Eliminating Central Line Associated Blood Stream Infections: The Journey to Zero

Target Zero

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Disclosures

• Consultant - Michigan Hospital Association Keystone Center
• Consultant - Missouri Center for Patient Safety
• Contracted consultant for Advancing Nursing, LLC

  - Consulting services:
    • Edward Lifesciences
    • Sage Products
    • Excelsior Medical
      (sponsorship for this presentation)
Session Objectives

• Identify risk factors for the development of central line associated blood stream
• Define key care practices based on the evidence that can reduce and sustain zero BSI’s
• Discuss strategies to work on a safety culture as care practices are changed.
• Discuss strategies to sustain the gains and promote continuous improvement
Potential Sources of Infection for Intravascular Devices

Skin organisms
- Endogenous Skin flora
- Extrinsic HCW hands
- Contaminated disinfectant

Contaminated catheter hub
- Endogenous Skin flora
- Extrinsic HCW hands

Contaminated infusate
- Extrinsic Fluid Medication
- Intrinsic Manufacturer

Fibrin sheath, thrombus

Hematogenous from distant infection

Skin

Vein
## CUSP & CLABSFI Interventions

### Adaptive /Cultural

<table>
<thead>
<tr>
<th>CUSP</th>
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</thead>
<tbody>
<tr>
<td>1. Educate on the Science of Safety</td>
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<td>2. Identify Defects (Staff Safety Assessment)</td>
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<td>3. Senior Executive Partnership</td>
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### Technical

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Blood Stream Infection (BSI) Insertion Prevention Bundle (IB)

- Remove/Avoid unnecessary lines (IA)
- Hand hygiene (IB)
- Maximal barrier (IB)
- Chlorhexadine for skin prep (IA)
- Avoid femoral lines (IA)

Education & Culture of Safety

CDC. Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]
www.ihi.org
http://www.onthecuspostophai.org/
Catheter-Related Blood Stream Infection Checklist

- If there is an observed violation of infection control practices, line placement should stop immediately and the violation should be corrected. If a correction is required, mark yes to question #6.
- If there are any concerns, the bedside nurse should contact the Senior Resident directly.

1. Today’s date/time
   month / day / year  start time

2. Location:
   - SICU
   - MICU
   - CCU
   - Livingston

3. Procedure:
   - New line
   - Other:

4. Is the procedure:
   - Central line
   - Peripheral line

5. Procedure follow
   - Yes
   - No

   After the procedure:
   - Was a sterile dressing applied to the site
   - Yes
   - No

6. Was a correction required to ensure compliance with infection control practices?
   - Yes
   - No

7. Time procedure was completed:
   STOP TIME

Please return completed form to the designated location in your ICU.

Berenholtz et al, 2004; Tsuchida et al, 2007

It is More than Just the Checklist!!!
Maintenance Bundle

- Dressing Care
- Accessing the line
- Administration set changes
- Assessing each day if line is necessary

- Additional strategies:
  - CHG Baths
  - CHG Dressings
  - Disinfection caps
  - Antibiotic impregnated catheters
## Dressing Care

- Use a transparent or gauze dressing to cover site (IA)
- Change transparent dressing and perform site care with a CHG based antiseptic every 7 days (IB) or more frequent if the dressing is soiled, loose, or damp; (IB)
- Change gauze dressings every 2 days or more frequent if the dressing is loose, soiled or damp (II)
- Use a chlorhexidine-impregnated sponge dressing for temporary short-term catheters in patients older than 2 months of age if the CLABSI rate is not ↓ despite EBP (1B)
- No recommendation is made for other types of chlorhexidine dressings.

SHEA and IDSA, Infection Control and Hospital Epidemiology  Oct 2008
Prevention of Catheter Infection: MMWR 2002;51 (No. RR-10):[1-29]
Care After Insertion

- Scrubbing the access port with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol) and accessing the port only with sterile devices. (IA)

- 3 sec, 10 sec & 15 sec scrub showed no difference in reducing bacterial load (Simmons S, et al. Crit Care Nurs Q, 2011;34:31-35)

- Replace administration sets not used for blood, blood products or lipids at intervals not longer than 96 hours (IA)

- Replace tubing used to administer blood, blood products, or fat emulsions within 24 hours of initiating the infusion. (IB)

- When needleless system used, consider a split septum valve versus a mechanical valve. (II)

- Change the needleless components at least as frequently as the administration set. (II)

- Use a 2% chlorhexidine wash for daily skin cleansing to reduce CRBSI (II)
Additional Strategies to Eliminate CLABSI

- CHG Baths
- CHG Dressings
- Disinfection caps
St. Joseph Mercy Hospital
Central Line Associated Blood Stream Infection Rate:
Infections per 1000 Line Days

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No CLABSI in 12 months in all 3 ICUs.
Only 1 CLABSI in past 18 months in 3 ICUs.
# CUSP & CLABSI Interventions

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Learning from Defects

• What happened?

