Top 10 “Must-Dos” For The Elimination of Preventable Healthcare-Associated Infections

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Sentri7
Webinar
July 16, 2014
Disclosure

• “To do’s” selected on the basis of scientific evidence and what I would want done on me.

• I consult for Baxter, Becton-Dickinson, Carefusion, Kimberly-Clark. GOJO, and Johnson and Johnson.
<table>
<thead>
<tr>
<th>Major Site of Infection</th>
<th>Total Infections</th>
<th>Hospital Cost per Infection (2002 $)</th>
<th>Total Annual Hospital Cost ($ in millions)</th>
<th>Deaths per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Site Infection</td>
<td>290,485</td>
<td>$25,546</td>
<td>7,421</td>
<td>13,088</td>
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<tr>
<td>Central Line-Associated Bloodstream Infection</td>
<td>248,678</td>
<td>$36,441</td>
<td>9,062</td>
<td>30,665</td>
</tr>
<tr>
<td>Ventilator-Associated Pneumonia</td>
<td>250,205</td>
<td>$9,969</td>
<td>2,494</td>
<td>35,967</td>
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<tr>
<td>Catheter-Associated Urinary Tract Infection</td>
<td>561,667</td>
<td>$1,006</td>
<td>565</td>
<td>8,205</td>
</tr>
</tbody>
</table>


Conduct active, prospective surveillance for healthcare-associated infections (HAIs).
Without measurement (surveillance), one does not know what your healthcare-associated infection (HAI) rate is or if prevention or control measures are effective.

Calculate standardized incidence rates (i.e., central line-associated bloodstream infections [CLA-BSIs], catheter-associated urinary tract infections [CA-UTIs], ventilator-associated pneumonia [VAP] in intensive care unit patients, surgical site infections [SSIs], etc.).

- standardized definitions.
- standardized surveillance protocols.
- appropriate risk adjustment.
- appropriate denominators for rate calculation.
The National Healthcare Safety Network (NHSN) is a voluntary, secure, internet-based surveillance system that integrates and expands legacy patient and healthcare personnel safety surveillance systems managed by the Division of Healthcare Quality Promotion (DHQP) at CDC. NHSN also includes a new component for hospitals to monitor adverse reactions and incidents associated with receipt of blood and blood products. Enrollment is open to all types of healthcare facilities in the United States, including acute care hospitals, long term acute care hospitals, psychiatric hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and long term care facilities. For more information, click on the topics below.

**Topics**

- **About NHSN**
  - Overview, Confidentiality, How data is used...
- **Enrollment Requirements**
  - Eligibility, How to enroll, Training, System Requirements, Security...
- **Resource Library**
  - Reports, Manuals, Newsletters, Forms...
- **Data Collection Forms**
  - Forms provided for routine data collection including customizable forms to meet specific needs...

**Patient Safety Component**

- Procedure, Device (Dialysis Event), Medication-associated, MDRO, & HRIIV Modules

**Healthcare Personnel Safety Component**

- Overview, Blood/Body Fluids Exposure, & Influenza Vaccination

**Biovigilance Component**

- Overview, Hemovigilance Module Publications...

**Data & Statistics**

- **States with Facilities Using NHSN**
  - (total=2186)

CDC currently supports more than 2000 hospitals that are using NHSN and 19 states require hospitals to report HAI’s using NHSN.

**Contact NHSN:**

- Centers for Disease Control and Prevention
  - National Healthcare Safety Network
  - MS-A24
  - 1600 Clifton Rd
  - Atlanta, GA 30333
  - nhsn@cdc.gov

More contact info >>

http://www.cdc.gov/NHSN
A Good Role Model or Starting Point

Patient Safety

Healthcare Personnel Safety

Research & Development

Biovigilance
<table>
<thead>
<tr>
<th>Module</th>
<th>Components</th>
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</thead>
<tbody>
<tr>
<td>Device-associated</td>
<td>CLABS1, VAP, CAUTI, CLIP, DE</td>
</tr>
<tr>
<td>Procedure-associated</td>
<td>SSI, PPP</td>
</tr>
<tr>
<td>Medication-associated</td>
<td>AUR</td>
</tr>
<tr>
<td>MDRO/CDAD</td>
<td>MDRO/CDAD Infection, Lab ID, Processes</td>
</tr>
<tr>
<td>Patient Influenza Immunization</td>
<td>Method A, Method B</td>
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</table>
Table 2. Pooled means and key percentiles of the distribution of central line-associated BSI rates and central line utilization ratios, by type of location, DA module, 2006

