Technologic Innovations to Prevent Catheter-Related Bloodstream Infection

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Hosted by Bruce Gamage
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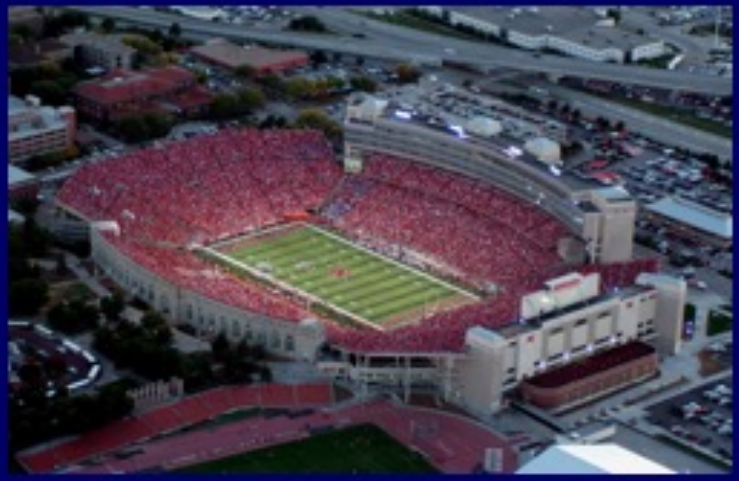
Nebraska


N
PACIFIC OCEAN
CANADA
Location Map of
NEBRASKA
Nebraska
PACIFIC OCEAN
ATLANTIC OCEAN
MEXICO
Gulf of Mexico
Map not to Scale
Copyright © Compare Infobase Pvt Ltd 2004-2005



Clinical Significance of CLA-BSI

- 78,000 central line-associated bloodstream infections (CLA-BSI) are estimated to occur yearly in United States hospitals and dialysis units.
- 2013 NHSN report from 4,567 US facilities, mean CLA-BSI rate in critical care units ranged from 0.0 – 3.0/1000 CVC d.
- CLA-BSI are associated with an estimated mortality rate of 12.3% and excess healthcare costs between $7,288 and $29,156 per episode.

Srinivasan A, et al. MMWR 60: 2011; CDC NHSN 2013 Data Summary; Umscheid CA, et al. Infect Control Hosp Epidemiol. 2011; 32:101-114. Scott RD. Division of Healthcare Quality Promotion, CDC, 2009.

International Nosocomial Infection Control Consortiu (INICC) report, data summary of 43 countries for 2007-2012. Device-associated module

Rosenthal VD, et al. AJIC 2014

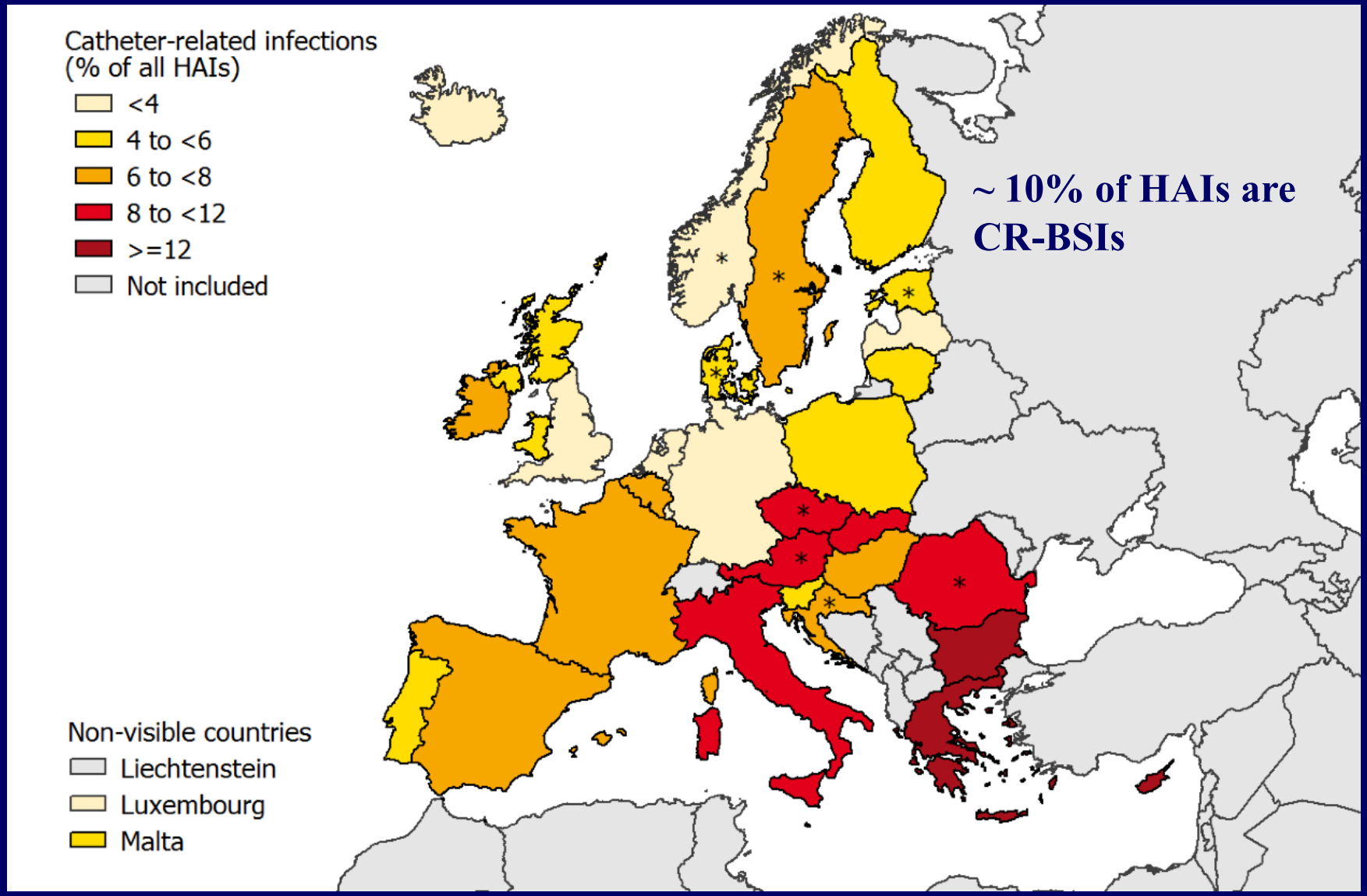
- **Countries Represented**: Argentina, Bolivia, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Cyprus, Dominican Republic, Ecuador, Egypt, El Salvador, Greece, Honduras, India, Iran, Saudi Arabia, Kosovo, Kuwait, Lebanon, Lithuania, Macedonia, Malaysia, Mexico, Mongolia, Morocco, Pakistan, Panama, Peru, Philippines, Poland, Puerto Rico, Romania, Russia, Serbia, Slovakia, Sudan, Thailand, Tunisia, turkey, United Arab Emirates, Uruguay, Venezuela, Vietnam