• Why did it happen (system lenses) ?

• What could you do to reduce risk ?

• How do you know risk was reduced ?
  – Create policy / process / procedure
  – Ensure staff know policy
  – Evaluate if policy is used correctly

*Each CLABSI is considered a DEFECT, and you must learn from each one*
Learning from Defects

- What happened?
  - 3 CLABSIs

- Why did it happen (system lenses)?
  - Reviewed compliance with insertion and maintenance bundles on each of these patients----done well
  - Common theme in patients: significantly immunocompromised

- What could you do to reduce risk?
  - Review of literature and found research on using CHG bathing to reduce CLABSI
  - Implement CHG bathing as an intervention to reduce CLABSI in the ICU

- How do you know risk was reduced?
  - Auditing compliance with new bathing procedure and bathing supply use
  - Monitor for reduction in CLABSI rate
Translating Evidence into Practice
(Johns Hopkins model)

1. Summarize the Evidence
   - Identify interventions associated with improved outcomes
   - Select interventions with the largest benefits and lowest barriers to use
   - Convert interventions to behaviors
   - Observe staff performing the interventions
   - "Walk the process" to identify defects in each step of intervention implementation
   - Enlist all stakeholders to share concerns and identify potential gains/losses associated with intervention implementation
   - Select measures (process and/or outcome)
   - Develop and pilot test measures
   - Measure Baseline Performance

2. Identify local barriers to implementation: understand the process and context of work
   - Envision the problem within the larger health care system
   - Engage Collaborative multi-disciplinary teams centrally (stages 1, 2 & 3) and locally (stage 4)

3. Measure Performance
   - Engage
     - Explain why the interventions are important
   - Educate
     - Share the evidence supporting the interventions
   - Execute
     - Design an intervention on "toolkit" targeted to barriers employing standardization, independent checks and reminders, and learning from mistakes
   - Evaluate
     - Regularly assess performance measures

4. Ensure all patients receive the interventions
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<th>Senior Executives</th>
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<td><strong>Engage</strong></td>
<td><strong>Ask, how does this make the world a better place?</strong></td>
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<tr>
<td></td>
<td>– Help staff understand the preventable harm</td>
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<tr>
<td></td>
<td>– Share stories about patients affected</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>– Estimate number of patients harmed</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>– Develop a business case</td>
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| **Educate** | **What do I need to do?** |               |                  |
|             | – Convert evidence into behaviors;                                            |              |                  |
|             | – Evaluate awareness and agreement                                             |              |                  |

| **Execute** | **How can I do it?** |               |                  |
|             | – Listen to resisters                                                       |              |                  |
|             | – Standardize, create independent checks                                     |              |                  |
|             | – Make it easy to do the right thing                                         |              |                  |
|             | – Learn from mistakes                                                       |              |                  |

| **Evaluate** | **How do I know we made a difference?** |               |                  |
|             | – Define measures                                                            |              |                  |
|             | – Regularly assess measures                                                   |              |                  |
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(Johns Hopkins model)

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4. Ensure all patients receive the interventions
Summarize the Evidence

- Traditional bathing with basins
- CHG bathing
Traditional Bathing

Why are there so many bugs in here?

Spreading Microorganism
Bath Water: A Source of Health-Care Associated Microbiological Contamination

• Compared normal bath water with chlorhexidine bath water on 3 wards
• Without Chlorhexidine: All samples + for bacterial growth (14/23 > 10^5 cfu/ml)
• With Chlorhexidine: 5/32 grew bacteria with growth 240 to 1900 cfu/ml
• Gloved hands/bathing: objects touch grew significant numbers of bacteria

Dry Basin Study: Level of Bacterial Growth

- 25 basins (children's hospital)
- 52% + for organisms
- 62% of those + had multiple organism present
- > multiple organisms present in the CCU

O’Flynn, J. APIC Meeting June 2007 Kosair children’s Hospital
Waterborne Infections Study

• Hospital tap water is the most overlooked source for Health-care associated pathogens
• 29 evidenced-based studies present solid evidence of waterborne Health-care associated infections
• Transmission occurs via drinking, bathing, items rinsed with tap water and contaminated environmental surfaces

Waterborne Infections Study

- Conservative estimates suggest significant morbidity and mortality from waterborne pathogens
- Immunocompromised patients are at the greatest risk
- Recommendation I: Minimize patient exposure to hospital tap water via bottled water and pre-packaged, disposable bathing sponges

