

Central Venous Catheter Infections: The Link Between Practice and Infection Rates

Nursing Grand Rounds
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Objectives

At the end of this presentation you will be able to:

- Define Central Line Associated Blood Stream Infection (CLABSI) based on NHSN/CDC guidelines.
- Explain the clinical significance of a CLABSI and how it impacts patient outcomes.
- Identify the RN role in preventing CLABSIs.
- Identify and apply certain nursing interventions that will help prevent CLABSIs.

Joint Commission National Patient Safety Goals 2009

- Consists of 8 Hospital Applicable Goals
 - Goal 1: Improve the accuracy of patient identification
 - Goal 2: Improve the effectiveness of communication among caregivers
 - Goal 3: Improve safety of using medications
 - Goal 7: Reduce the risk of health care-associated infections
 - Goal 8: Accurately and completely reconcile medications across the continuum
 - Infection Rate Data and outcomes
 - Compliance with IHI CVC Bundle
 - Goal 9: reduce the risk of patient falls resulting from falls
 - Elements
 - Goal 14: Prevent health care-associated pressure ulcers
 - Standardization of Insertion Protocol
 - Standardization of Care of Line Protocol
 - Goal 15: The Organization identifies safety risks inherent in its patient population
 - Policies and practices
 - Risk Assessments
 - Education of Staff, Patient, Families

http://www.jointcommission.org/GeneralPublic/NPSG09_npages.htm

Joint Commission National Patient Safety Goals 2009

- Sub-Goals**
- Meet Hand Hygiene Guidelines
 - Prevent Multidrug-Resistant Organism Infections
 - Prevent Central Line-Associated Blood Stream Infections
 - Prevent Surgical Site Infections

- Elements of Performance**
- Infection Rate Data and outcomes
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2010 UWMC Breakthrough Goals

- Focused on Infection Prevention/Control
 - Central Line Associated Blood Stream Infection (CLABSI)
 - Methicillin Resistant *Staphylococcus aureus* (MRSA)
 - Ventilated Associated Pneumonia (VAP)
 - Catheter Related Urinary Tract Infection (CA-UTI)
 - Respiratory Virus Infection

Decreased the incidence of the above infections by 50% in FY 2010

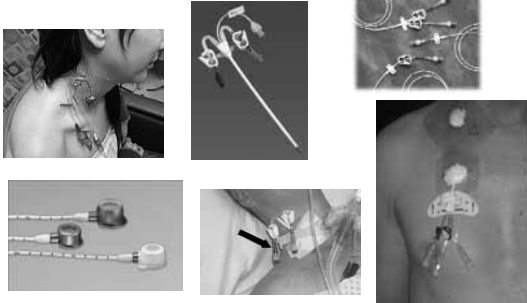
What is a CLABSI?

Central Line:

- **Definition:** An intravascular catheter that terminates at or close to the heart or in one of the great vessels which is used for infusion, withdrawal of blood, or hemodynamic monitoring
- **Types:**
 - Temporary: A central line that is nontunneled
 - Permanent:
 - Tunneled catheters including certain dialysis catheters
 - Implanted catheters (including ports)

Andrus, M. (2004). Protocol and Definitions Device-associated Module. IHI/NIH.

What is a CLABSI?



Andrus, M. (2004). Protocol and Definitions Device-associated Module. NHSN.

What is a CLABSI: NHSN/CDC Guidelines

Criteria 1:

- Pt has a recognized pathogen cultured from ONE or more blood cultures

AND

- The organism is NOT related to another site



S. aureus, Enterococcus spp., E.coli, Pseudomonas, Klebsiella spp., ect

O'Grady, et. al (2002). Guidelines for the Prevention of Intravascular Catheter-Related Infections. MMWR.

Criteria 2:

- Pt has at least one of the following s/sx: fever (>38° C), chills, or hypotension

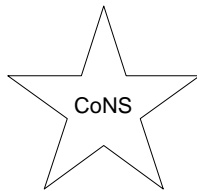
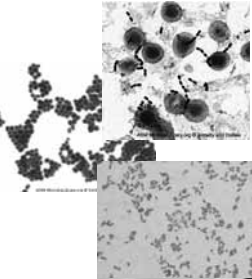
AND

- S/Sx and positive laboratory results are not related to an infection at another site

AND

- Common skin contaminant is cultured from two or more blood cultures drawn on separate occasions

What is a CLABSI: NHSN/CDC Guidelines



S. aureus, Enterococcus spp., E.coli, Pseudomonas, Klebsiella spp., ect

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What is a CLABSI cont...

Criteria 3

Pt \leq 1 year of age has at least one of the following S/Sx:

- Fever ($>38^{\circ}\text{C}$, rectal), hypothermia ($<37^{\circ}\text{C}$, rectal), apnea, or bradycardia

AND

- S/Sx and positive laboratory results are NOT related to an infection at another site

AND at least ONE of the following:

- Common skin contaminant 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 physician institutes appropriate antimicrobial therapy.

O'Grady, et al (2002). Guidelines for the Prevention of Intravascular Catheter-Related Infections. MMWR.