Comparison of device-associated health care–associated infection rates per 1,000 device days in the ICUs of the INICC (2007-2012) and the U.S. NHSN (2012)

DA-HAI per Type of ICU	INICC 2007-2012 pooled mean (95% CI)	U.S. NHSN 2012 pooled mean (95% CI)
Medical cardiac ICU		
CLABSI	3.5 (3.1-3.9)	1.1 (1.0-1.1)
CAUTI	5.9 (5.4-6.4)	2.2 (2.0-2.3)
VAP	11.5 (10.5-12.5)	1.0 (0.8-1.1)
Medical and surgical ICU		
CLABSI	4.9 (4.8-5.1)	0.9 (0.9-1.0)
CAUTI	5.3 (5.2-5.8)	1.2 (1.2-1.3)
VAP	16.5 (16.1-16.8)	1.1 (1.0-1.2)
Pediatric ICU		
CLABSI	6.1 (5.7-6.5)	1.4 (1.3-1.6)
CAUTI	5.6 (5.1-6.1)	2.7 (2.5-3.0)
VAP	7.9 (7.4-8.4)	0.8 (0.6-0.9)
Newborn ICU (1,501-2,500 g)		
CLABSI	4.8 (3.7-6.1)	0.6 (0.5-0.8)
VAP	10.7 (8.4-13.4)	0.2 (0.1-0.5)

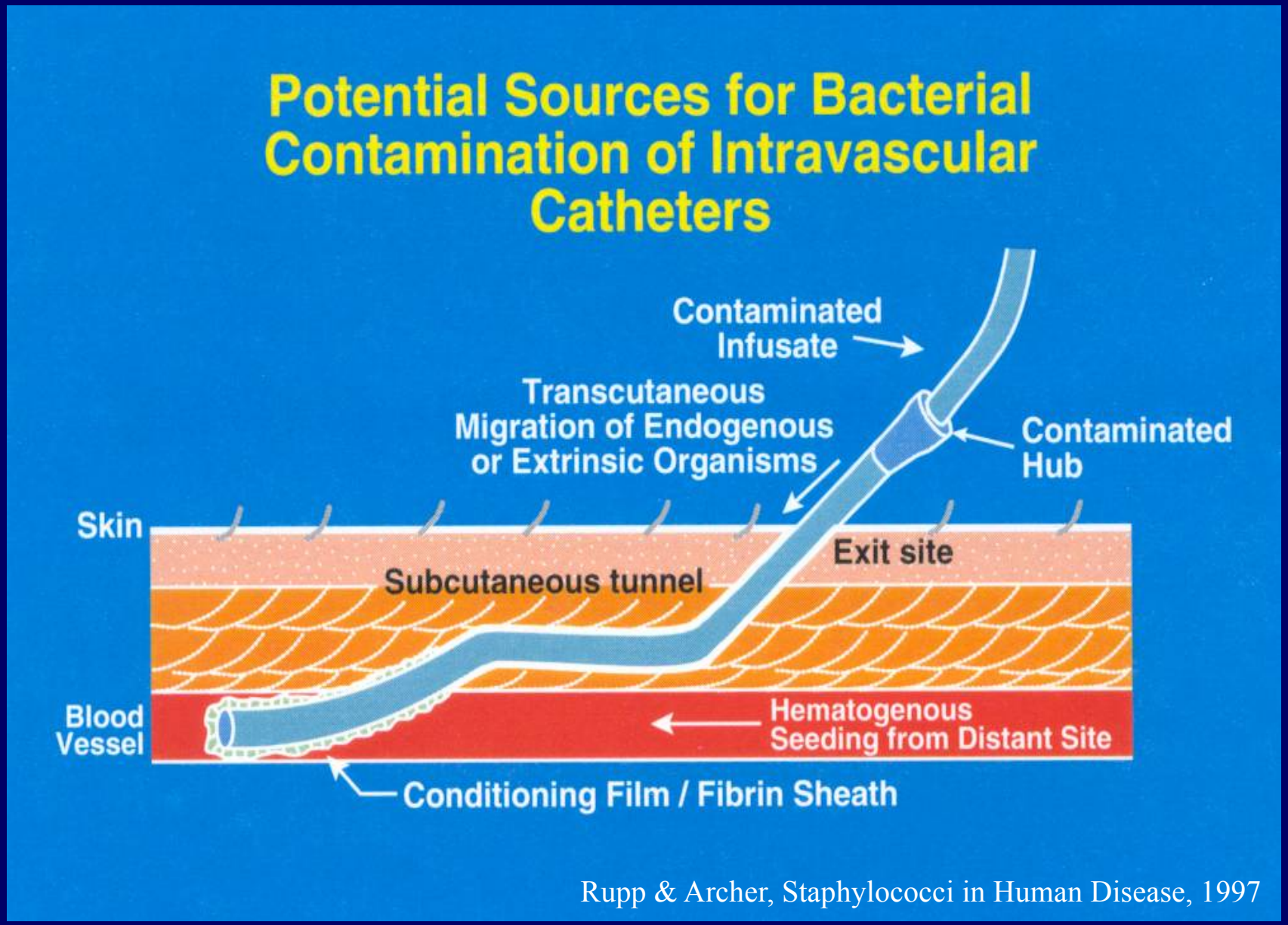
CAUTI, catheter-associated urinary tract infection; *CI*, confidence interval; *CLABSI*, central line–associated bloodstream infection; *DA-HAI*, device-associated health-care-associated infection; *ICU*, intensive care unit; *INICC*, International Nosocomial Infection Control Consortium; *NHSN*, National Healthcare Safety Network; *VAP*, ventilator-associated pneumonia.

Relative frequency of CR-BSI as a total of all HAIs by country (ECDC PPS 2011-2012)



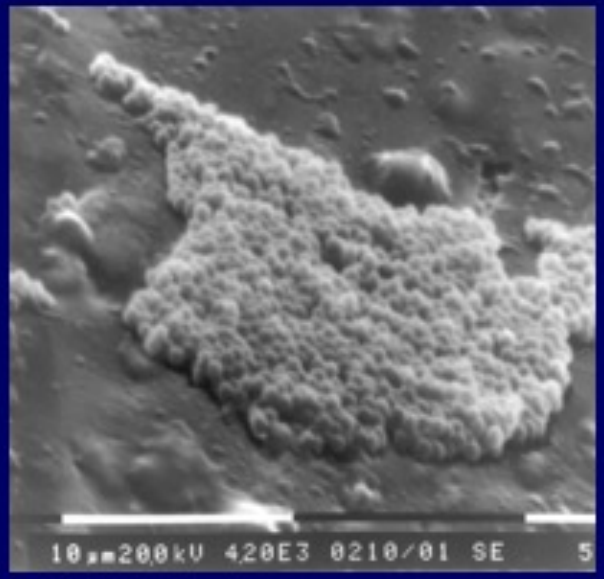
http://ecdc.europa.eu/en/healthtopics/Healthcare-associated_infections/database