Guidelines for Environmental Infection Control

- Practice hand hygiene to prevent the hand transfer of water borne pathogens and use barrier precautions (Cat 1A)
- Eliminate contaminated water or fluid environmental reservoirs wherever possible (Cat 1B)
- Clean and disinfect sinks & wash basins on a regular basis using an EPA-registered product (Cat 2)
- Evaluate for possible environmental sources ie colonization after use of tap water in patient care (Cat 1B)

CDC. MMWR June 6th, 2003, 52;No. RR-10
P. aeruginosa Outbreak: Tap Water the Culprit

- Single genotype
- 59 burn patients (hydrotherapy tank)
- 19 adult ICU patients (wash basins & water taps)
- 13/31 ICU patients (tap water)
- 5/14 surgical unit patients (tap water)

Bathing with CHG Basinless Cloths

• Prospective sequential group single arm clinical trial
• 1787 patients bathed
  – Period 1: soap & water
  – Period 2: CHG cloth cleansing
  – Period 3: non-medicated basinless cloth bath

Veron MO et al. Archives Internal Med 2006;166:306-312
26 colonization's with VRE per 1000 patients days vs. 9 colonization's per 1000 patient days with CHG bath
Table 3. Percentage of Environmental Surface Culture Specimens That Were Positive for Vancomycin-Resistant Enterococci During the 3 Study Periods*

<table>
<thead>
<tr>
<th>Site Where Culture Specimen Was Obtained</th>
<th>Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soap and Water (n = 311)</td>
</tr>
<tr>
<td>Table</td>
<td>10 (3)</td>
</tr>
<tr>
<td>Bed rail</td>
<td>33 (11)</td>
</tr>
<tr>
<td>Pull sheet</td>
<td>63 (20)</td>
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CHG Bathing Reduces CLA-BSI’s (II)

- 52 week, 2 arm, cross-over design clinical trial
- 22 bed MICU with 11 beds in 2 geographically separate areas
- 836 MICU patients
  - 1st 28 weeks: 1 hospital randomize to bathe with (commercially available 2%) CHG cloths & the other unit bathe with soap & water
  - 2 week wash out period
  - 2nd 24 weeks: methods were crossed over
- Measured: Primary outcomes: incidence of CA-BSI’s & clinical sepsis. Secondary: other infections

Results:

- CHG arm were significantly less likely to acquire a CA-BSI 4.1 vs. 10.4 infections per 1000 patient days
- Benefit against primary CA-BSI’s by CHG cleansing after 5 days in MICU
- No difference in clinical sepsis or other infections

CHG Bathing: Pre & Post Intervention


Quarterly BSI Rates in the ICU: 2007–1st Quarter 2009

Corcoran et al APIC 6/2009

Intervention began May 2008

100% decrease
Effect of Daily Chlorhexidine bathing On Hospital-Acquired Infection
Climo, M et al, NEJM February 4, 2013

- Multicenter, cluster-randomized, nonblinded crossover trial
- Evaluate the effect of daily bathing with CHG impregnated washcloths on acquisition of MDROs and the incidence of hospital acquired CLABSI
- 9 ICUs and bone marrow transplants units in 6 hospitals; 7727 patients
- Randomly assigned to bathe patients either with no-rinse 2% CHG impregnated washcloths or with nonantimicrobial washcloths for 6 months
- Measured incidence rates of acquisition of MDROs and the rates of hospital acquired CLABSI were compared between the two periods
Results:

- Overall rate of MDRO acquisition was 5.1 cases per 1000 patient days with CHG bathing versus 6.60 cases per 1000 patient days with nonantimicrobial washcloths (p=0.03) 23% reduction

- CLABSI rate was 4.78/1000 patient days with CHG bathing versus 6.60/1000 patient days with nonantimicrobial washcloths (p=0.007) 28% reduction

- No serious skin reactions were noted during either study period
Strategies for Bathing to Reduce Source Control & Improve Skin Defense

Basin Bath

- ↑ transmission of organisms
- ↑ time & effort
- ↑ # of supplies
- Harmful soaps
- Rough washcloths
- Cold/tepid water
- Scrubbing technique
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(Johns Hopkins model)

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Translating Evidence into Practice
- Envision the problem within the larger health care system
- Engage Collaborative multi-disciplinary teams centrally (stages 1, 2 & 3) and locally (stage 4)
Implementation

- Define new bathing process

**Patient Bathing Instructions: Chlorhexidine Gluconate Cloths**

Chlorhexidine gluconate is a fast-acting, broad-spectrum antiseptic that helps reduce the number of microorganisms on your skin – a known risk factor for infection.