<table>
<thead>
<tr>
<th>Type of location</th>
<th>No. of locations</th>
<th>No. of CLAB</th>
<th>Central line-days</th>
<th>Pooled mean</th>
<th>Percentile</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10%</td>
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<tr>
<td>Burn ICU</td>
<td>14</td>
<td>127</td>
<td>18,612</td>
<td>6.8</td>
<td></td>
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<tr>
<td>Coronary ICU</td>
<td>53</td>
<td>181</td>
<td>63,941</td>
<td>2.8</td>
<td>0.0</td>
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<tr>
<td>Surgical cardiothoracic ICU</td>
<td>51</td>
<td>150</td>
<td>92,484</td>
<td>1.6</td>
<td>0.0</td>
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<tr>
<td>Medical ICU</td>
<td>73</td>
<td>489</td>
<td>170,719</td>
<td>2.9</td>
<td>0.0</td>
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<tr>
<td>Medical/surgical ICU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Major teaching</td>
<td>63</td>
<td>304</td>
<td>128,502</td>
<td>2.4</td>
<td>0.0</td>
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<tr>
<td>All others</td>
<td>102</td>
<td>431</td>
<td>198,551</td>
<td>2.2</td>
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<td>Pediatric medical/surgical ICU</td>
<td>36</td>
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<tr>
<td>Neurosurgical ICU</td>
<td>19</td>
<td>75</td>
<td>21,412</td>
<td>3.5</td>
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<tr>
<td>Surgical ICU</td>
<td>72</td>
<td>378</td>
<td>137,484</td>
<td>2.7</td>
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<tr>
<td>Trauma ICU</td>
<td>21</td>
<td>182</td>
<td>39,635</td>
<td>4.6</td>
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<tr>
<td>Inpatient medical ward</td>
<td>18</td>
<td>51</td>
<td>24,218</td>
<td>2.1</td>
<td></td>
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<tr>
<td>Inpatient medical/surgical ward</td>
<td>26</td>
<td>58</td>
<td>38,340</td>
<td>1.5</td>
<td></td>
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<table>
<thead>
<tr>
<th>Type of location</th>
<th>No. of locations</th>
<th>Central line-days</th>
<th>Patient-days</th>
<th>Pooled mean</th>
<th>Percentile</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>Burn ICU</td>
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<td>18,612</td>
<td>29,007</td>
<td>0.64</td>
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<td>Surgical cardiothoracic ICU</td>
<td>51</td>
<td>92,484</td>
<td>127,333</td>
<td>0.73</td>
<td>0.52</td>
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<tr>
<td>Medical ICU</td>
<td>75</td>
<td>170,719</td>
<td>288,862</td>
<td>0.59</td>
<td>0.30</td>
</tr>
<tr>
<td>Medical/surgical ICU</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Major teaching</td>
<td>63</td>
<td>128,502</td>
<td>223,001</td>
<td>0.58</td>
<td>0.36</td>
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<tr>
<td>All others</td>
<td>104</td>
<td>198,551</td>
<td>408,305</td>
<td>0.49</td>
<td>0.28</td>
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<tr>
<td>Pediatric medical/surgical ICU</td>
<td>39</td>
<td>48,144</td>
<td>97,498</td>
<td>0.49</td>
<td>0.20</td>
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<td>Neurosurgical ICU</td>
<td>19</td>
<td>21,412</td>
<td>44,364</td>
<td>0.48</td>
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<tr>
<td>Surgical ICU</td>
<td>72</td>
<td>137,484</td>
<td>222,459</td>
<td>0.62</td>
<td>0.38</td>
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<tr>
<td>Trauma ICU</td>
<td>21</td>
<td>39,635</td>
<td>61,176</td>
<td>0.65</td>
<td>0.49</td>
</tr>
<tr>
<td>Inpatient medical ward</td>
<td>18</td>
<td>24,218</td>
<td>100,174</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>Inpatient medical/surgical ward</td>
<td>27</td>
<td>38,340</td>
<td>163,510</td>
<td>0.23</td>
<td>0.07</td>
</tr>
</tbody>
</table>

BSI, bloodstream infection; CLAB, central line-associated BSI.
\( ^* \) Number of CLAB.
\( ^\text{1000} \) Number of central line-days/1000.
\( ^\text{1000} \) Number of central line-days.
\( ^\text{1000} \) Number of patient-days.
#2-To Do--An Insertion Bundle for Prevention of Central Line-Associated Bloodstream Infections (CLA-BSIs)