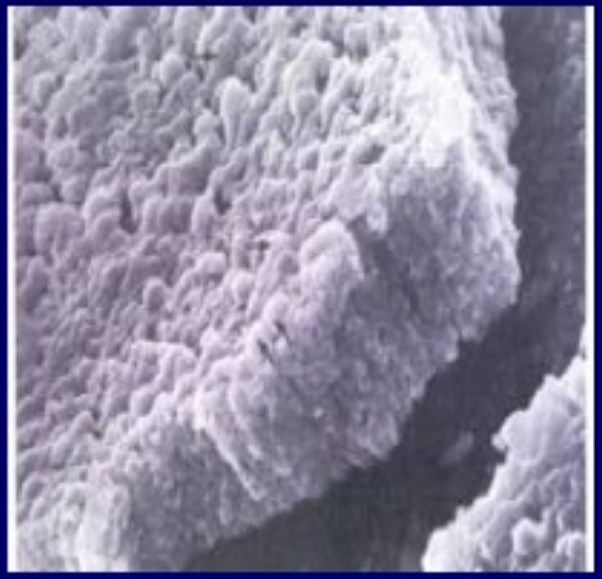
Pathogenesis of CVC-Associated BSI



Rupp & Archer, Staphylococci in Human Disease, 1997

Pathogenesis of CVC-Associated BSI





Mature biofilm-associated infection with diverse population of cells including "persistor cells" is very difficult to eradicate with catheter in place

Prevention of CR-BSI

Practice Associated Interventions

Practice Associated Interventions

- Education & Training
- Staffing Levels
- Insertion Procedures
  - Full Sterile Barriers & Checklist
- Post Insertion Care
  - Dressing Integrity
  - Aseptic Access Technique (scrub the hub)
  - Discontinuing unneeded catheters

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 28, 2006 VOL. 355 NO. 26

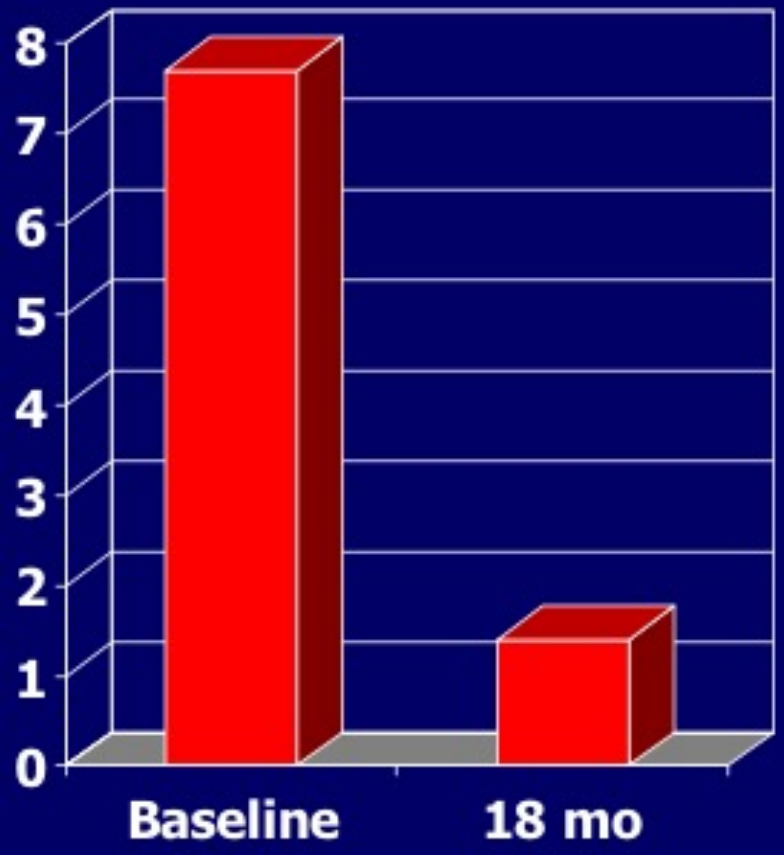
An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU

Peter Pronovost, M.D., Ph.D., Dale Needham, M.D., Ph.D., Sean Berenholtz, M.D., David Sinopoli, M.P.H., M.B.A., Haitao Chu, M.D., Ph.D., Sara Cosgrove, M.D., Bryan Sexton, Ph.D., Robert Hyzy, M.D., Robert Welsh, M.D., Gary Roth, M.D., Joseph Bander, M.D., John Kepros, M.D., and Christine Goeschel, R.N., M.P.A.

Intervention in 108 ICUs:

- Daily Goals Sheet
- Hand Hygiene
- Full Sterile Barrier Precautions
- Chlorhexidine Antiseptic
- Avoidance of the Femoral Site
- Removal of CVCs asap

Mean BSI/1000 CVC d



(P<0.002)

Nebraska Medical Center CVC Insertion Kit

The Nebraska Medical Center, 987400 Nebraska Medical Ce*, Omaha NE 68198-7400 Ph:402-559-4...

Patient Information

Patient Name	Sex	DOB
[redacted]	Female	6/25/1966

CVC Checklist Note signed] **L RN at 6/12/2014 6:28 PM**

Author: [redacted] RN — Author Type: Registered Nurse

Filed: 6/12/2014 6:28 PM — Note Time: 6/12/2014 6:27 PM — Cosigner: [redacted] RN at 6/12/2014 6:38 PM