- KEEP CHG Cloths (Burgundy Package) out of eyes, ears, mouth, and any other mucosal areas.
- USE each cloth to thoroughly wipe each area in a circular or back and forth motion, making sure all skin is cleansed.
- Keep cloths on foam and avoiding contact with cotton sheets since CHG could leave a permanent brown stain if washed in bleach.
- DISPOSE of all cloths in a trash receptacle.
- DO NOT apply any unapproved lotions or barrier creams. These can deactivate the antiseptic.

**DO NOT FLUSH CLOTHS IN TOILET**

Use Sage Bathing Washcloths for face and head

Tear package at notch on back flap to open or cut with scissors

1. NECK (JAWLINE DOWN), CHEST, ARMS, HANDS
2. ABDOMEN & GROIN
3. RIGHT LEG AND FOOT
4. LEFT LEG AND FOOT
5. BACK
6. BUTTOCKS

1, 2

1, 2

3

3

4

4

5

5

6

6

FRONT

BACK
Implementation

- Identify barriers
  - Cost
  - Like it the current way
  - Compatibility with other skin care products
  - Are they getting clean?
- Make it easy to do the right thing
  - Equipment
  - Signs at bedside
Warmer

• Packages will be used from the warmer
  – Use any baths that are flashing “Take First”
  – In no “Take First”, then select any package

• If the “Take First” is blinking, the wipes should be used in the next 24 hours or be removed from the warmer

• CHG wipes can stay in the warmer up to XX hours
  – At that time they should be removed from the warmer, allowed to cool and then can be rewarmed

• Warmers are equipped with a protective device that turns the unit off if it overheats

• Warmers will be maintained with 3 inch clearance on each side and one inch on the top
Compatible Products

• Comfort Shield Incontinence Wipes—Has a built in skin barrier
• Keri Lotion
• Aquaphor Original Formula Ointment
• Lubriderm Dry Skin Care Lotion
• Eucerin Original Lotion
• Vaseline 100% Pure Petroleum Jelly
• Alcohol foams or rubs
• Keri Oil
• Pro Shield Ointment
• Pro Shield spray
Incompatible Products

• Any other brand name lotion/bath products (ex: Bath and Body Works, Suave, etc)
• Dial Soap: Can be used just prior to CHG bath, but not again within 24 hours—Do not reuse basins
• All deodorants
• Tap Water
Measure Performance and Ensure all Patients get the Evidence

- **Ease of Use**
- **Impact on CLABSI**
  - Rate decreased from 0.9/1000 catheter days to 0.7/1000 catheter days
- **Audit use of product**
- **Discuss issues with compliance at team meetings**
- **Unit nursing and medical leadership accountability**

### CHG BATH EVALUATION

1. The CHG baths were easy to use
   - □ strongly agree □ agree □ neutral □ disagree □ strongly disagree □ N/A
2. The patient’s skin after use of the CHG cloths was in good condition
   - □ strongly agree □ agree □ neutral □ disagree □ strongly disagree □ N/A
3. The non-CHG bathing cloths were sufficient to clean the face and perineal area during the bath
   - □ strongly agree □ agree □ neutral □ disagree □ strongly disagree □ N/A
4. The non-CHG bathing cloths were sufficient to clean the patient in-between CHG baths.
   - □ strongly agree □ agree □ neutral □ disagree □ strongly disagree □ N/A
5. The patient was satisfied with the CHG bath.
   - □ strongly agree □ agree □ neutral □ disagree □ strongly disagree □ N/A
6. I liked the CHG bath
   - □ strongly agree □ agree □ neutral □ disagree □ strongly disagree □ N/A

**COMMENTS:**
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

**DATE:** ________________
**Name (optional) ____________________________________________**

Please return the completed evaluation to the designated area in the unit or to the unit EC.
St. Joseph Mercy Hospital
Central Line Associated Blood Stream Infection Rate:
Infections per 1000 Line Days

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No CLABSI in 12 months in all 3 ICUs.
Only 1 CLABSI in past 18 months in 3 ICUs
Methodology:

- Multi-center, randomized controlled trial
- 7 ICUs participated
- Included all patients who required arterial or central venous catheter for 48 hours or longer
- Use of CHG dsg vs standard dsg
- Already using maximal barrier precautions, try and use subclavian site for central line, use alcohol/povidone-iodine prep solution (not CHG)
- Looked at 3 day vs. seven day dressing change (but changed when dsg was loose, soiled or damp in all groups)

