Top 10 "Must Do's" for the Elimination of Healthcare-Associated Infection
Dr. William Jarvis, Jason & Jarvis Associates
Teleclass broadcast sponsored by GOJO (www.gojo.com)

Top 10 "Must-Do's" For The Elimination of Healthcare-Associated Infections

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Hosted by Anne Bialachowski
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Disclosure

- "To do's" selected on the basis of scientific evidence and what I would want done on me.
- I consult for Becton-Dickinson, Carefusion, Kimberly-Clark. GOJO, Johnson and Johnson, Medscape, APIC and CDC.

Estimated Annual Number, Hospital Cost, and Mortality of HAI by Site of Infection

Major Site of Infection	Total Infections	Hospital Cost per Infection (2002 $)	Total Annual Hospital Cost ($ in millions)	Deaths per Year
Surgical Site Infection	290,485	$25,546	7,421	13,088
Central Line–Associated Bloodstream Infection	248,678	$36,441	9,062	30,665
Ventilator–Associated Pneumonia	250,205	$9,969	2,494	35,967
Catheter–Associated Urinary Tract Infection	561,667	$1,006	565	8,205

Klevens RM, Edwards JR, Richards CL, Horan T, Gaynes R, Pollock D, Cardo D. Estimating healthcare-associated infections in U.S. hospitals, 2002. Public Health Reviews (in press)
Stone PW, Braccia D, Larson E. Systematic review of economic analysis of health care-associated infections. Am J Infect Control 2005;33:501–9.
Roberts RR, Scott RD, Cordell R, Solomon SL, Steele L, Kampe LM, Trick WE, Weinstein RA. The use of economic modeling to determine the hospital costs associated with nosocomial infections. Clin Infect Dis 2003;36:1424–32.

#1-To Do--SURVEILLANCE

- Conduct active, prospective surveillance for healthcare-associated infections (HAIs).

#1-To Do--SURVEILLANCE

- Without measurement (surveillance), one does not know what your 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.

http://www.cdc.gov/NHSN

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A Good Role Model or Starting Point

NHSN National Healthcare Safety Network

- Patient Safety
- Healthcare Personnel Safety
- Research & Development
- Biovigilance

CDC's NHSN Patient Safety Component Modules

Device-associated	•CLABSI •CAUTI •DE •VAP •CLIP
Procedure-associated	• SSI • PPP
Medication-associated	• AUR
MDRO/CDAD	•MDRO/CDAD Infection •Lab ID •Processes
Patient Influenza Immunization	•Method A •Method B

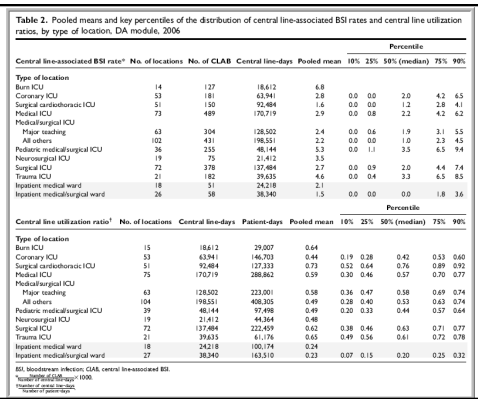


Table 2. Pooled means and key percentiles of the distribution of central line-associated BSI rates and central line utilization ratios, by type of location, DA module, 2006

Central line-associated BSI rate*	No. of locations	No. of CLAB	Central line-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Type of location									
Burn ICU	14	127	18,612	6.8					
Coronary ICU	53	181	63,941	2.8	0.0	0.0	2.0	4.2	6.5
Surgical cardiothoracic ICU	51	150	92,484	1.6	0.0	0.0	1.2	2.8	4.1
Medical ICU	73	489	170,719	2.9	0.0	0.8	2.2	4.2	6.2
Medical/surgical ICU									
Major teaching	63	304	128,502	2.4	0.0	0.6	1.9	3.1	5.5
All others	102	431	198,551	2.2	0.0	0.0	1.0	2.3	4.5
Pediatric medical/surgical ICU	36	255	48,144	5.3	0.0	1.1	3.5	6.5	9.4
Neurosurgical ICU	19	75	21,412	3.5					
Surgical ICU	72	378	137,484	2.7	0.0	0.9	2.0	4.4	7.4
Trauma ICU	21	182	39,635	4.6	0.0	0.4	3.3	6.5	8.5
Inpatient medical ward	18	51	24,218	2.1					
Inpatient medical/surgical ward	26	58	38,340	1.5	0.0	0.0	0.0	1.8	3.6