• Only insert catheters if necessary.
• Use a catheter insertion checklist (to monitor processes).
• Hand hygiene--before catheter insertion.
• Use a catheter insertion/dressing change kit or cart.
• >0.5% Chlorhexidine (CHG) with alcohol for skin antisepsis.
• Maximal barrier precautions (i.e., cap, mask, gown, gloves, full body drape).
• Vessel preservation-correct catheter at the correct site--avoid femoral.
• Remove catheters as soon as possible.
#3-To Do--A Maintenance Bundle for Prevention of Central Line-Associated Bloodstream Infections (CLA-BSIs)

- Use the safest needleless connector.
- Scrub the hub of the connector with chlorhexidine (CHG) or alcohol for ≥15 seconds with each manipulation.
- Use the CHG-impregnated sponge disk (BioPatch).
- Consider daily CHG baths for medical intensive care unit patients.
- Use antiseptic or antimicrobial impregnated catheters (if catheter in for ≥5 days).
- Maintain lumen patency (flush lines every 8 hours).
- Keep dressing dry and intact.
- Remove lines when no longer medically needed.
- Use antimicrobial/antiseptic locks in high-risk patients.
Pre-Keystone--JHU SICU CLA-BSI Intervention

Keystone Project

• **Study design**: Intervention cohort study in 108 Michigan Intensive care units (ICUs) over 18 months. Comparison of CVC-BSI rates before, during, and after intervention.

• **Results**: 103 ICUs. 1,981 months of ICU data and 375,757 catheter-days.

<table>
<thead>
<tr>
<th>Baseline</th>
<th>3 Months</th>
<th>IRR</th>
<th>16-18 Months</th>
<th>IRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7</td>
<td>0</td>
<td>0.62</td>
<td>1.4</td>
<td>0.34</td>
</tr>
</tbody>
</table>

**Conclusion**: An evidence-based intervention resulted in a large and sustainable decrease (up to 66%) in CVC-BSI rates that was maintained for 18 months.

State of prevention Knowledge/Science
Successful Implementation of HICPAC/CDC Guidelines Prevents Bloodstream Infections

Pennsylvania

FIGURE. Central line-associated bloodstream infection rate* in 66 intensive care units (ICUs), by ICU type and semiannual period — southwestern Pennsylvania, April 2001–March 2005

- All other unit types
- Medical/surgical units

Michigan

103 ICUs at 67 Michigan hospitals, 18 months

MMWR 2005;54:1013-16
Successful State CLA-BSI Collaborative, New York City, 2005-2007

New York: CDC guidelines basis for prevention implementation initiatives
- Greater New York Hospital Association (GNYHA) prevention initiative
- Collaborative partnership with 46 hospitals


Central-line infections per 1,000 central-line days
Hospitals Participating in NHSN are Preventing MRSA Bloodstream Infections

Trends in Bloodstream Infections* by ICU Type, NHSN hospitals, 1997-2007


Deron C. Burton; Jonathan R. Edwards; Teresa C. Horan; et al.

TABLE 2. Estimated annual number of central line–associated bloodstream infections (CLABSIs), by health-care setting and year — United States, 2001, 2008, and 2009

<table>
<thead>
<tr>
<th>Health-care setting</th>
<th>Year</th>
<th>No. of infections (upper and lower bound of sensitivity analysis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive-care units</td>
<td>2001</td>
<td>43,000 (27,000–67,000)</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>18,000 (12,000–28,000)</td>
</tr>
<tr>
<td>Inpatient wards</td>
<td>2009</td>
<td>23,000 (15,000–37,000)</td>
</tr>
<tr>
<td>Outpatient hemodialysis*</td>
<td>2008</td>
<td>37,000 (23,000–57,000)</td>
</tr>
</tbody>
</table>

*Case definitions approximate current definition of CLABSI according to the National Healthcare Safety Network.
#4-To Do: Surgical Site Infection (SSI) Bundle

1. Administer the prophylactic antibiotic within 30-60 minutes (not 0-30 minutes) before the surgical incision.

2. Administer the correct prophylactic antibiotic for the surgical procedure (increase dose in obese; re-dose for procedures >3 hours).

