Central Line Associated Bloodstream Infection Prevention

Last updated 2019

Basics of Infection Prevention
Healthcare-Associated Infections Program
Center for Health Care Quality
California Department of Public Health

Objectives

- Describe the etiology and epidemiology of central line associated bloodstream infections (CLABSI)
- Identify patients at risk for CLABSI
- Review evidence-based CLABSI prevention care practices
- Discuss adherence monitoring and feedback

CLABSI Prevention Objectives

- National 2020 Target Goal: Reduce CLABSI by 50% from 2015 baseline
  - Recommended for adoption in California hospitals by the CDPH HAI Advisory Committee
- Centers for Medicare and Medicaid Services (CMS) Value-Based Purchasing
  - Reduce payments for hospitals ranking among the lowest-performing 25 percent

National Action Plan for Prevention of HAI, 2013:
(https://health.gov/hcq/prevent-hai.aspx)

CMS Hospital Value-Based Purchasing:
(https://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier2&cid=1228772039937)

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CLABSI in California Hospitals in 2017

- 2,278 CLABSI reported in 2017
  - Would have needed to prevent 900 of those to achieve 2020 CLABSI reduction goal
- GOAL: 50% CLABSI reduction from 2015 baseline of 1.0 = SIR 0.5 in 2020

On track if

- **SIR 0.70** in 2018
- **SIR 0.60** in 2019

CDPH HAI in California Hospitals Annual Report January to December 2017
(https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AnnualHAIReports.aspx)

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Central Line

- Intravascular catheter that terminates at or close to the heart or one of the great vessels
- Used for infusion, withdrawal of blood or hemodynamic monitoring
- Multiple types
  - Nontunneled (subclavian, jugular)
  - Peripherally inserted central catheters (PICCs)
  - Tunneled (Broviac, Hickman, Groshong)
  - Dialysis catheter (Quinton)
  - Implanted ports (Permacath)

CLABSI Pathogenesis

Common mechanisms

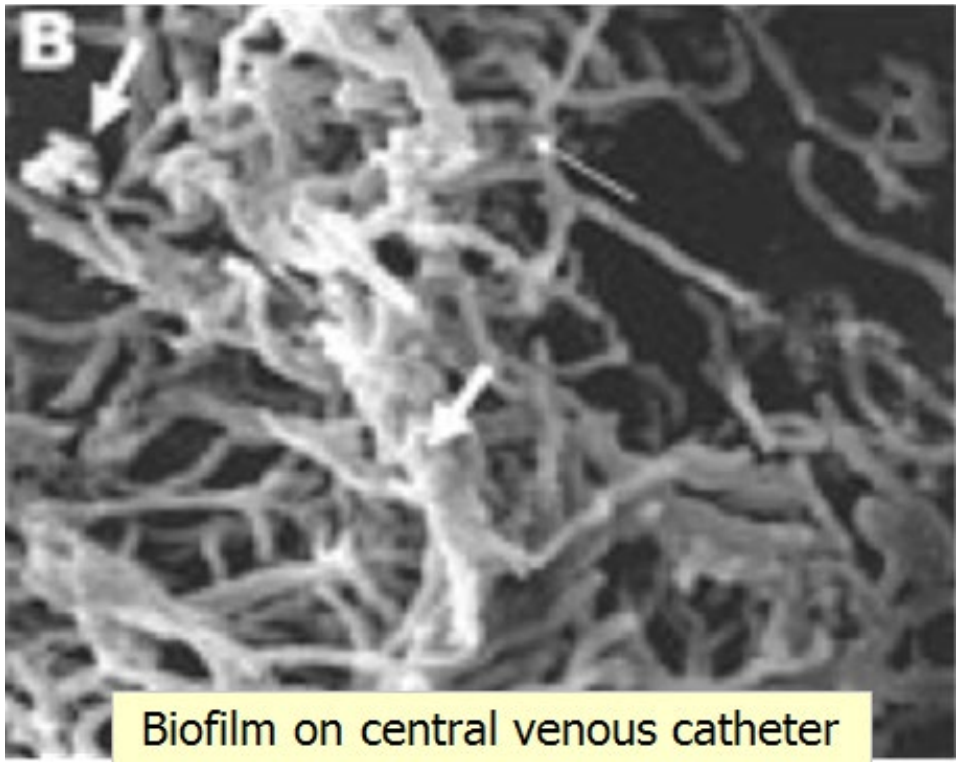
- Extraluminal contamination
  - Pathogens migrate on external surface of catheter
  - Introduce bacteria during insertion
- Intraluminal contamination
  - Pathogens migrate along internal surface
  - Access port contamination