Central line utilization ratio†	No. of locations	Central line-days	Patient-days	Pooled mean	Percentile 10%	25%	50% (median)	75%	90%
Type of location									
Burn ICU	15	18,612	29,007	0.64					
Coronary ICU	53	63,941	146,703	0.44	0.19	0.28	0.42	0.53	0.60
Surgical cardiothoracic ICU	51	92,484	127,333	0.73	0.52	0.64	0.76	0.89	0.92
Medical ICU	75	170,719	288,862	0.59	0.30	0.46	0.57	0.70	0.77
Medical/surgical ICU									
Major teaching	63	128,502	223,001	0.58	0.36	0.47	0.58	0.69	0.74
All others	104	198,551	408,305	0.49	0.28	0.40	0.53	0.63	0.74
Pediatric medical/surgical ICU	39	48,144	97,498	0.49	0.20	0.33	0.44	0.57	0.64
Neurosurgical ICU	19	21,412	44,364	0.48					
Surgical ICU	72	137,484	222,459	0.62	0.38	0.46	0.63	0.71	0.77
Trauma ICU	21	39,635	61,176	0.65	0.49	0.56	0.61	0.72	0.78
Inpatient medical ward	18	24,218	100,174	0.24					
Inpatient medical/surgical ward	27	38,340	163,510	0.23	0.07	0.15	0.20	0.25	0.32

BSI, bloodstream infection; CLAB, central line-associated BSI.
*Number of CLABSIs/number of central line-days × 1000.
†Number of central line-days/number of patient-days.

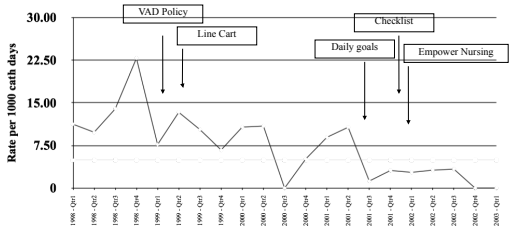
#2-To Do--An Insertion Bundle for Prevention of Central Line-Associated Bloodstream Infections (CLA-BSIs)

- 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 (cap, mask, gowm, 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 CHG or alcohol for ≥15 seconds with each manipulation.
- Use the CHG-impregnated sponge disk (BioPatch).
- Daily CHG baths for medical intensive care unit patients.
- Use antiseptic or antimicrobial impregnated catheters (if catheter in for ≥5 days).
- Maintain lumen patentcy.
- Keep dressing dry and intact.
- Remove lines when no longer medically needed.
- Use antimicrobial/antiseptic locks.

Pre-Keystone--JHU SICU CLA-BSI Intervention



Berenholtz et al. Crit Care Med 2004;32:2014.

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Keystone Project

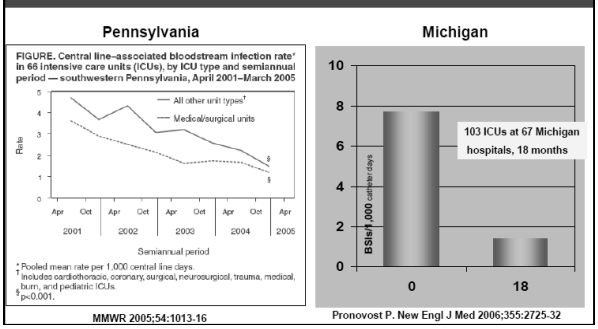
- Study design: Intervention cohort study in 108 Michigan Intensive care units (ICUs) over 18 months. Comparison of CVC-BSI rates before, during, and after intervention.
- Results: 103 ICUs. 1,981 months of ICU data and 375,757 catheter-days.

Median CVC-BSI Rates per 1,000 CVC-days

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.

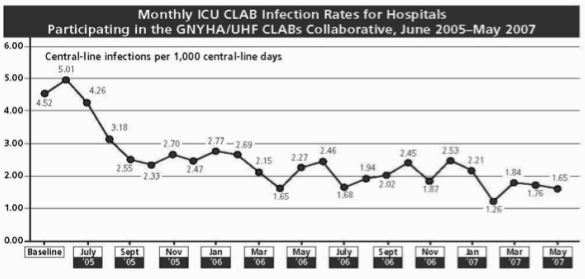
Pronovost P. et al NEJM 2006;355:2725-32.