Central Venous Catheter Checklist*

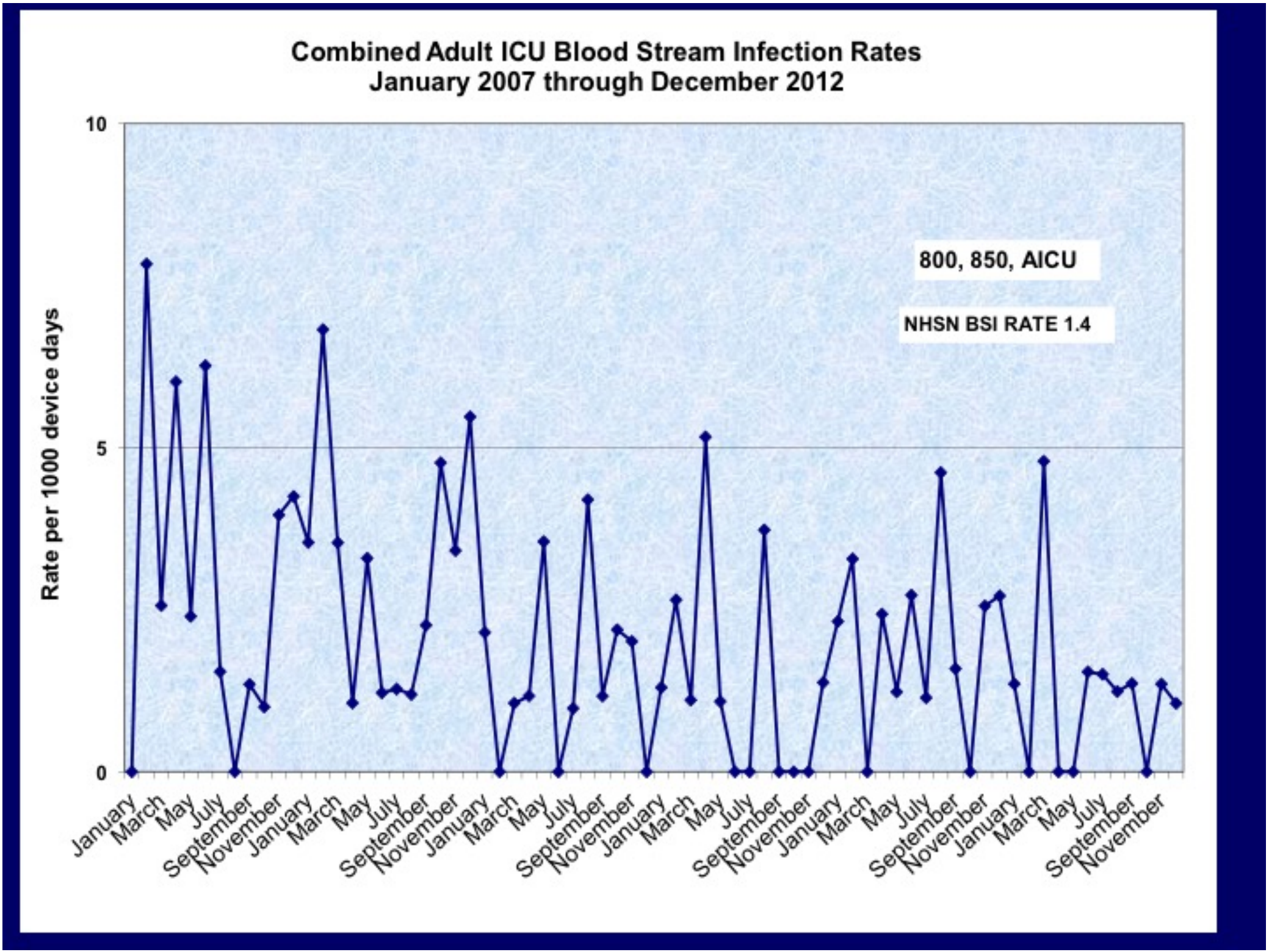
NAME: [redacted] MRN: [redacted]
Date of Birth: 6/25/1966 Gender: female

Unit / Room: 800 ICU
Type of line inserted: PICC insertion
Is the line tunneled or un-tunneled or port?
Reason for insertion: New indication
If suspected central line associated infection, was the central line exchanged over a guidewire? N/A
Name of person performing procedure: L Rouse RN
Occupation of inserter: PICC Team
Supervising Physician / Provider:
Inserter performed hand hygiene prior to line insertion: Yes
All personnel in room must wear cap, mask & gloves: Yes
Operator(s) don cap, mask & eye protection: Yes
Skin preparation: Chlorhexidine gluconate
If Chlorhexidine was not used, was there a contraindication for Chlorhexidine?
Was skin prep dry at time of first puncture? (If not directly observed, ask inserter) Yes
Operator(s) don sterile gown & sterile gloves? Yes
Drape site with full body sterile drapes (head to toe): Yes
Sterile field maintained throughout procedure: Yes
Did the insertion attempt result in a successful central line placement? No
Dressing applied: Yes
Observer was present throughout the procedure? Yes

Comments (extenuating circumstances, breaks in protocol, rationale for rewire): _____

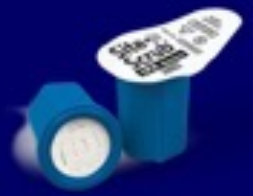
Observer Signature: [redacted], RN 6:27 PM 6/12/2014

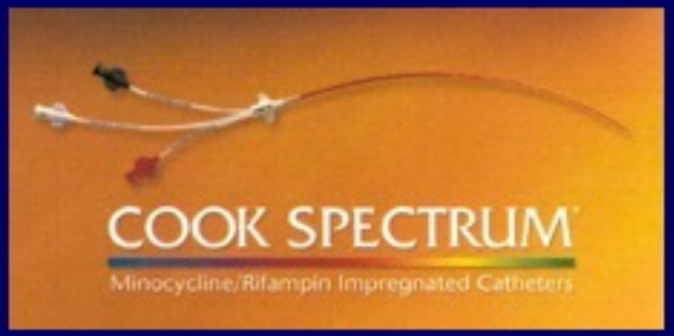
* Responses in Bold/Red are required elements of the CLABSI prevention bundle


Combined Adult ICU Blood Stream Infection Rates
January 2007 through December 2012
Rate per 1000 device days
10
5
0
800, 850, AICU
NHSN BSI RATE 1.4
January
March
May
July
September
November

What if Practice Measures Aren't Working??????

Prevention of CR-BSI
Technologic Innovations





Behavioral Change vs. Technology

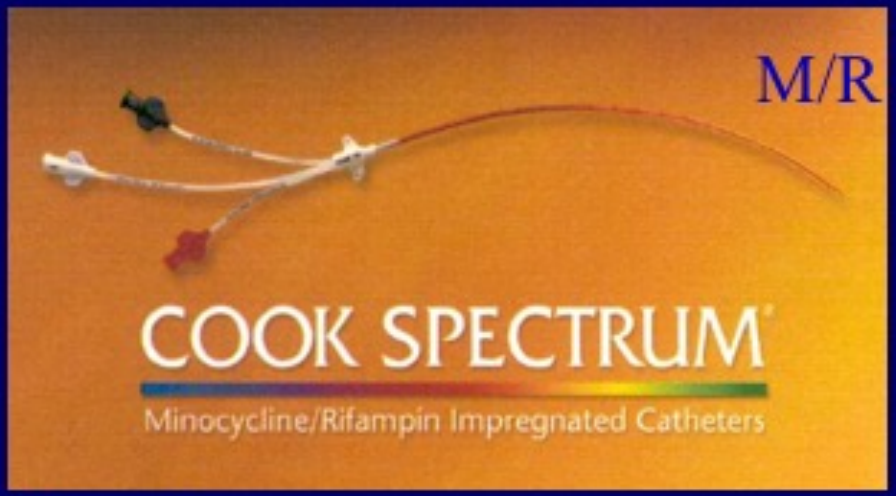
"If you can choose between education and influencing human behavior or introduction of a gizmo, choose the gizmo everytime."