48 hour Rule

- A patient must have had a central line place within the 48 hour period before the development of the Bloodstream Infection (BSI)

Also...

- If the BSI develops in a patient within 48 hours of discharge from a location, the BSI is accountable to the discharging location.

There is NO minimum period of time that the central line must be in place in order for the BSI to be considered central-line associated.

O'Grady, et al (2002). Guidelines for the Prevention of Intravascular Catheter-Related Infections. MMWR

Clinical Significance: ICU

- 48% ICU Patients have central lines = 15 million central venous catheter (CVC) days per year
 - CVC Day: any day that a patient has a central line in place at the time the count is made.
- 5.3 CLABSI occur per 1000 CVC Day or ~92,000 per year
- Annually ~500-4000 deaths
- Estimated cost per infection: \$3,700-\$29,000
- Annual cost: \$296 million to \$2.3 billion
- Prolonged hospitalization by a mean of 7 days

Apic. (2009). Guide to the Elimination of Catheter-Related Bloodstream Infection APIC Elimination Guide. 14.

Risk Factors

- Prolonged Hospitalization prior to catheterization
- Prolonged duration of catheter
- Heavy microbial colonization at insertion site
- Heavy microbial colonization of catheter hub
- Catheter placed at internal jugular site
- Neutropenia
- Pre-maturity
- TPN
- Standard care of Catheter (e.g. excessive manipulation, RN to patient ratio)

Sources of Contamination

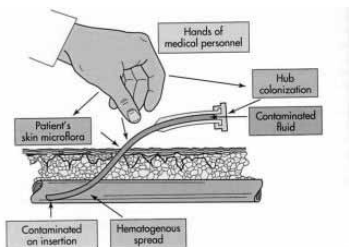


Figure 40-14 Potential sites for contamination of an intravascular device.

Potter and Perry

Knowledge Check: Case Study #1

30 y/o woman with a tunneled catheter develops a fever. Blood cultures are positive for gram positive cocci.

How can you determine whether the bacteremia is related to the catheter?

- Any other source of Infection?
- How many sets of blood cultures? One? Two? Separate draw?
- Could this be a skin contaminant?
- What are other tests we could run?

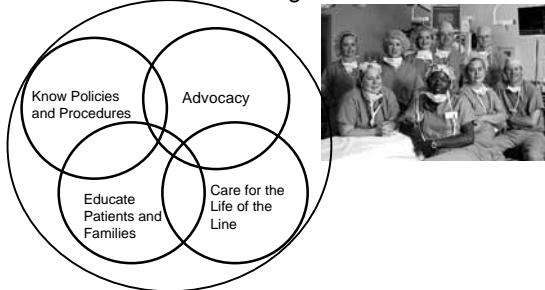
Dell, T. (2008). Lecture.

Quantitative Culture and Tip Culture

- Paired quantitative blood cultures (pour plates)
 - Ratio >5:1
- Unpaired quantitative blood cultures
 - >100 CFU/ml
- Time to positivity
 - 2 hour time difference
- Catheter tip >15 CFU/ml
 - Do not send routinely in absence of clinical concern for infection.

Dellit, T. (2008). Lecture

The RN Role in Reducing CLABSIs



RN Role: Policies and Procedures: Insertion Standardization

- UWMC: CLABSI Team:
 - Streamlined, standardized and evidence-based process for the placement, management, timely and safe removal and tracking of infections for non-tunneled central venous catheters.
 - MD training: online didactic, lab simulation, and proctored procedures.
 - MD/RN education integration: learning as a multidisciplinary team.

- Elements of Performance**
 - Infection Rate Data and outcomes
 - Compliance with IHI CVC Bundle Elements
 - ✓ Standardization of Insertion Protocol
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RN Role: P/P: Advocacy: CVC Bundle Compliance

- Patient Safety Advocate
 - "Stopping the Line"
 - The role of the RN is to advocate for patient safety.
 - This means the RN is empowered to "Stop the Line" if there is a break in sterile technique or if the central line insertion checklist is not followed.
 - Assertion: Two Challenge Rule
 - Team STEPPS: It is the RNs responsibility to assertively voice concern at least **TWO** times to ensure it has been heard.
 - Requires policy for chain of command/backup if line is not stopped.

Knowledge Check: Case Study #2

You are taking care of Mr. M. He is a 63 y/o male with cardiomyopathy and coronary disease. He has a 20 gauge PIV in his L AC. He converts into rapid A. fib. You stabilize him by giving him IV amiodarone boluses It is determined that he is going to need a 'non emergent' central line because they want to put him on an amiodarone gtt. A PICC line is ordered, but the PICC RN is busy doing STAT PICC requests. The Provider decides to place a central line instead and has started the procedure without you knowing. You enter the room and they are gowned and ready to go. You notice the checklist has not been filled out. What do you do?

Scope of RN in CVC Placement Procedure

- It is NOT in the RNs Scope to:
 - Walk the Provider through the procedure.
 - Help Identify landmarks.
 - Teach provider to use equipment.
- It is IN the RNs Scope to:
 - Have general knowledge about the procedure.
 - Educate the Provider on the proper process for the procedure
 - Stop the procedure if any of the bundle elements are not followed.
 - Stop the procedure if the situation becomes a threat to patient safety.
 - Protect and advocate for your patient.