Timsit JF, et al. JAMA 2009;301:1231-1241
CHG-Impregnated Sponges for Prevention of CLABSI (IB)

Results:

• 1636 patients (3778 catheters, 28,931 catheter days)
• Median duration of catheter insertions 6 days (4-10)
• Use of CHG dressing decreased the CLA-BSI rate from:
  – 1.3 per 1000 catheter days to 0.4 per 1000 catheter days
• Use of CHG dressing not associated with greater resistance of bacteria in skin samples at removal
• 8 episodes of contact dermatitis with patch (817 pts)
• No difference in site colonization between dressing changes at 3 days or 7 days

Prevented 1 Major CLA-BSI per 117 Catheters

Timsit JF, et al. JAMA 2009;301:1231-1241
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<tr>
<td>Ann Arbor</td>
<td>7.6</td>
<td>2.12</td>
<td>1.11</td>
<td>1.13</td>
<td>0.9</td>
<td>0.70</td>
<td>0.84</td>
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Learn from a Defect

- Select a specific defect
  - What happened?
  - Why did it happen (system lenses)?
  - What could you do to reduce risk?
  - How do you know risk was reduced?

Each CLABSI is considered a DEFECT, and we tried to learn from each one
Implementing Disinfection Caps

- Identified defect:
  - inconsistency of ‘scrubbing the hub’
- Literature/evidence review of potential strategies
- Recognizing impact of human factors
- Presentation to value analysis team
- 4 E’s
  - Engage
  - Educate
  - Execute
  - Evaluate
    - Measurement
    - Continual learning and refinement
## 4 E’s: Implementation Framework

### Implementing Disinfection Caps

<table>
<thead>
<tr>
<th></th>
<th>Frontline Staff</th>
<th>Team Leaders</th>
<th>Senior Executives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engage</strong></td>
<td><strong>Ask, how does this make the world a better place?</strong></td>
<td></td>
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<tr>
<td></td>
<td>– CLABSI rate not at zero; preventable harm</td>
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<tr>
<td></td>
<td>– Business case</td>
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<tr>
<td><strong>Educate</strong></td>
<td><strong>What do I need to do?</strong></td>
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<td></td>
<td>– Review all of the evidence and that even with scrubbing the hub—not all bugs gone</td>
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<tr>
<td></td>
<td>– Convert evidence into behaviors: put caps on all ports during admission process</td>
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<tr>
<td><strong>Execute</strong></td>
<td><strong>How can I do it?</strong></td>
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<tr>
<td></td>
<td>– Listen to resisters: why won’t this work</td>
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<td></td>
<td>– Standardize: all possible ports—peripheral and central lines</td>
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<tr>
<td></td>
<td>– Create independent checks: discuss at huddles, techs rounding</td>
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<tr>
<td></td>
<td>– Make it easy to do the right thing: stock bedsides and next to pyxis, add cap with flush</td>
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<td></td>
<td>– Learn from mistakes: investigate when compliance not achieved</td>
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<tr>
<td><strong>Evaluate</strong></td>
<td><strong>How do I know we made a difference?</strong></td>
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<tr>
<td></td>
<td>– Define measures: compliance &gt;75%</td>
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<tr>
<td></td>
<td>– Regularly assess measures: monthly</td>
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</tbody>
</table>
Continuous passive disinfection of catheter hubs prevents contamination and bloodstream infection
Wright, M et al American Journal of Infection Control, Jan, 2013

• 3-phased, multifacility, quasi-experimental study
• 3 periods
  – Period 1 (P1) baseline: standard disinfection of hub before accessing
  – Period 2 (P2): passive disinfection cap on all central lines
  – Period 3 (P3): standard disinfection of hub before accessing
• Assessed intraluminal contamination in PICC patients only, with PICC lines in > 5 days
• CAUTI used as a concurrent control
• Results:
  – Period 1: 12.7% contamination
  – Period 2: 6.8% contamination*
  – Period 2: CLA-BSI rates ↓ from 2.24 to .49 per 1000 cath days in 4 months (p = 0.08)
  – 4th hospital CLA-BSI rates ↓ from 1.35 to .30 per 1000 cath days in 5 months

*P=0.05

Wrights MC et al. SHEA, 2011
Continuous passive disinfection of catheter hubs prevents contamination and bloodstream infection
Wright, M et al American Journal of Infection Control, Jan, 2013

Results:

• Contamination:
  – P1: 12.7%
  – P2: 5.5% (p=0.002)
  – P3: 12%

• CLABSI rate
  – P1: 1.43/1000 catheter days
  – P2: 0.69/1000 catheter days (p=0.04)
  – P3: 1.31/1000 catheter days