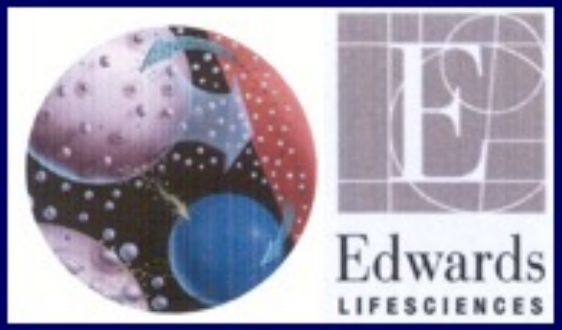
Bob Weinstein

Commercially Available Antimicrobial Central Venous Catheters

CHG/SS

ARROWgard Blue PLUS®
Central Venous Catheters



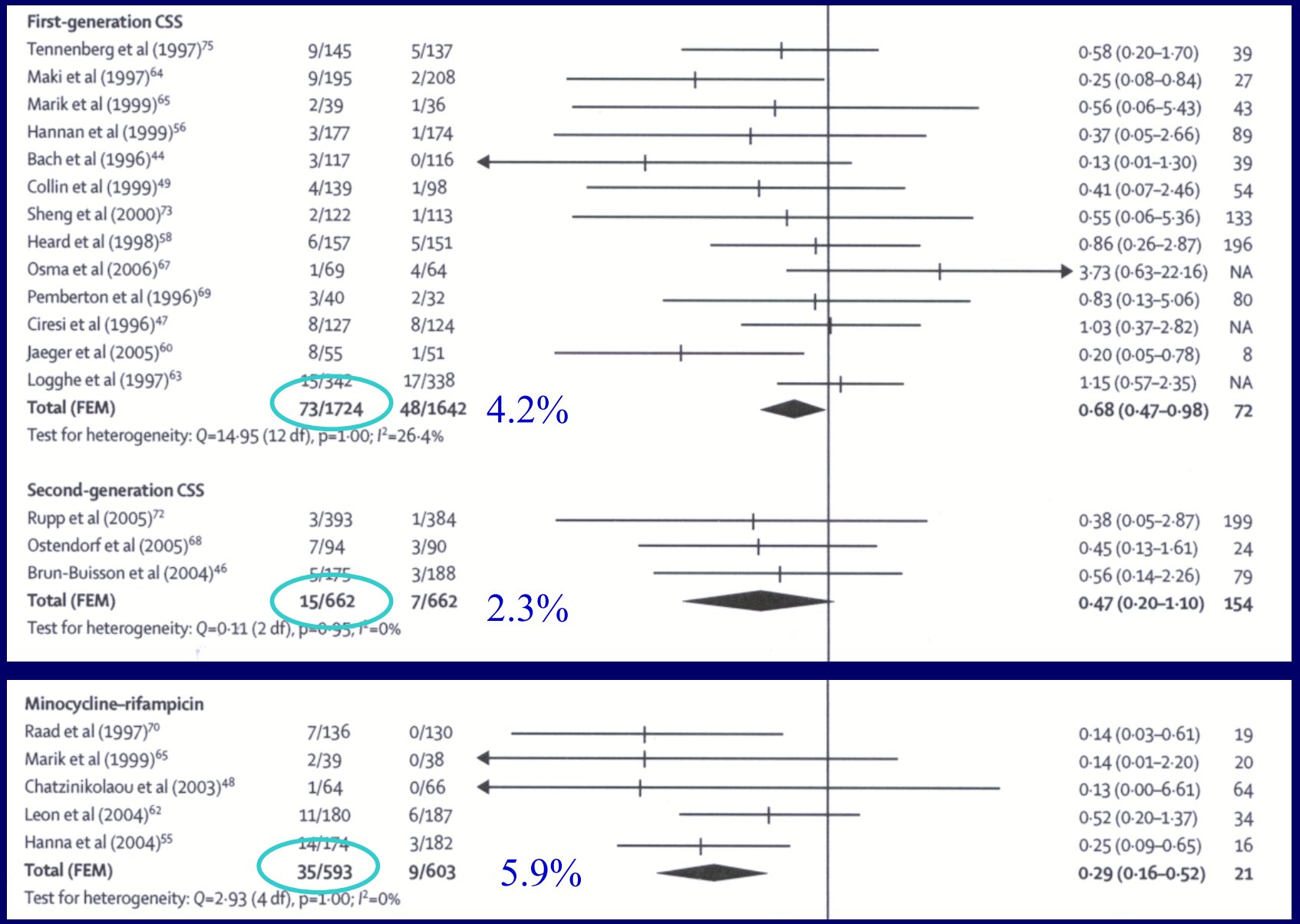


Silver/Platinum/
Carbon (Silver
Iontophoretic; Vantex)

Hydrocath Assure (BD)
Benzalkonium
AMC Thromboshield (Edwards)
Benzalkonium Heparin

Multistar
Miconazole/Rifampin
(Vygon)

Do antimicrobial-coated catheters prevent BSI?



0.68

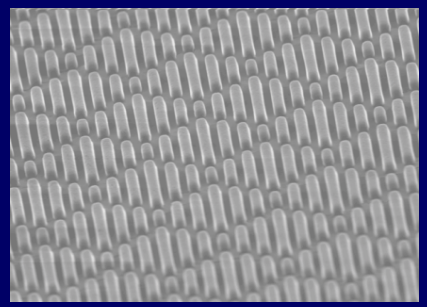
0.47

0.29

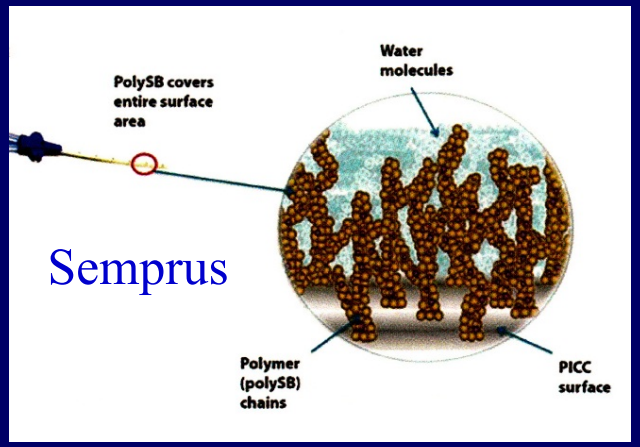
Casey AL, et al. Lancet ID, 2008

Novel Antimicrobial Coatings & CVCs

- 5-Fluorouracil
- Rifampin-Miconazole
- Silver Nanoparticles
- Chlorhexidine/Minocycline/Rifampin
- Gentian violet/Chlorhexidine
- Surface Pattern
  (Sharklet)



- Polymeric sulfobetaine (polySB)
- Heated CVCs



Preservation of Dressing Integrity

- Dressing disruption is a major risk factor for catheter-related infections

Table 5. Association between dressing disruption and catheter colonization or infection (unadjusted and adjusted marginal Cox model)