Less common mechanisms

- Seeding from another infection site source
- Contaminated infusates

Biofilms

- Complex aggregation of microorganisms growing on a solid substrate
- Form on catheter surfaces
- Contribute to CLABSI risk



Biofilm on central venous catheter

Common CLABSI Pathogens

- Coagulase-negative Staphylococci 16%
- *Staphylococcus aureus* 13%
- *Klebsiella (pneumoniae/oxytoca)* 8%
- *Enterococcus faecalis* 8%
- *Enterococcus faecium* 7%
- *Candida albicans* 6%

Distribution of Pathogens Reported to NHSN by HAI Type, 2011-2016
(https://www.cdc.gov/nhsn/xls/reportdatatables/2014-appendix-pathogens.xlsx)

CLABSI Risk Factors

Higher Risk

Modifiable

- Multiple catheters
- Multiple lumen catheters
- Excessive line manipulation
- Emergency insertion
- Prolonged duration
- Prolonged hospital stay prior to line insertion
- Neutropenia
- Prematurity
- Total parenteral nutrition
- **Hemodialysis**

Lower Risk

- Single lumen catheters
- Elective insertion
- Remove lines promptly
- Specialized inserter
- Optimal site selection (subclavian)

Hemodialysis

- Catheters (specifically, central lines) are the most common cause of BSI in dialysis patients
  - 7X higher CLABSI risk than arteriovenous fistulas or grafts

Vascular Access Type	Rate (per 100 patient-months)
AV fistula	0.26
AV graft	0.39
Other vascular access type	0.67
Central venous catheter	2.16

- Include hemodialysis providers **and contractors** in CLABSI prevention education and competency programs

CLABSI Prevention – What works?

Best sources for **evidence-based CLABSI prevention practice** recommendations

- **CDC Guidelines** for the Prevention of Intravascular Catheter-Related Infections, **2011**
  - (https://www.cdc.gov/infectioncontrol/guidelines/pdf/bsi/bsi-guidelines-H.pdf)
- CDC **Checklist** for CLABSI Prevention of CLABSI
  - (https://www.cdc.gov/hai/pdfs/bsi/checklist-for-clabsi.pdf)
- **SHEA/IDSA** Strategies to Prevent Central Line-Associated BSI Acute Care Hospitals, **2014**
  - (http://www.inicc.org/media/docs/StrategiestoPreventCLABSIsinAcuteCareHospitals-2014Update.pdf)

CLABSI Prevention – What Works?

- Proper line insertion practices (CLIP)
- Proper line maintenance
- Clinical staff that has been trained and had competency verified (return demonstration)
- Adherence monitoring and feedback of prevention care practices

Prevention "Bundle"

- A group of practices with high-level clinical evidence of effectiveness
- When applied together, improvements are synergistically greater
- Benefits of bundle adoption
  - Minimize practice variation among health care providers
  - Adherence to a set of recommendations is enhanced
  - Able to measure adherence

The whole is greater than the sum of its parts!

Central Line Insertion Practices (CLIP) Bundle

Prepare

1. All-inclusive catheter cart/kit
2. Optimal catheter site selection

Insert

1. Hand hygiene
2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Daily review of line necessity

Empower all providers to stop the insertion if improper insertion practice observed

Institute of Healthcare Improvement CLABSI Bundle, 2009:
(http://app.ihi.org/imap/tool/processpdf.aspx?processGUID=e876565d-fd43-42ce-8340-8643b7e675c7)

CLIP – Hand Hygiene

- Perform hand hygiene prior to central line insertion
- Do not palpate insertion site after applying antiseptic unless aseptic technique maintained

CLIP - Maximum Barrier Precautions

- Adhere to aseptic technique
- Cap, mask, sterile gown and gloves worn by the line inserter and assistant
- Patient covered from head to toe with sterile drape with small opening for insertion site

CLIP – Optimal Catheter Site Selection

- Select lower risk insertion site if possible
  - Avoid femoral site in obese adult patients
  - Subclavian vein preferred for non-tunneled catheters in adults