• CAUTI rates
  – P1: 1.42/1000 urinary catheter days
  – P2: 1.41/1000 urinary catheter days
  – P3: 1.04/1000 urinary catheter days (p=0.03)

*P=0.05

Wrights MC et al. SHEA, 2011
Drilling down to the details

<table>
<thead>
<tr>
<th>Room #</th>
<th>Patients - If just one patient in room, please indicate with letter A. If more than one in room, continue to indicate with B, C, etc….</th>
<th>Total Unused Valves (# of valves not connected to cont/intermit IV. Include peripheral, central, continuous lines)</th>
<th>Total Unused Valves w/disinfection caps - (# of disinfection caps placed on available valves)</th>
<th>% of disinfection caps being used</th>
<th>Compliant?</th>
<th>NO- Less than 100% of available valves covered with DC - Indicate with an X</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>901</td>
<td>A 2 0 0.0% x</td>
<td>PIV-Ysites not covered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>903</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
<td></td>
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<tr>
<td>904</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
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<tr>
<td>906</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
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<tr>
<td>907</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
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<tr>
<td>908</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
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<td>909</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
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<td>911</td>
<td>A 1 1 100.0% x</td>
<td>PIV-Saline lk</td>
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<tr>
<td>912</td>
<td>A 1 1 100.0% x</td>
<td>Saline lk</td>
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<tr>
<td>913</td>
<td>A 1 1 100.0% x</td>
<td>Saline lk</td>
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</tr>
<tr>
<td>914</td>
<td>A 3 3 100.0% x</td>
<td>PIV-Ysites</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>915</td>
<td>A 5 5 100.0% x</td>
<td>PICC</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>916</td>
<td>A 3 2 66.7% x PIV-Ysite</td>
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<tr>
<td>917</td>
<td>A 1 1 100.0% X</td>
<td>IU</td>
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<tr>
<td>918</td>
<td>A 2 1 50.0% X</td>
<td>1 Saline lk</td>
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<tr>
<td>919</td>
<td>A 2 2 100.0% X</td>
<td>PICC-double lumen</td>
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<tr>
<td>920</td>
<td>A 3 3 100.0% X</td>
<td>All Ysites covered</td>
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<tr>
<td>921</td>
<td>A 1 0 0.0% X</td>
<td>Saline lk</td>
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<tr>
<td>922</td>
<td>A 1 0 0.0% X</td>
<td>Saline lk</td>
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<tr>
<td>923</td>
<td>A 1 1 100.0% X</td>
<td>Saline lk</td>
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<tr>
<td>924</td>
<td>A 3 3 100.0% X</td>
<td>All Ysites covered</td>
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<tr>
<td>925</td>
<td>A 1 1 100.0% X</td>
<td>Saline lk</td>
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<tr>
<td>927</td>
<td>A 1 1 100.0% X</td>
<td>PICC</td>
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<tr>
<td>928</td>
<td>A 1 1 100.0% X</td>
<td>Saline lk</td>
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<tr>
<td>931</td>
<td>A 1 1 100.0% X</td>
<td>Saline lk</td>
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<tr>
<td>932</td>
<td>A 1 1 100.0% X</td>
<td>Saline lk</td>
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</tbody>
</table>
Continuous Improvement and Sustainability

- Measurement
- Learn from defects
- Review literature
- Tests of change
What to Measure and How Often?

- Outcome measure: CLABSI rate
- Process measures:
  - Insertion bundle
    - Collect the Insertion checklist and summarize compliance. Share data at team meetings and with all staff
    - Deal real time with compliance issues——chain of command
  - Maintenance bundle
    - Audit line care: dressings dated and time; occlusive; CHG dressing as appropriate
- Frequency of measurement
Process Measures

• Insertion bundle
  – % of line insertions with 100% compliance

• Maintenance bundle
  – Dressing intact
  – Dressing time and dated
  – Dressing changed per policy—every 7 days or if soiled or loose
  – Central line anchored properly
  – CHG dressing for femoral or PICC lines
  – All open ports capped with disinfection caps
  – All IV tubing changed per policy (every 96 hours, except for TPN, lipids or propofol)
Spread to the Non-ICU
Translating Evidence into Practice
(Johns Hopkins model)

1. Summarize the Evidence
   - Identify interventions associated with improved outcomes
   - Select interventions with the largest benefits and lowest barriers to use
   - Convert interventions to behaviors

2. Identify local barriers to implementation: understand the process and context of work
   - Observe staff performing the interventions
   - "Walk the process" to identify defects in each step of intervention implementation
   - Enlist all stakeholders to share concerns and identify potential gains / losses associated with intervention implementation