	Catheter Colonization ≥10³ colony-forming units/mL		Catheter-Related Bloodstream Infection		Major Catheter-Related Infection	
	HR (95% CI)	*p*	HR (95% CI)	*p*	HR (95% CI)	*p*
Unadjusted						
First	1.64 (1.13–2.39)	.01	3.15 (0.67–14.79)	.15	2.66 (0.50–14.26)	.25
Second disruption	1.52 (1.14–2.04)	.005	5.18 (1.85–14.48)	.002	4.31 (1.39–13.41)	.012
Final disruption	13.54 (10.17–18.04)	<.0001	14.90 (6.40–34.64)	<.0001	13.41 (5.17–34.75)	<.0001
Adjusted[a]						
First disruption	1.30 (0.90–1.87)	.16	2.65 (0.67–10.56)	.17	1.94 (0.50–7.48)	.33
Second disruption	1.16 (0.87–1.55)	.33	4.49 (1.71–11.79)	.002	3.26 (1.18–9.02)	.023
Final disruption[a]	13.99 (9.88–19.82)	<.0001	18.11 (5.66–57.88)	<.0001	12.51 (3.95–39.62)	<.0001

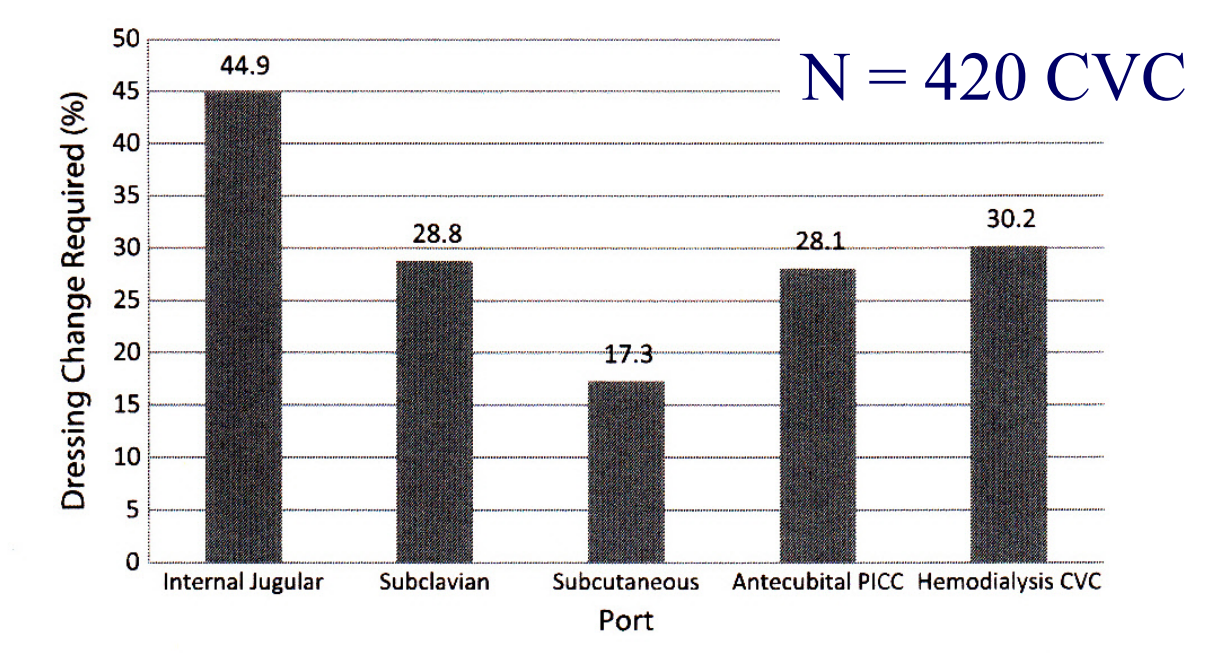
- The number of dressing disruptions was related to increased risk of colonization and bloodstream infection (P<0.001)

Timsit, et al. Crit Care Med 2012

Hospital-wide assessment of compliance with central venous catheter dressing recommendations

Mark E. Rupp MD [a,b,*], Kyle Cassling BA [a], Hayley Faber BS [a], Elizabeth Lyden MS [c], Kate Tyner RN [b], Nedra Marion RN [b], Trevor Van Schooneveld MD [a,b]

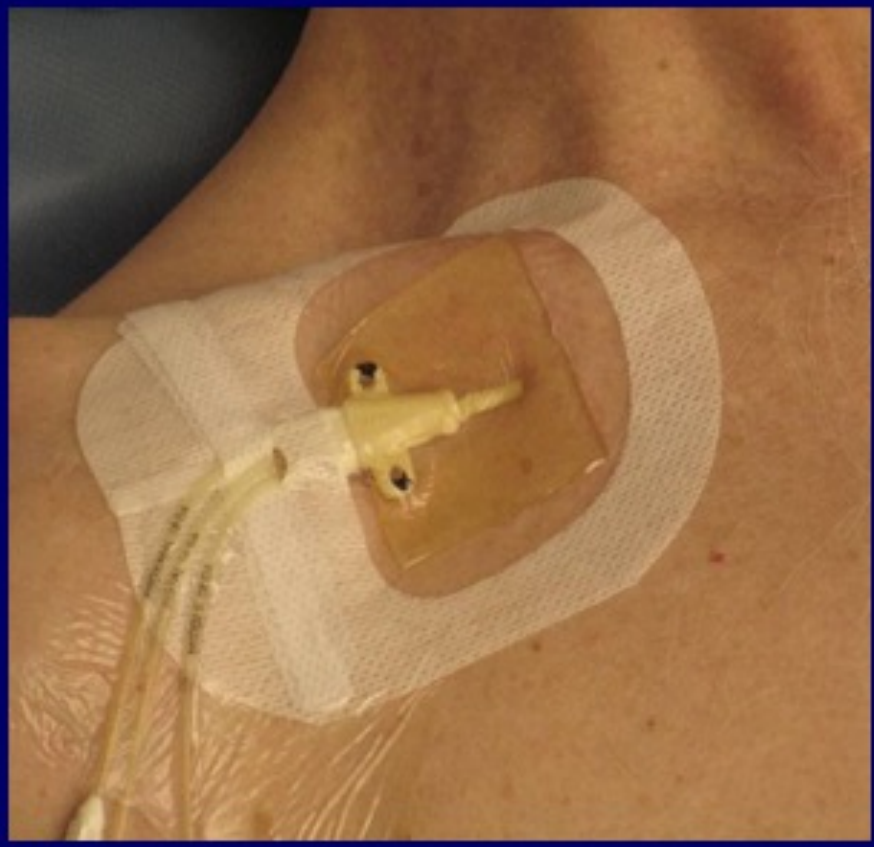
AJIC 2013



- On any given day approximately 31% of dressings were suboptimal and in need of change
- Reasons: 69% blood under dressing, 25.4% edge lift, 5.4% moisture under dressing

Chlorhexidine Impregnated CVC Dressings

"Biopatch"