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



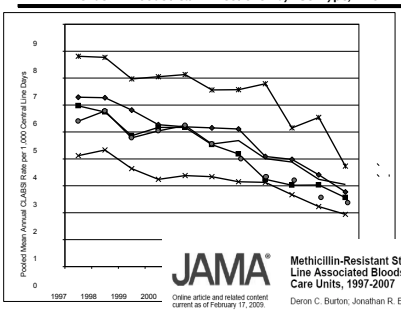
Successful State CLA-BSI Collaborative, New York City, 2005-2007

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



Hospitals Participating in NHSN are Preventing MRSA Bloodstream Infections

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



JAMA®
Online article and related content current as of February 17, 2009.

Methicillin-Resistant Staphylococcus aureus Central Line Associated Bloodstream Infections in US Intensive Care Units, 1997-2007

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

JAMA. 2009;301(7):727-736 (doi:10.1001/jama.2009.153)

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

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

*Case definitions approximate current definition of CLABSI according to the National Healthcare Safety Network.

CDC MMWR 2011:60:1-6.

#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).
6. Maintain appropriate peri-operative temperature management-normothermia (colon surgery).
7. Minimize the number and movement of OR personnel.
8. Insure appropriate skin antisepsis.
9. Screen patients for S. aureus (MRSA/MSSA)and decolonize (CHG, mupiricin).

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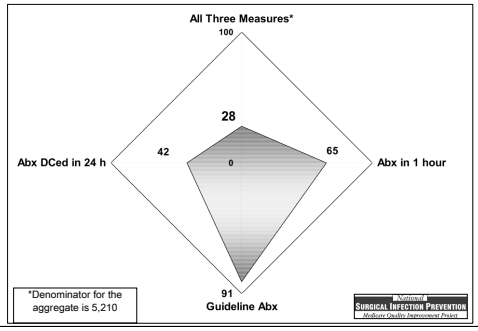
Surgical Infection Prevention Project (SIPP):
National Performance – 4th Quarter, 2003

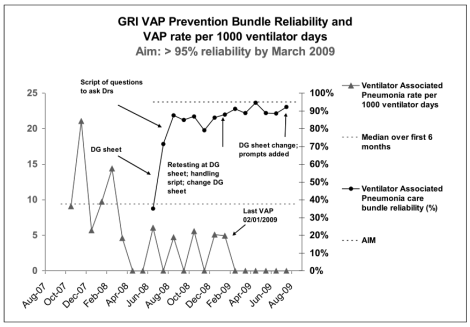


#5-To Do: Preventing Catheter-associated Urinary Tract Infections (CA-UTIs)--The Bladder Bundle

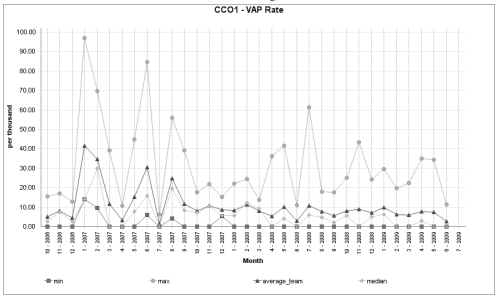
1. Insert catheters only for appropriate indications.
2. Leave catheters in place only as long as needed.
3. Ensure that only properly trained persons insert and maintain catheters.
4. Insert catheters using aseptic technique and sterile equipment.
5. Maintain a closed drainage system.
6. Maintain unobstructed urine flow.
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 of 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.
9. Avoid non-essential tracheal suction.
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.



Scotland Health System Results



#7 To Do-Environmental Cleaning and Decontamination

- Educate environmental services personnel (ESP) about their critical role in 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 for terminal cleaning of rooms.

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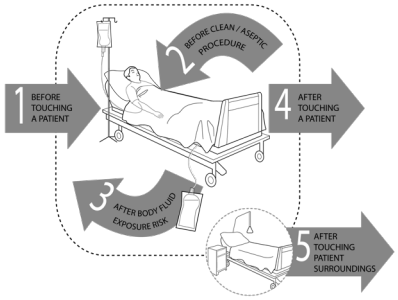
#8 To Do--Hand Hygiene

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.

