39 (2017) 162–168


BIOPATCH
Protective Disk with CHG
AEGIS
CHG IMPREGNATED
FOAM DISC
1.9 CM (¾ IN)
1.5 MM HOLE
10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Jacksonville
Florida