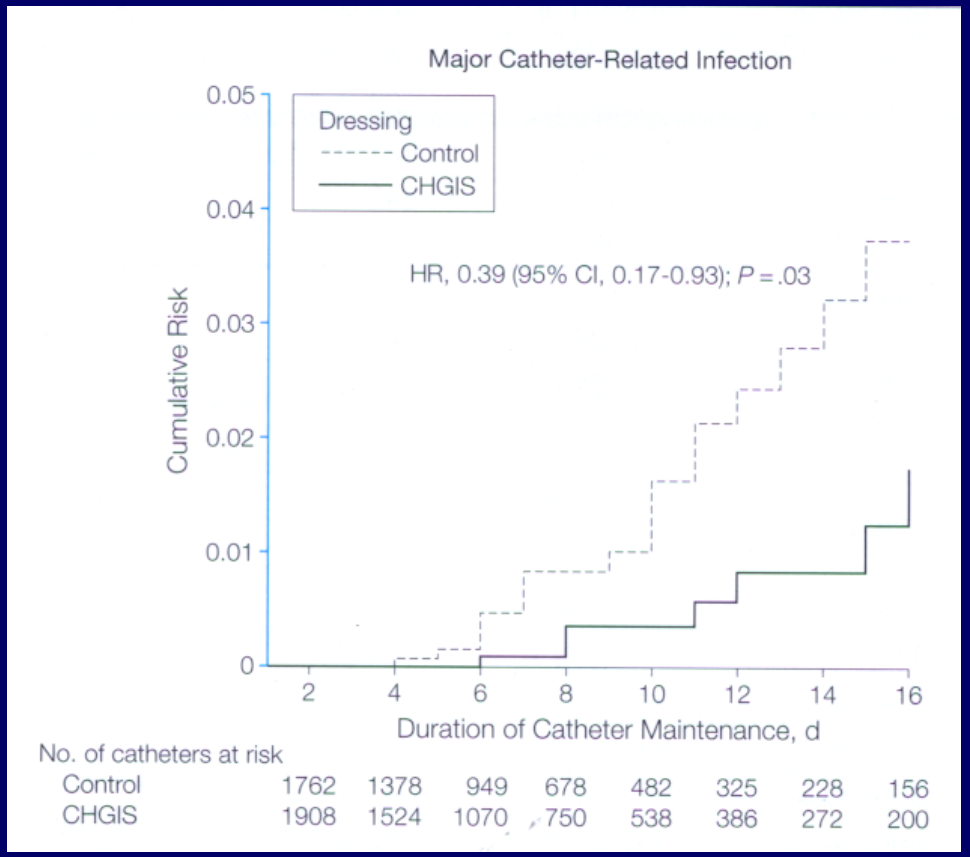


"Tegaderm CHG"

Chlorhexidine-Impregnated Sponges and Less Frequent Dressing Changes for Prevention of Catheter-Related Infections in Critically Ill Adults

A Randomized Controlled Trial

Timsit, et al. JAMA, 2009

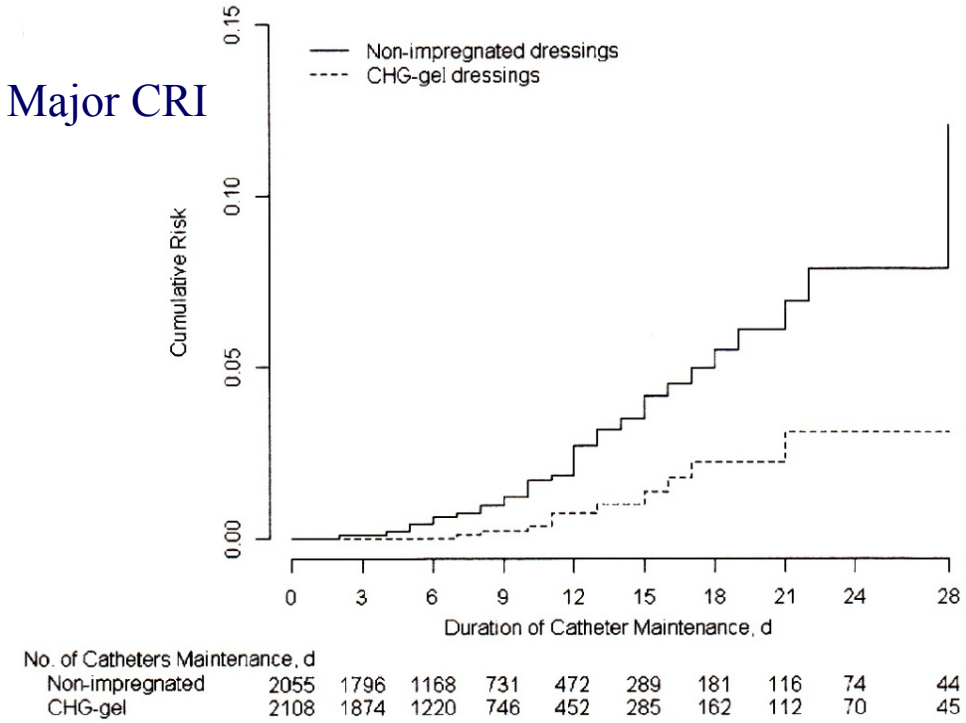


- CR-BSI: 1.4/1000 CVC d vs 0.4/1000 CVC d (P<0.005)
- No significant difference between 3d and 7d dressing changes
- Full sterile barrier precautions used
- Site prep with 4% povidone-iodine soln & PI/Etoh

Randomized Controlled Trial of Chlorhexidine Dressing and Highly Adhesive Dressing for Preventing Catheter-related Infections in Critically Ill Adults

Timsit, et al. Crit Care Med, 2013

Major CRI



- CR-BSI: 1.3/1000 CVC d vs 0.5/1000 CVC d (P= 0.02)
- Major-CRI: 2.1/1000 CVC d vs 0.7/1000 CVC d (P=0.0006)
- Highly adhesive dressings decreased dressing detachment rate (71.9% vs 64.3%; P<0.0001) but increased rate of colonization HR 1.65, 95%CI 1.21-2.26, P =0.0016)

Scrub the Hub!