3. Measure Performance
   - Select Measures (Process and/or outcome)
   - Develop and pilot test measures
   - Measure Baseline Performance

4. Ensure all patients receive the interventions

Translating Evidence into Practice
- Envision the problem within the larger health care system
- Engage Collaborative multi-disciplinary teams centrally (stages 1,2 & 3) and locally (stage 4)
4 E’s: Implementation Framework

<table>
<thead>
<tr>
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<th>Frontline Staff</th>
<th>Team Leaders</th>
<th>Senior Executives</th>
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<tbody>
<tr>
<td><strong>Engage</strong></td>
<td><strong>Ask, how does this make the world a better place?</strong></td>
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<tr>
<td></td>
<td>– Help staff understand the preventable harm</td>
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<td></td>
<td>– Share stories about patients affected</td>
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<tr>
<td></td>
<td>– Estimate number of patients harmed</td>
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<td></td>
<td>– Develop a business case</td>
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<tr>
<td><strong>CLABSI</strong></td>
<td>➢ Overview with staff that CLABSI are preventable</td>
<td>➢ Also share P4P measures</td>
<td>➢ Define business case—what does each CLABSI cost our institution</td>
</tr>
<tr>
<td></td>
<td>➢ Review incidence of CLABSI</td>
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<tr>
<td></td>
<td>➢ Share CLABSI rate with team and frontline staff</td>
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<tr>
<td></td>
<td>➢ Share stories of individual cases of CLABSI from this hospital or unit and impact on the patient</td>
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</table>
Pre-Procedure Briefing Steps:

• Make introductions
• Discuss patient information and procedure
• Agree upon a time for line insertion
• Review best practice for line insertion (if necessary)
• Nurse defines their role to physician: provide equipment, monitor patient, provide patient comfort, observe for compliance with best practices and STOP procedure if sterile process compromised
  – Establish communication expectation for sterile procedure breaks
  – Examples include: your sleeve has touched the IV pole, the guidewire touched the headboard
Pre-Procedural Briefing Steps:

• Identify any special supply or procedural needs
• Discuss any special patient issues (ie: patient confused, patient awake)
• Answer any additional questions

TIME OUT: RIGHT PATIENT
RIGHT PROCEDURE
# 4 E’s: Implementation Framework

<table>
<thead>
<tr>
<th>CLABSI</th>
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<tbody>
<tr>
<td>➢ <strong>Frontline Staff</strong></td>
</tr>
<tr>
<td>➢ What do I need to do?</td>
</tr>
<tr>
<td>➢ Convert evidence into behaviors;</td>
</tr>
<tr>
<td>➢ evaluate awareness and agreement</td>
</tr>
<tr>
<td>➢ Convert evidence into behaviors</td>
</tr>
<tr>
<td>➢ Insertion bundle</td>
</tr>
<tr>
<td>➢ Maintenance bundle</td>
</tr>
<tr>
<td>➢ Empower nurses to stop line insertion if best practice not followed</td>
</tr>
<tr>
<td>➢ Create/update central line policies</td>
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<tr>
<td>➢ Educate medical staff/residents/mid-level providers on proper insertion techniques</td>
</tr>
<tr>
<td>➢ Simulation</td>
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<tr>
<td>➢ Credentialing</td>
</tr>
<tr>
<td>➢ Define their role</td>
</tr>
<tr>
<td>➢ Get medical leadership support for stopping line insertion</td>
</tr>
<tr>
<td>➢ Ask executives if need assistance with getting products or support from medical staff</td>
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</table>
## 4 E’s: Implementation Framework

<table>
<thead>
<tr>
<th>Execute</th>
<th>Frontline Staff</th>
<th>Team Leaders</th>
<th>Senior Executives</th>
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</thead>
</table>
| **How can I do it?** | - Listen to resisters  
- Standardize, create independent checks  
- Make it easy to do the right thing  
- Learn from mistakes | | |

| CLABSI | Create central line bags  
Develop line insertion checklist  
Ensure nurse in room during line insertion to complete checklist  
Establish pre-procedure briefing process  
Add to multidisciplinary rounds—can this line be removed  
Learn from each defect---each CLABSI | Hold staff accountable for new process | Remove barriers  
Support checklist | |
### 4 E’s: Implementation Framework

