Central Line Associated Bloodstream Infection Prevention
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

(health.gov/hcq/prevent-hai.aspx)

CMS Hospital Value-Based Purchasing
(www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HAC/Hospital-Acquired-Conditions)
CLABSI in California Hospitals in 2019

- 1750 CLABSI reported in 2019

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIR</td>
<td>0.97</td>
<td>0.95</td>
<td>0.85</td>
<td>0.79</td>
<td>0.67</td>
</tr>
</tbody>
</table>

- GOAL: **50% CLABSI** reduction from 2015 baseline of 1.0 = SIR 0.5 in 2020
- 2020 CLABSI data will be available in 2021
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)

NHSN Patient Safety Module: Chapter 4
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
- Example: Nonaggregative *C. auris* phenotype has the capacity to form biofilms with enhanced virulence capacity*

*Biofilm-Forming Capability of Highly Virulent, Multidrug-Resistant *Candida auris* (wwwnc.cdc.gov/eid/article/23/2/16-1320_article)
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 (EXCEL)
(www.cdc.gov/nhsn/xls/reportdatatables/2014-appendix-pathogens.xlsx)
CLABSI Risk Factors

**Higher Risk**
- 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

<table>
<thead>
<tr>
<th>Vascular Access Type</th>
<th>Rate (per 100 patient-months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV fistula</td>
<td>0.26</td>
</tr>
<tr>
<td>AV graft</td>
<td>0.39</td>
</tr>
<tr>
<td>Other vascular access type</td>
<td>0.67</td>
</tr>
<tr>
<td>Central venous catheter</td>
<td>2.16</td>
</tr>
</tbody>
</table>

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

Guidelines, Recommendations and Resources

Nurses, medical providers, technicians and others who work in dialysis facilities face a difficult task of managing the complex conditions affecting their patients while simultaneously focusing on reducing the risk of infection for these at-risk individuals. The resources on this page include guidance documents and web links to resources on the prevention of infection in the dialysis setting.

CDC Guidelines and Recommendations

The guidelines and recommendations included in this section reflect existing evidence-based guidelines produced by the Centers for Disease Control and Prevention and the Healthcare Infection Control Practices Advisory Committee.

CDC Guidelines, Recommendations and Resources for Dialysis Safety
(www.cdc.gov/dialysis/guidelines/index.html)

CDC Infection Control Guidelines & Guidance Library (PDF)
CLABSI Prevention – What works?

Best sources for evidence-based CLABSI prevention practice recommendations

- **CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011** (PDF)
  (www.cdc.gov/infectioncontrol/pdf/guidelines/bsi-guidelines-H.pdf)

- **CDC Checklist for CLABSI Prevention of CLABSI** (PDF)
  (www.cdc.gov/hai/pdfs/bsi/checklist-for-clabsi.pdf)

- **SHEA/IDSA Strategies to Prevent Central Line-Associated BSI Acute Care Hospitals, 2014** (PDF)
  (www.inicc.org/media/docs/StrategiestoPreventCLABSIinAcuteCareHospitals-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
(www.ihi.org/Topics/Bundles/Pages/default.aspx)
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 antiseptic 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
Additional note on Drawing Blood Cultures

- Recommend drawing from peripheral site if possible
  - Drawing from central line may result in a false positive and unnecessary antibiotics
  - Best is one from peripheral site, and one from central line
- Disinfect the tops of the culture bottles before injecting
  - Under the cap is not sterile!
- Disinfect the peripheral site and allow to dry
  - Do NOT fan to dry faster
- Do Not draw blood cultures at the same time
  - If ordered 15 mins apart for example, wait the appropriate time before drawing.
- Culturing the catheter tip will NOT be accurate

CDC Antibiotic Prescribing and Use in Hospitals and LTC; A Clinician Guide
(www.cdc.gov/antibiotic-use/core-elements/collecting-cultures.html)
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

CDC NHSN Central Line Insertion Practices Adherence Monitoring Form (PDF)
(www.cdc.gov/nhsn/forms/57.125_CLIP_BLANK.pdf)
## Monitoring Central Line Access Maintenance

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

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

CDPH Adherence Monitoring Tools
(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/MonitoringAdherenceToHCPracticesThatPreventInfection.aspx)
### Monitoring Central Line Dressing Maintenance, cont’d

<table>
<thead>
<tr>
<th>Central Line Maintenance Practices</th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Adherence by Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central line insertion date is documented.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Dressings wet, soiled, or dislodged are changed promptly.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Need for the line assessed daily by a practitioner, with prompt removal of unnecessary lines</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Optimal site selected, avoid femoral site in adult patients.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>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.)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Antiseptic-containing protector caps are utilized for all line connectors if facility policy.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>A CHG-impregnated sponge applied at insertion site</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Tubing and administration set have been in place for ≤ 7 days. (Mark “No” if no date on dressing.)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>TPN/Lipids: tubing dated to ensure change every 24 hours.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Daily bathing with a 2% CHG solution is done if facility policy.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>57 Hospitals with High CLABSI Rates, 2015-2017</th>
<th># Observations</th>
<th>Adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Insertion</td>
<td>12</td>
<td>90%</td>
</tr>
<tr>
<td>Line Maintenance</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Insertion Date Documented</td>
<td></td>
<td>83%</td>
</tr>
<tr>
<td>Hand Hygiene Before/After Even if Gloves Worn</td>
<td></td>
<td>78%</td>
</tr>
<tr>
<td>Clean, Dry, Intact Dressing</td>
<td></td>
<td>92%</td>
</tr>
<tr>
<td>Avoid Femoral Site</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>CHG Sponge at Insertion Site</td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>Daily CHG Bath if Hospital Policy</td>
<td></td>
<td>63%</td>
</tr>
</tbody>
</table>
Educate Patients/Residents to Prevent CLABSIs

Educate patients/residents to:

- Speak up about any concerns so that HCP are reminded to follow the best infection prevention practices.

- Ask a healthcare provider if the central line is absolutely necessary. If so, ask them to help you understand the need for it and how long it will be in place.

- Pay attention to the bandage and the area around it. If the bandage comes off or if the bandage or area around it is wet or dirty, tell a HCP right away.

- Don’t get the central line or the central line insertion site wet.

CDC CLABSIs: Resources for Patients and Healthcare Providers
(www.cdc.gov/hai/bsi/clabsi-resources.html)
Educate Patients/Residents prevent CLABSI - continued

• Tell HCP if the area around the catheter is sore or red or if the resident has a fever or chills

• Do not let any visitors touch the catheter or tubing

• The patient/resident should avoid touching the tubing as much as possible

• In addition, everyone visiting the patient/resident must wash their hands—before and after they visit
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**
<table>
<thead>
<tr>
<th>Questions?</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>For more information, please contact</td>
<td>Now that you have completed this module, Click on the “Post Test” link when it pops up</td>
</tr>
<tr>
<td><a href="mailto:HAIProgram@cdph.ca.gov">HAIProgram@cdph.ca.gov</a></td>
<td>To Return to Learning Stream and take the post test</td>
</tr>
<tr>
<td>Include “SNF IP Training Class” in the subject line</td>
<td><em>If the Post Test link does not pop up, you will be sent a link via e-mail</em></td>
</tr>
</tbody>
</table>