3. Discontinue the prophylactic antibiotic(s) within 24 hours after surgery end time (48 hours for cardiac surgery).

4. Maintain appropriate peri-operative glucose control (esp. cardiac).

5. Do not shave hair (clip, if necessary).


7. Minimize the number and movement of OR personnel (and what they bring into the operating room).

8. Insure appropriate skin antisepsis.

9. Screen patients for *S. aureus* (MRSA/MSSA) and decolonize (CHG, mupiricin).

*Denominator for the aggregate is 5,210
#5-To Do: Preventing Catheter-associated Urinary Tract Infections (CA-UTIs)--The Bladder Bundle

1. Insert catheters only for appropriate indications.
2. Leave catheters in place only as long as needed.
3. Ensure that only properly trained persons insert and maintain catheters.
4. Insert catheters using aseptic technique and sterile equipment.
5. Maintain a closed drainage system.
7. Use of antimicrobial/antiseptic-impregnated catheters.
8. Consider physician reminders and automatic stop orders.
9. Consider alternatives to indwelling urinary catheterization.
10. Use portable ultrasound devices to assess urine volume to reduce unnecessary catheterizations.
#6 To Do--The Ventilator-Associated Pneumonia (VAP) Prevention Bundle

1. Avoid endotracheal intubation, if possible.
2. Use oral, rather than nasal, endotracheal tubes.
3. Hand hygiene before and after patient contact.
4. All patients assessed daily for weaning and extubation.
5. Minimizing duration/intensity of sedation and device exposure.
6. Avoid supine position, aim for at least 30° head up.
7. Use Chlorhexidine for daily mouth care.
8. Use subglottic secretion drainage in patients likely to be ventilated >48 hours.
10. Use of sterile water for irrigation.
11. Minimize the duration of mechanical ventilation.
12. Promote tracheostomy when ventilation is needed for a longer term.
GRI VAP Prevention Bundle Reliability and VAP rate per 1000 ventilator days
Aim: > 95% reliability by March 2009
#7 To Do - Environmental Cleaning and Decontamination

- Educate environmental services personnel (ESP) about their critical role in healthcare-associated infection (HAI) prevention.
- Educate ESP about recommended cleaning practices and the importance of following hospital cleaning policies.
- Develop policies on which patient-care equipment and environmental surfaces are to be cleaned by ESP and by nursing staff.
- Ensure compliance by ESP with cleaning and disinfection procedures (Checklist, monitoring).
- Consider enhanced methods (i.e., hydrogen peroxide or ultraviolet germicidal irradiation) for terminal cleaning of rooms.
#8 To Do--Hand Hygiene

1. System change.
2. Education of healthcare workers.
3. Alcohol-based hand rubs/gels/foams.
4. Proper dispenser placement.
5. Monitoring and feedback of performance (Is visual monitoring sufficient?).
6. Administrative support (IP monitoring; managers/administrators/unit leaders enforce).
7. Leadership and culture change.
8. Clinician accountability.
“5 Moments for Hand Hygiene”

1. BEFORE TOUCHING A PATIENT
2. BEFORE CLEAN / ASEPTIC PROCEDURE
3. AFTER BODY FLUID EXPOSURE RISK
4. AFTER TOUCHING A PATIENT
5. AFTER TOUCHING PATIENT SURROUNDINGS

How to Clean

- Doing it right
Is important!
Where to Clean?

HAND HYGIENE
areas most frequently missed during handwashing

- back of hand
- palm of hand

Most frequently missed
- Frequently missed
- Less frequently missed

Based on work by Taylor L. (1976) on instruction of handwashing techniques, Nursing Times, Jan 12, 1976, p. 24-25.
12 Steps to Prevent Antimicrobial Resistance: Hospitalized Adults

1. Vaccinate
2. Get the catheters out
3. Target the pathogen
4. Access the experts
5. Practice antimicrobial control
6. Use local data
7. Treat infection, not contamination
8. Treat infection, not colonization
9. Know when to say “no” to vanco
10. Stop treatment when cured
11. Isolate the pathogen
12. Break the chain

#9 To Do--Antimicrobial Stewardship

Prevent Transmission

Use Antimicrobials Wisely

Diagnose & Treat Effectively

Prevent Infections
#10 To Do--MRSA Prevention and Control

1. Risk assessment to identify high risk patients.
2. Active surveillance testing of identified high-risk or all patients to identify the reservoir for spread.
3. Barrier precautions for known or suspected MRSA-colonized or -infected patients.
5. Decolonization or suppression of colonized patients (esp. in surgical patients).
6. Antibiotic Stewardship.