CLIP – Chlorhexidine (CHG) Skin Antisepsis

- Perform skin antisepsis just prior to line insertion using a skin antisepsis containing greater than 0.5% chlorhexidine with alcohol
- Allow time to dry completely before puncturing site

CLIP – Daily Review of Line Necessity

- Perform daily review of central line necessity (and document in patient record)
  - Appropriate use examples include chemotherapy, extended antibiotic course, hemodialysis, total parenteral nutrition
- Promptly remove unnecessary lines
  - Risk of infection increases with duration of line

Central Line – Dressings

- Place a sterile gauze dressing or a sterile, transparent, semipermeable dressing over the insertion site
- For patients 18 years of age or older use a CHG impregnated dressing (FDA approved for CLABSI prevention) unless the facility has demonstrated success at preventing CLABSI with basic prevention practices

Central Line Care and Maintenance

- Adopt a central line maintenance bundle to include:
  - Perform hand hygiene when replacing, accessing, repairing, or dressing a catheter
  - Disinfect hub and access port before each use
    - Only use sterile devices to access catheters
  - Immediately replace dressings that are wet, soiled, or dislodged
  - Use aseptic technique with clean or sterile gloves
  - Change gauze dressings at least every two days or semipermeable dressings at least every seven days
  - Change administration sets no more frequently than every 4 days, but at least every 7 days

Additional CLABSI Prevention Practices

If you have ensured high adherence to basic CLABSI prevention practices and CLABSI continue:

- Perform daily chlorhexidine bathing (2% solution) in select populations, e.g., ICU
- Consider using antimicrobial-impregnated catheter if line is expected to be in >5 days
- Cover insertion site with chlorhexidine-impregnated dressings
  - Decrease CLABSI rates in some studies, not in others
- Antiseptic impregnated caps for access ports

Measuring Prevention

Requires monitoring for:

Adherence with practices known to reduce infections

- **Process** measure

Changes in CLABSI incidence

- **Outcome** measure

Facility Role in CLABSI Prevention

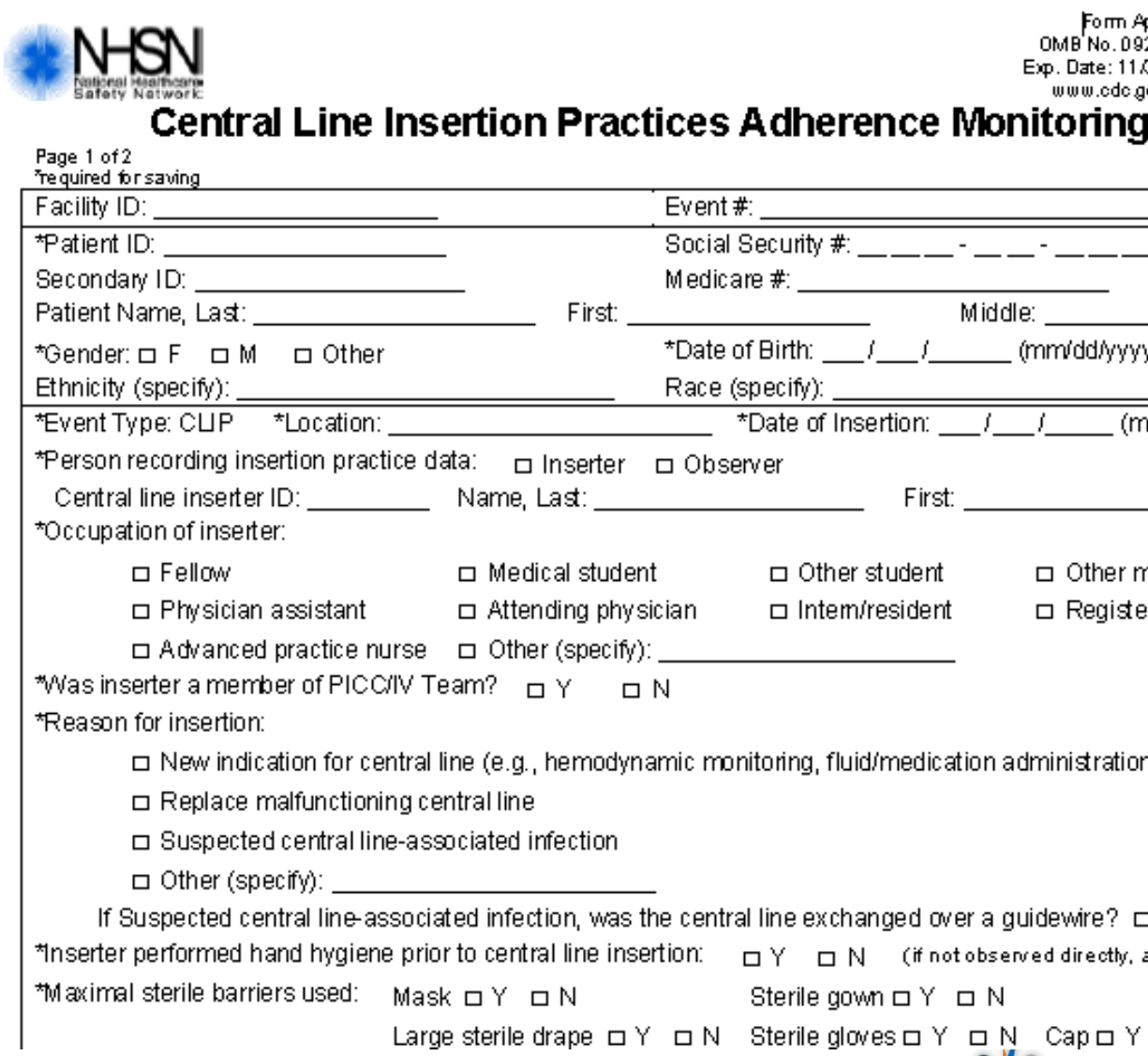
- Ensure policies and practices reflect current evidence based recommendations
  - CDC and SHEA/IDSA guidelines
- Ensure staff competency upon hire and at least annually
  - New hire orientation
  - Annual skills fair
  - Return demonstration to ensure competency
- Monitor adherence to prevention practices and provide feedback