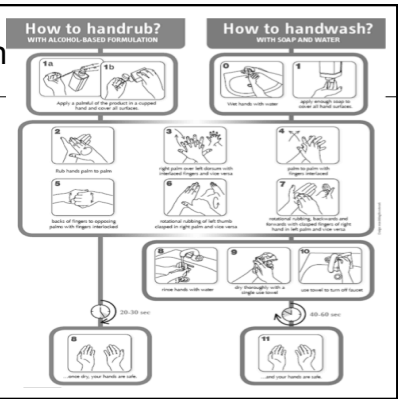
"5 Moments for Hand Hygiene"



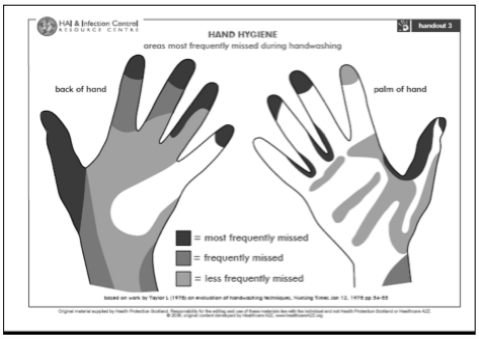
Sax H, et al. J Hosp Infect 2007;67:9-21

How to Clean

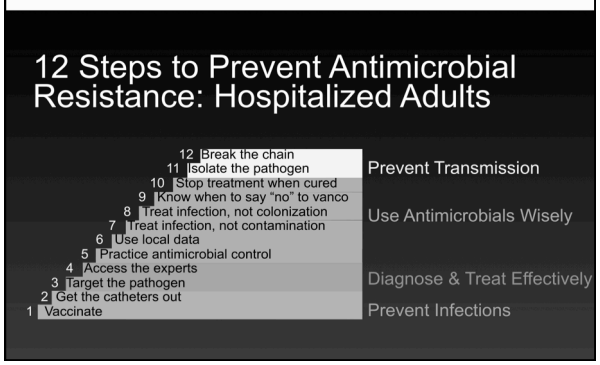
– Doing it right
Is important !



Where to Clean?



#9 To Do--Antimicrobial Stewardship



#10 To Do--MRSA Prevention and Control

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

Muto CA. et al, ICHE 2003;24:362-386.

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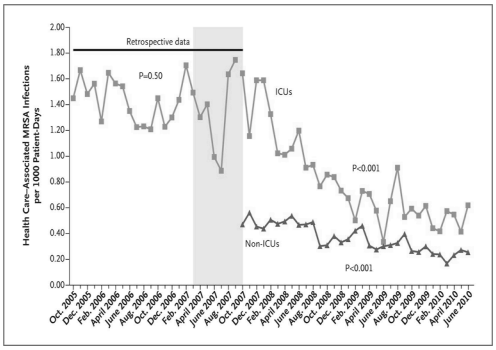
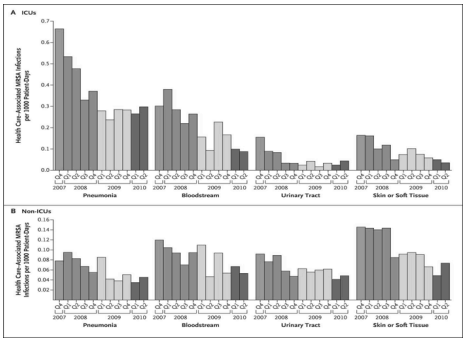
Nationwide Rates of Health Care–Associated Infections with MRSA in Veterans Affairs (VA) Facilities.



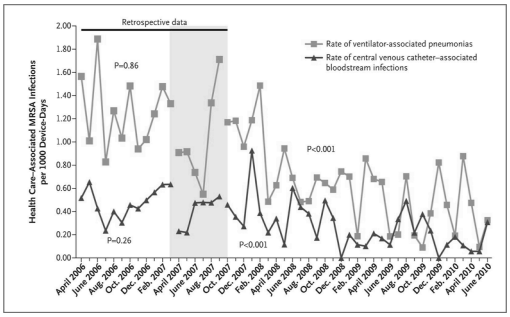
Jain R et al. N Engl J Med 2011;364:1419-1430

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



Jain R et al. N Engl J Med 2011;364:1419-1430

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



Jain R et al. N Engl J Med 2011;364:1419-1430

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

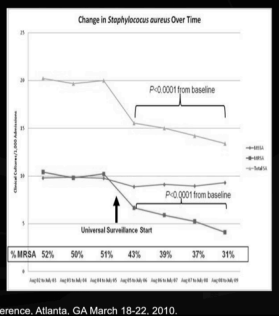
The rate of total clinical S. aureus (20.2 to 13.4/1,000 admissions) and MRSA (10.4 to 4.1/1,000 admissions) ($P \leq 0.001$), but MSSA did not change.

