Preventing central line-associated bloodstream infections: The CLABSI Bundle
Do Central Lines Cause Bloodstream Infections?

Central venous catheters (CVCs) disrupt the integrity of the skin, making infection with bacteria and/or fungi possible.

Infection may spread to the bloodstream and hemodynamic changes and organ dysfunction (severe sepsis) may ensue.

Approximately 90% of the catheter-related bloodstream infections (BSIs) occur with CVCs.

Incidence and Risk

48% of ICU patients have central venous catheters, accounting for 15 million central venous catheter-days per year in ICUs.

The case fatality rate for catheter-related bloodstream infections approaches 20%.

Central Line Associated BSI’s (CLABSI) are Costly & Prolong Care

- Attributable cost per bloodstream infection is estimated to be $3,700 to $29,000.

- HAI bloodstream infections prolong hospitalisation by a mean of 7 days.

Risk Factors with Percutaneous Non-Tunneled Catheters:

- **Site of insertion**: Subclavian vein less risky than internal jugular or femoral vein
- **Multiple ports/hubs**: More manipulation and contamination
- **Parenteral feeding**: TPN and/or lipids
- **Infection elsewhere**: Remote, e.g., UTI or wound

Evidence Summary

Attributable mortality is 4-20%.
Routine replacement does not reduce risk
Maximal barrier precautions reduce risk
CVCs coated with antiseptics or antibiotics may reduce risk but are expensive
Use of chlorhexidine skin prep reduces risk more than povidone-iodine

Saint S. http://www.ahrq.gov/clinic/evrptfiles.htm#ptsafety
Opportunity Knocks

What if a series of interventions could markedly reduce the risk of CLABSI?

What if those interventions were already readily available in hospitals?

What if all of those interventions were done all of the time on each patient?
Benefits of Reducing CLABSI

Better patient outcomes
Reduced mortality
Improved satisfaction
  Nursing
  Physician
  Patients and families
Financial benefits
The Central Line Bundle

...is a group of interventions related to patients with intravascular central catheters that, when implemented together, result in better outcomes than when implemented individually.
Central Line Bundle Elements

1. Hand hygiene
2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults
5. Daily review of line necessity with prompt removal of unnecessary lines
6. Line secure and dressing clean and intact

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CLABSI Rate

Beginning of Collaborative

Graph showing the CLABSI rate from 1/31/2004 to 12/31/2004 with marked points indicating the beginning of the collaborative period.
Central Line Bundle Elements

**Hand hygiene**

Maximal barrier precautions
Chlorhexidine skin antisepsis
Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults
Daily review of line necessity with prompt removal of unnecessary lines
Line secure and dressing clean and intact
Hand Hygiene

When caring for central venous catheters, cleanse hands with soap and water or an alcohol-based waterless hand cleaner:

- Before and after palpating catheter insertion sites
- Before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter

Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.

Cleanse hands if they are obviously soiled or if contamination is suspected.

Cleanse hands between patients, after removing gloves and after using the bathroom.

O’Grady NP. MMWR. Aug 9, 2002; 51: RR10, 1-29.
Central Line Bundle Elements

Hand hygiene

**Maximal barrier precautions**

Chlorhexidine skin antisepsis

Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults

Daily review of line necessity with prompt removal of unnecessary lines

Line secure and dressing clean and intact
What are Maximal Barrier Precautions?

– Hand hygiene
– Non-sterile cap and mask
  • All hair should be under cap
  • Mask should cover nose and mouth tightly
– Sterile gown and gloves
– Cover patient’s head and body with a large sterile drape
Central Line Bundle Elements

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4. Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults
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Chlorhexidine Skin Antisepsis

Prepare skin with antiseptic/detergent chlorhexidine in 70% isopropyl alcohol.

Allow antiseptic solution time to dry completely before puncturing the site (~2 minutes).
Central Line Bundle Elements

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2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults
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6. Line secure and dressing clean and intact
CDC Recommendation Regarding Site Selection

“...in adult patients, a subclavian site is preferred for infection control purposes, although other factors (e.g. the potential for mechanical complications, risk for subclavian vein stenosis, and catheter-operator skill) should be considered when deciding where to place the catheter.”

O’Grady NP. MMWR. Aug 9, 2002; 51: RR10, 6.
Checklist Elements

- **Before the procedure, did they:**
  - Use appropriate hand hygiene?
  - Apply chlorhexidine as antiseptic to procedure site?
  - Drape entire patient in a sterile fashion?

- **During the procedure, did they:**
  - Use sterile gloves, mask, cap and sterile gown?
  - Maintain a sterile field?
  - Select the subclavian site for an adult patient, unless contraindications were noted?

- **Verify: Did all personnel assisting with procedure follow the above precautions?**
Central Line Bundle Elements

1. Hand hygiene
2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters in adults
5. Daily review of line necessity with prompt removal of unnecessary lines
6. Line secure and dressing clean and intact
Daily Review of Line Necessity

- Use current documentation to prompt discussion of line removal.
- Avoid routine replacement of central lines, even over guidewires.
To Be Successful

“Reduce the incidence of central line catheter-related bloodstream infections using the central line bundle.”

“The rate of CLABSI can decrease by 50% in one year using the central line bundle.”

Adopt a change methodology that accelerates improvement such as The Model for Improvement.
Helpful Changes: Central Line Insertion

Use line carts and kits or “grab bags”.
Standardise insertion procedures.
Store all equipment in the same place.
Include central line insertion checklists in the kits or on the cart.
Central line catheter-related bloodstream infection rate per 1000 central line-days:

**Numerator:** Number of central line catheter-related bloodstream infections x 1000

**Denominator:** Number of central line-days (total number of days of exposure to central venous catheters by all patients in the selected population during the selected time period)
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Central Line Bundle Compliance

ICU Central Line Bundle Compliance
(Includes Insertion Bundle and Daily Necessity Assessment)

Compliance Rate

Date

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