Nationwide Rates of Health Care–Associated Infections with MRSA in Veterans Affairs (VA) Facilities.

Nationwide Quarterly Rates of Health Care–Associated Infection with MRSA in Veterans Affairs Facilities, by Type of Infection.

Nationwide Monthly Rates of Ventilator-Associated Pneumonias and Central Venous Catheter–Associated Bloodstream Infections with MRSA in Veterans Affairs Intensive Care Units.

Impact of a 4-Year Universal Surveillance and Decolonization Program to Control Methicillin-Resistant *Staphylococcus aureus* (MRSA)

The rate of total clinical *S. aureus* (20.2 to 13.4/1,000 admissions) and MRSA (10.4 to 4.1/1,000 admissions) ($P \leq 0.001$), but MSSA did not change.

The prevalence density of aggregate hospital-associated MRSA disease (all body sites) at baseline, during ICU surveillance, and during universal surveillance was 8.9, 7.4 ($P = 0.15$ compared with baseline), and 3.3 ($P \leq 0.001$ compared with baseline and ICU surveillance), respectively.

The prevalence density of MRSA infection at each body site decreased.

The percentage of exogenous MRSA fell from 48.1% to 33.3%.

This intervention was estimated to reduce healthcare infection cost by almost $9 million and prevented 72 deaths.
# Healthcare–Associated Invasive MRSA Infections, 2005-2008

## Table 3. Modeled Yearly Percent Change for All Invasive Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections and Bloodstream Infections, January 2005-December 2008

<table>
<thead>
<tr>
<th>Epidemiological Category</th>
<th>Modeled Yearly Percent Change (95% Confidence Intervals), %&lt;sup&gt;a&lt;/sup&gt;</th>
<th>P Value</th>
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<tbody>
<tr>
<td>All invasive MRSA infections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital-onset</td>
<td>-9.4 (-14.7 to -3.8)</td>
<td>.005</td>
</tr>
<tr>
<td>Health care–associated community-onset</td>
<td>-5.7 (-9.7 to -1.6)</td>
<td>.01</td>
</tr>
<tr>
<td>MRSA bloodstream infections</td>
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<td></td>
</tr>
<tr>
<td>Hospital-onset</td>
<td>-11.2 (-15.9 to -6.3)</td>
<td>.001</td>
</tr>
<tr>
<td>Health care–associated community-onset</td>
<td>-6.6 (-9.5 to -3.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Dialysis in last year</td>
<td>-6.4 (-11.4 to -1.1)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.02</td>
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<tr>
<td>No dialysis in last year</td>
<td>-7.2 (-11.4 to -2.8)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.006</td>
</tr>
</tbody>
</table>

<sup>a</sup> Multilevel model adjusted for age and race unless otherwise specified.

<sup>b</sup> Unadjusted multilevel model.

#11—Establish a Culture of Zero Tolerance For Healthcare-Associated Infections

Who has gotten to ZERO HAI?

Mercy Hospital ICU

Ventilator Associated Pneumonia (VAP)

Quarterly

May04 - Suction and oral care education.

Aug05 - Hilo evac tubes in use.

Feb08 - BAL/PBS for susp VAP

CT ICU Primary Bloodstream Infection Rates

VAP Rate

NNIS Benchmark
Johns Hopkins Medical Institution
CLABSI for All Adult ICU’s
2001 – 2009

Allegheny General Hospital CCU
Central Line Associated Bacteremia
2002 Through April 2007

Process Standardization  Process Extinction  Education Programs  Cultural Shift?
Incidence of CRBSI in PICC Lines
House-Wide; January 2005-March 2009

Incidence of CRBSI- all CVC
House-Wide; January 2005- March 2009

Sophie Harnage RN BSN
Clinical Manager Infusion Services
Sutter Roseville Medical Center
Roseville, CA
Conclusions

• By implementing these evidence-based interventions, a large proportion of HAIs can be prevented.
• Bundles of interventions (rather than just one) have been shown to be effective in reducing HAIs.
• We are entering a new era where Zero Tolerance for HAIs will be expected.
• Infection control is everybody’s business, but we in infection control should lead the way.
Keys for the Elimination of Healthcare-associated Infections

- Collect data and disseminate results
  - Communication with consumers
  - Evaluate how we’re doing

- Full adherence to evidence-based best practices

- Recognize excellence

- Identify and respond to emerging threats

- Improve science for prevention through research
Thank you