Adherence Monitoring and Feedback

- Perform surveillance and adherence monitoring of care practices
  - Use standardized tools to measure adherence
    - As an example monitor adherence to:
      - Daily review of line necessity
      - Prompt removal of central lines
      - Accessing the line using “scrub-the-hub” practices
      - Catheter site care and dressing practices
- Provide feedback to frontline staff and leaders
  - Present adherence results with CLABSI incidence to each unit

Monitoring Central Line Insertion

- If patient develops CLABSI, within 7-10 days after insertion, assess CLIP adherence
- If high CLABSI, monitor CLIP in all locations where lines are inserted, including OR and interventional radiology



NHSN National Healthcare Safety Network

Form A
OMB No. 09
Exp. Date: 11/
www.cdc.g

Central Line Insertion Practices Adherence Monitoring

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Facility ID: _____ Event #: _____

*Patient ID: _____ Social Security #: ___-___-____
Secondary ID: _____ Medicare #: _____
Patient Name, Last: _____ First: _____ Middle: _____
*Gender: ☐ F ☐ M ☐ Other *Date of Birth: ___/___/_____ (mm/dd/yyyy)
Ethnicity (specify): _____ Race (specify): _____

*Event Type: CLIP *Location: _____ *Date of Insertion: ___/___/_____ (m

*Person recording insertion practice data: ☐ Inserter ☐ Observer
Central line inserter ID: _____ Name, Last: _____ First: _____
*Occupation of inserter:
☐ Fellow ☐ Medical student ☐ Other student ☐ Other m
☐ Physician assistant ☐ Attending physician ☐ Intern/resident ☐ Registe
☐ Advanced practice nurse ☐ Other (specify): _____
*Was inserter a member of PICC/IV Team? ☐ Y ☐ N
*Reason for insertion:
☐ New indication for central line (e.g., hemodynamic monitoring, fluid/medication administration
☐ Replace malfunctioning central line
☐ Suspected central line-associated infection
☐ Other (specify): _____
If Suspected central line-associated infection, was the central line exchanged over a guidewire? ☐
*Inserter performed hand hygiene prior to central line insertion: ☐ Y ☐ N (if not observed directly, a
*Maximal sterile barriers used: Mask ☐ Y ☐ N Sterile gown ☐ Y ☐ N
Large sterile drape ☐ Y ☐ N Sterile gloves ☐ Y ☐ N Cap ☐ Y

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Monitoring Central Line Access Maintenance