RN Role: Line Care

* It is important to know your organization's policy and procedure surrounding the care of a certain line.
However, the following slides are evidence based and can serve as generalize good care practices.*



Elements of Performance

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RN Role: Line Care: Dressing Changes

- When? How often? Shower?
- Tegaderm, Biopatch, CHG... OH MY!
 - What about gauze?
- Sterile vs Clean?
 - Mask
- Cleaning Techniques
- Skin Considerations



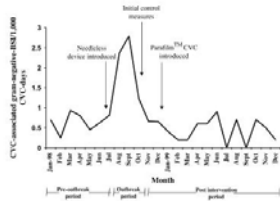
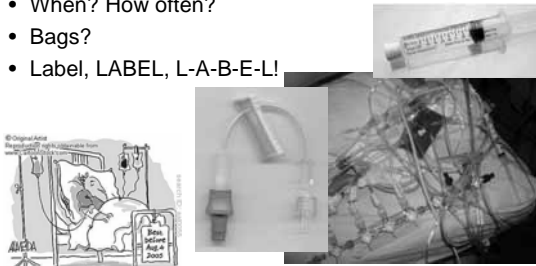


Fig 2. CVC-associated GN-BSI rates in HSCT outpatients at the FHCRC, January 1998 to December 1999.

Tosciano, C.M., Bell, M., Zukerman, C., et al. (2009). Gram negative bloodstream infections in hematopoietic stem cell transplant patients: The role of needless device use, bathing practices, and catheter care. *American Journal of Infection Control*, 37 (4), 327-334.

RN Role: Line Care: IV Lines and Caps

- When? How often?
- Bags?
- Label, LABEL, L-A-B-E-L!



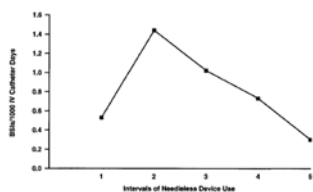


Figure 2. BSI rates during different intervals when needleshed devices were used, Coram Healthcare, Houston: 1, Clave device with end cap change twice per week (February-May 1994); 2, Safatec device with end cap change once per week (June 1994); 3, Safatec device with end cap change twice per week (July-August 1994); 4, Safatec device with end cap change every 2 days (September-October 1994); 5, Interlink device with end cap change every 2 days (November 1994-April 1995).

Do, A.N., Ray, B., Banerjee, S., et al. (1999). Bloodstream infections associated with needleshed device use and importance of infection control practices in home health care setting. *Journal of Infectious Disease*. 179. 442-448.

RN Role: General Line Care

- Scenario 1: Pt pulls out his PIV while Heparin is running. Besides cleaning up all the blood, is it OK to use the same line?
- Scenario 2: Choose your own adventure! Lines are not labeled! A: Pretend you don't notice and let someone else worry about it? B: Throw a label on it and guesstimate when it was last changes. C: Change out the system.
- Scenario 3: You have a pt with a PICC line that is sluggish, How often should lines be flushed?

WHEN in DOUBT, THROW it OUT!

RN Role: Drawing Blood Cultures

- Drawing correctly = less risk of contamination = saving money = avoidance of possible line removal = less patient days = efficiency = patient satisfaction/safety!

- Blood Culture Pearls:
 - Skin Prep/Line Prep
 - Volume
 - LABELING!



Wyant, S. (2005). Blood culture sampling: Best practices to reduce false positive blood cultures. *Society of Gynecologic Nurse Oncologists*, 15(1), 6-12.

RN Role: Accessing the Line

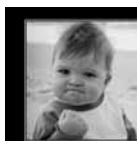


- Duration of swabbing
- 70% alcohol vs. Chlorhexidine wipes
- Risk of accessing line

www.uw.edu/nursing/courses/320/

RN Role: Patient and Family Education

- Varieties of ways to communicate information about Central Lines!



EXPLANATION
XXXXXXXX

- Elements of Performance**
 - Infection Rate Data and outcomes
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Additional References

- The Joint Commission National Patient Safety Goals:
<http://www.jointcommission.org/GeneralPublic/NPSG/>
- Institute for Healthcare Improvement, Central Venous Catheters:
<http://www.jointcommission.org/GeneralPublic/NPSG/>
- O'Grady NP, Alexander M, Dellinger EP, et al. Guidelines for the prevention of intravascular catheter-related infections. Centers for Disease Control and Prevention. *MMWR Recomm Rep*. Aug 9 2002;51(RR-10):1-29.
- Mermel LA. Prevention of intravascular catheter-related infections. *Annals of Internal Medicine*. Mar 7 2000;132(5):391-402.
- Richardson, D. Standards of Care, and Strategies in the Prevention of Infection: A Primer on Central Venous Catheters (Part 2 of a 3-Part Series). *Vascular Access Nursing*. 2007; 12(1). 19-27
- Wyant, S. Blood Culture Sampling: Best practices to reduce false positive blood cultures. *Society of Gynecological Nurse Oncologists*. March 2005; 15(1):6-12

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