<table>
<thead>
<tr>
<th><strong>Evaluate</strong></th>
<th><strong>Frontline Staff</strong></th>
<th><strong>Team Leaders</strong></th>
<th><strong>Senior Executives</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>How do I know we made a difference?</strong></td>
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<td></td>
<td>– Define measures</td>
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<tr>
<td></td>
<td>– Regularly assess measures</td>
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<tr>
<td><strong>CLABSI</strong></td>
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<tr>
<td></td>
<td>➢ Measure CLABSI rate monthly and share with staff</td>
<td>➢ Share at staff meetings</td>
<td>➢ Ask for performance measures</td>
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<tr>
<td></td>
<td>➢ Measure compliance with insertion and maintenance bundles</td>
<td>➢ Support staff in LFDs</td>
<td>➢ Share with board</td>
</tr>
<tr>
<td></td>
<td>➢ Learn from each defect—review each CLABSI with team and staff</td>
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</table>
Intervention to Decrease CLA-BSI
Statewide Collaborative-Keystone ICU

- 103 ICU’s in state of Michigan reported data
- Examine 375,757 catheter days
- Implementation of the BSI Bundle/checklist
- **Results**
  - Median rate of CLA-BSI per 1000 catheter days went 2.7 to 0 at 3 months \((p<0.002)\)
  - Mean rate of CLA-BSI’s per 1000 catheter days went 7.7 to 1.4 at 18 month follow up \((p<0.002)\)
  - ↓ in mortality when compared to other mid-west states

36 Months Post Initial Implementation: 90 of original 103 ICU’s evaluated
Results: Mean rate 1.1 per 1000 catheter days/ Median: Zero
2009: mean .88 per 1000 catheter days (personal communication)

Teamwork Climate Across Michigan ICUs

The strongest predictor of clinical excellence: caregivers feel comfortable speaking up if they perceive a problem with patient care.

No BSI = 5 months or more w/ zero

No BSI 21%
No BSI 31%
No BSI 44%

Health Services Research, 2006;41(4 Part II):1599.
On the CUSP: Stop BSI
A National Initiative

- AHRQ government funded 3 year initiative
- HRET and American Hospital Association
- John Hopkins Quality & Safety Research Group
- MHA’s Keystone Center for Patient Safety & Quality
- Goals:
  - Eliminate CLA-BSI: <1/1000 catheter days, median 0
  - Improve safety culture by 50%
  - Learn from 1 defect a month
- Build an infrastructure for future efforts
- Baseline and monthly CLA-BSI rate, hospital survey on patient safety & monthly survey on teamwork barriers

http://www.onthecuspstophai.org/
On the CUSP: Stop CLA-BSI Final Report

- 44 state hospital associations recruited 1100 hospital teams over a 4 year period
- Hospital participating in this project reduced the rate nationally from 1.903 infections per 1,000 catheter days to 1.137 infections per 1,000 catheter days: a 40 percent reduction
  - Preventing more than 2,000 CLABSIs
  - Saving more than 500 lives
  - Avoiding more than $34 million in health care costs
- < 20% of US hospitals are participating

http://www.onthecuspsstophai.org/
http://blogs.wsj/health/2011/04/05/progress-on-reducing-bloodstream-infections/
## Implementation Framework

### 2 more E’s

<table>
<thead>
<tr>
<th>Embed</th>
<th>Frontline Staff</th>
<th>Team Leaders</th>
<th>Senior Executives</th>
</tr>
</thead>
</table>
|       | *Has this become business as usual?*  
*How do I know it will last?*  
Make policies and procedures, train new people, walk the process  
Learn from each defect |               |                   |
| Expand| *Who else needs to know this?*  
*What’s next?*  
Pass it on to other units  
Identify and address your next challenges |               |                   |

---

Has this become business as usual?  
How do I know it will last?  
Make policies and procedures, train new people, walk the process  
Learn from each defect

Who else needs to know this?  
What’s next?  
Pass it on to other units  
Identify and address your next challenges
Potential Barriers

- Perception of lack of time or the importance
- Lack of evidence based education…just do it!!!!
- Absence of a define protocol/procedure
- Staff turnover/Replacement staff
- Inaccessibility of needed supplies
- No real clinical lead on the unit
- Lack of feedback on progress
- Lack of accountability/responsibility

Interventions To Ensure Patient Receive Evidence & Sustain Benefit

- Education…to all caregivers…it works*
- Ask Daily if line is needed
- Checklist, nurse
- Empower nurses
- Products/Processes that make it easy for the frontline caregiver to provide the care
- Measurement/Feedback**
- Setting targets/Celebrating successes
- Placement of new practice/education in orientation
- Simulation training of residents reduced CLABSI’s.***

**Westwall S. Nursing in Critical Care, 2008;13(4):203-207
Can we change practice through process improvement alone?

OR

Will successful change require an altering of the value structure within the unit?
We all are responsible for the safety of our patients......Own the Issues

• “If not this, then what??”
• “If not now, then when?”
• “If not me, then who??”