Observation	Patient 1		Patient 2		Adherence by Task # Yes	Adherence by Task # Obs
Supply kit is used for central line dressing changes.	(Yes)	No	(Yes)	No	2	2
Hand hygiene performed before **and** after manipulating the catheter (regardless of glove use).	Yes	(No)	Yes	(No)	0	2
Wet, soiled, or dislodged dressings are changed promptly.	(Yes)	No	(Yes)	No	2	2
Need for line assessed daily by a practitioner, with prompt removal of unnecessary lines.	(Yes)	No	Yes	(No)	1	2
Scrubbing method is used during dressing change when applying CHG to the insertion site.	(Yes)	No	Yes	No	1	1
Dressing is changed with aseptic technique, using clean gloves to remove the old dressing and sterile gloves when applying the new dressing.	(Yes)	No	Yes	No	1	1
The access port or hub is scrubbed immediately prior to each use with the appropriate antiseptic.	Yes	No	(Yes)	No	1	1
Antiseptic-containing protector caps are utilized for all line connectors if it is facility policy.	Yes	No	Yes	No	Not Policy	
The catheter is accessed with only sterile devices.	Yes	No	(Yes)	No	1	1
Daily bathing with a 2% CHG solution is done if facility policy.	(Yes)	No	(Yes)	No	2	2
Total # Yes 11	Total # Observations 14		#Yes/#observations x 100= 79% Adherence			

If patient develops CLABSI, greater than 7-10 days after insertion, assess line maintenance adherence

Monitoring Central Line Dressing Maintenance

Central Line Maintenance Practices	Patient 1		Patient 2		Adherence by Task	
					# Yes	# Observed
Central line insertion date is documented.	Yes	No	Yes	No	2	2
Dressings wet, soiled, or dislodged are changed promptly.	Yes	No	Yes	No	2	2
Need for the line assessed daily by a practitioner, with prompt removal of unnecessary lines	Yes	No	Yes	No	0	2
Optimal site selected, avoid femoral site in adult patients.	Yes	No	Yes	No	2	2
Sterile gauze, sterile transparent or sterile semi-permeable dressing used to cover the catheter site is in place for ≤ 7 days (Mark "No" if no date on the dressing.)	Yes	No	Yes	No	0	2
Antiseptic-containing protector caps are utilized for all line connectors if facility policy.	Yes	No	Yes	No	2	2
A CHG-impregnated sponge applied at insertion site	Yes	No	Yes	No	2	2
Tubing and administration set have been in place for ≤ 7 days. (Mark "No" if no date on dressing.)	Yes	No	Yes	No	0	2
TPN/Lipids: tubing dated to ensure change every 24 hours.	Yes	No	Yes	No	None	Today
Daily bathing with a 2% CHG solution is done if facility policy.	Yes	No	Yes	No	1	2

Total # Yes 11 Total # Observations 18 #Yes/#observations x 100= 61 % Adherence

CLABSI Practice Observations

57 Hospitals with High CLABSI Rates, 2015-2017		
	# Observations	Adherence
Line Insertion	12	90%
Line Maintenance	39	
Insertion Date Documented		83%
Hand Hygiene Before/After Even if Gloves Worn		78%
Clean, Dry, Intact Dressing		92%
Avoid Femoral Site		95%
CHG Sponge at Insertion Site		95%
Daily CHG Bath if Hospital Policy		63%

Preventing CLABSI: The MOST Important Things

Prevent Early- and Late-Onset CLABSI

- ❑ **Provide list of indications** for central line
- ❑ **Education** of HCP inserting or caring for central line
- ❑ **Bathe** ICU patients with CHG daily
- ❑ **Adhere** to infection prevention practices at insertion (CLIP)
- ❑ **Use all-inclusive** catheter cart/kit
- ❑ **Use Ultrasound** guidance for insertion
- ❑ Use **alcoholic CHG skin prep**
- ❑ **Disinfect hub** before accessing central line
- ❑ **Remove** nonessential catheters
- ❑ **Change** transparent dressings and site care with CHG every 5-7 days or if soiled
- ❑ **Replace** administration sets not used for blood product or lipids no longer than every 4 days (96 hours)
- ❑ **Use antimicrobial ointment** for hemodialysis catheter insertion sites
- ❑ **Perform CLABSI surveillance**

Questions?

For more information,
please contact any
HAI Liaison IP Team member

Or email
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