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.



Peterson LR et al., Abstract 73, Fifth Decennial Conference, Atlanta, GA March 18-22, 2010.

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

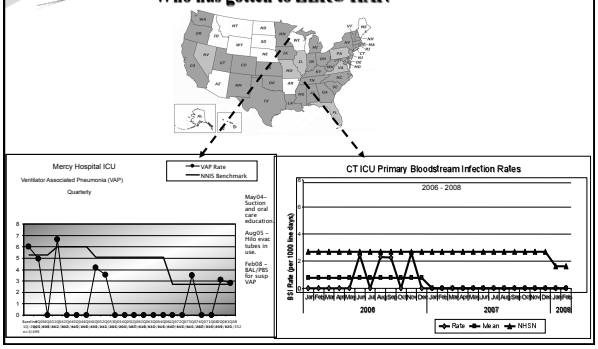
Epidemiological Category	Modeled Yearly Percent Change (95% Confidence Intervals), %[a]	*P* Value
All invasive MRSA infections		
Hospital-onset	−9.4 (−14.7 to −3.8)	.005
Health care–associated community-onset	−5.7 (−9.7 to −1.6)	.01
MRSA bloodstream infections		
Hospital-onset	−11.2 (−15.9 to −6.3)	.001
Health care–associated community-onset	−6.6 (−9.5 to −3.7)	<.001
Dialysis in last year	−6.4 (−11.4 to −1.1)[b]	.02
No dialysis in last year	−7.2 (−11.4 to −2.8)[b]	.006

[a] Multilevel model adjusted for age and race unless otherwise specified.
[b] Unadjusted multilevel model.

Kallen A., et al. JAMA 2010;304:641-647.

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

Who has gotten to ZERO HAI?



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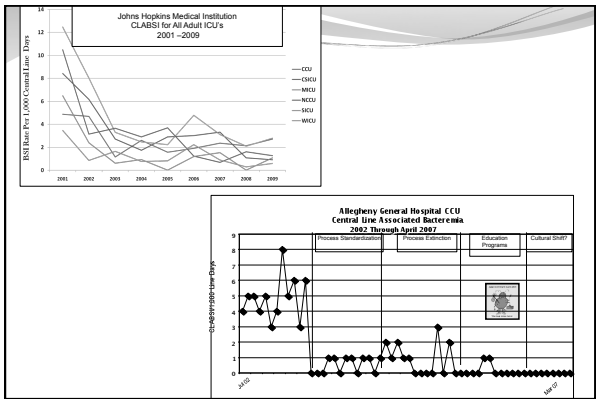

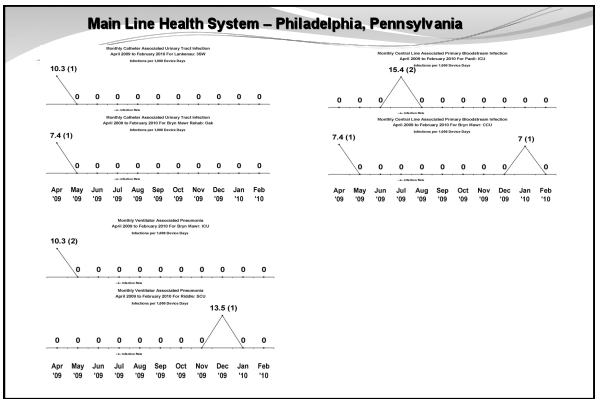

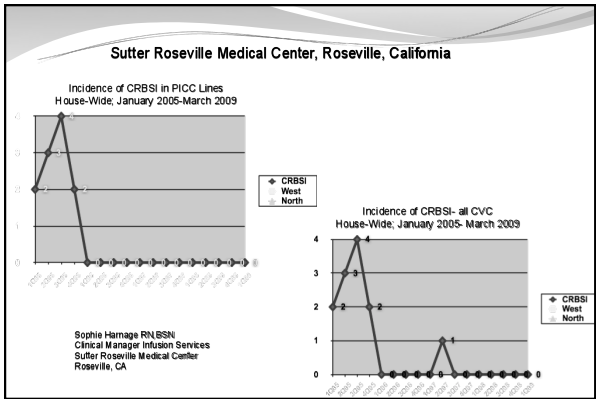

Conclusions

- 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

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