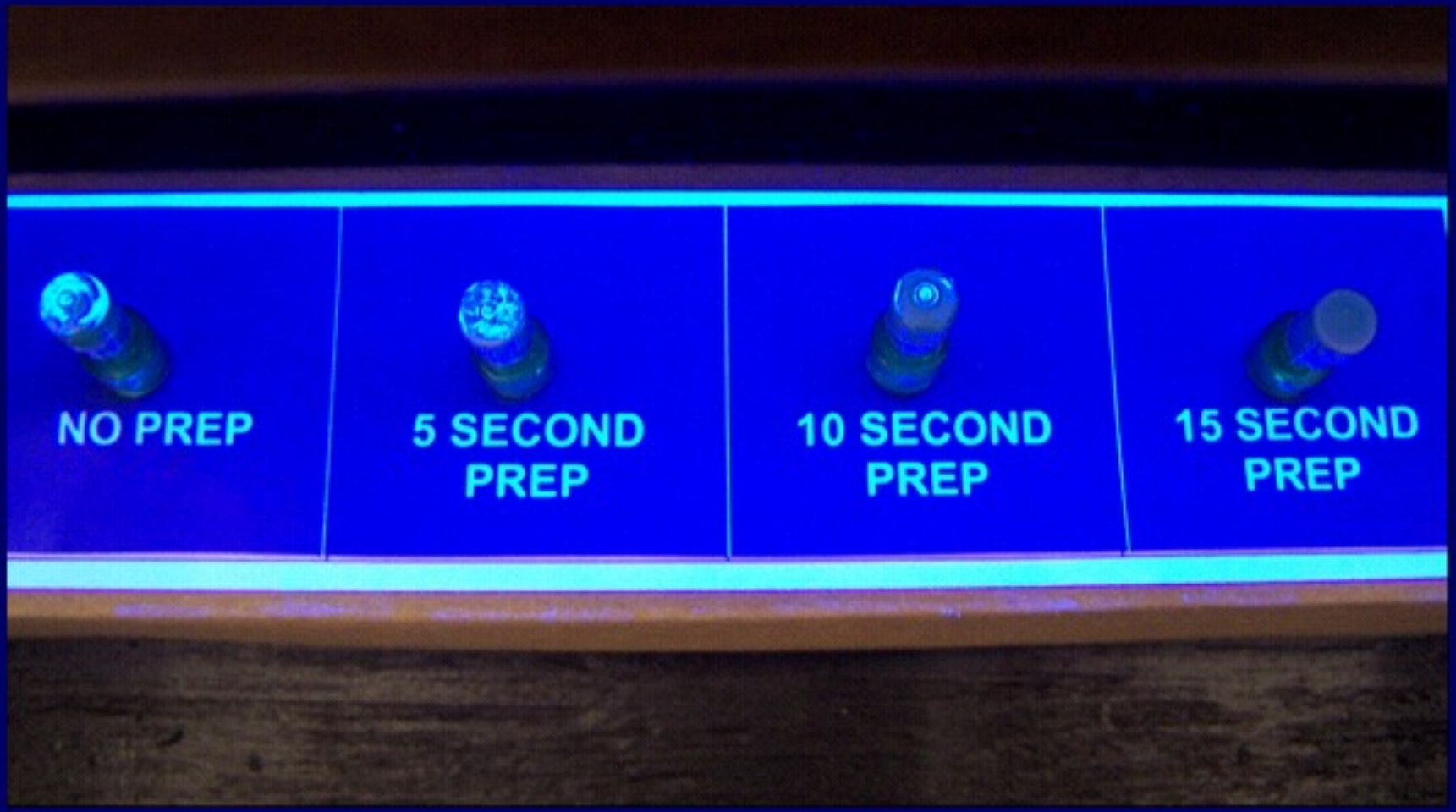
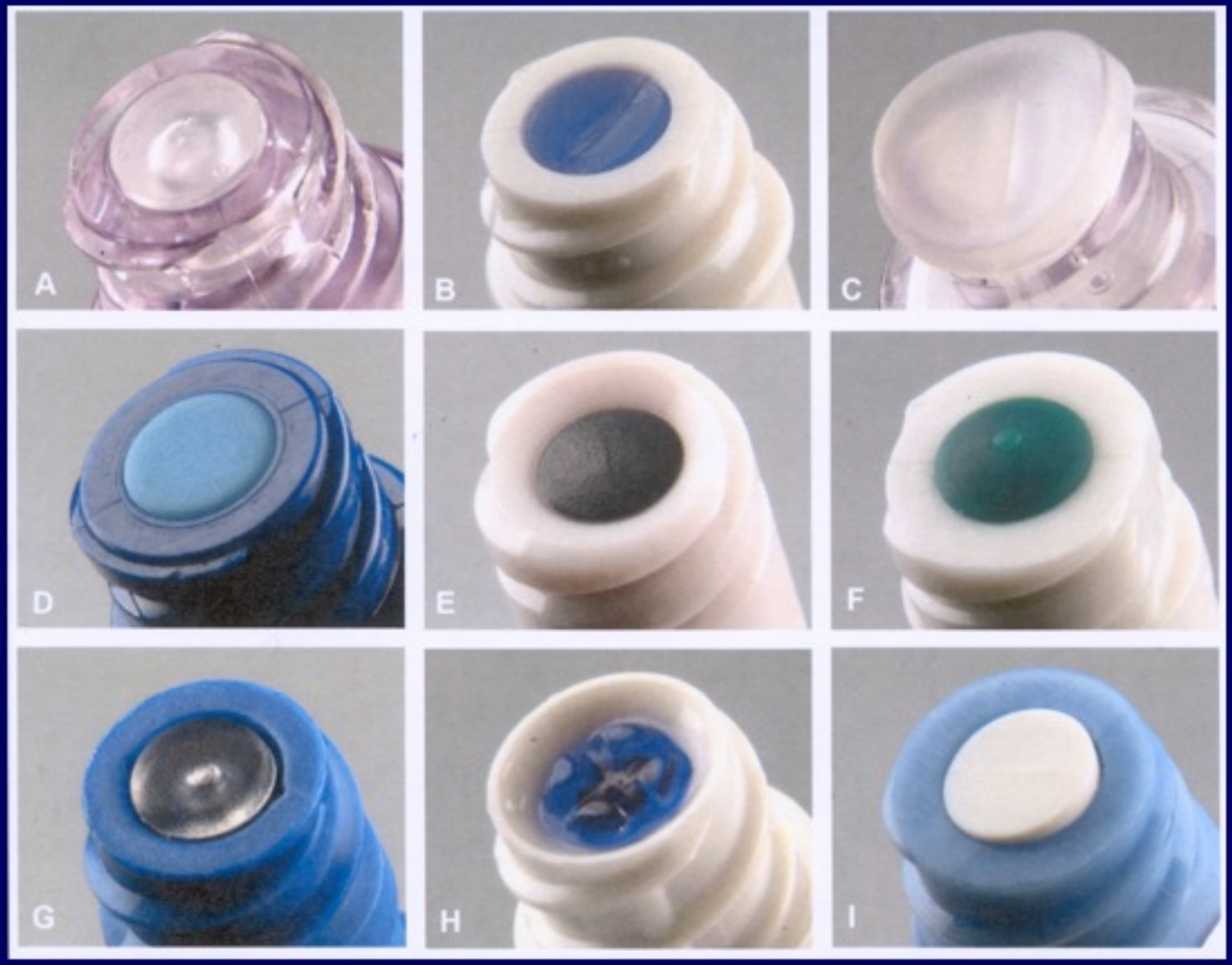


Figure: Courtesy Kristina Bryant, Kosair Children's Hosp

Not All Mechanical Valves are Created Equal



Needleless Connector Valves Linked to Increased CLA-BSI

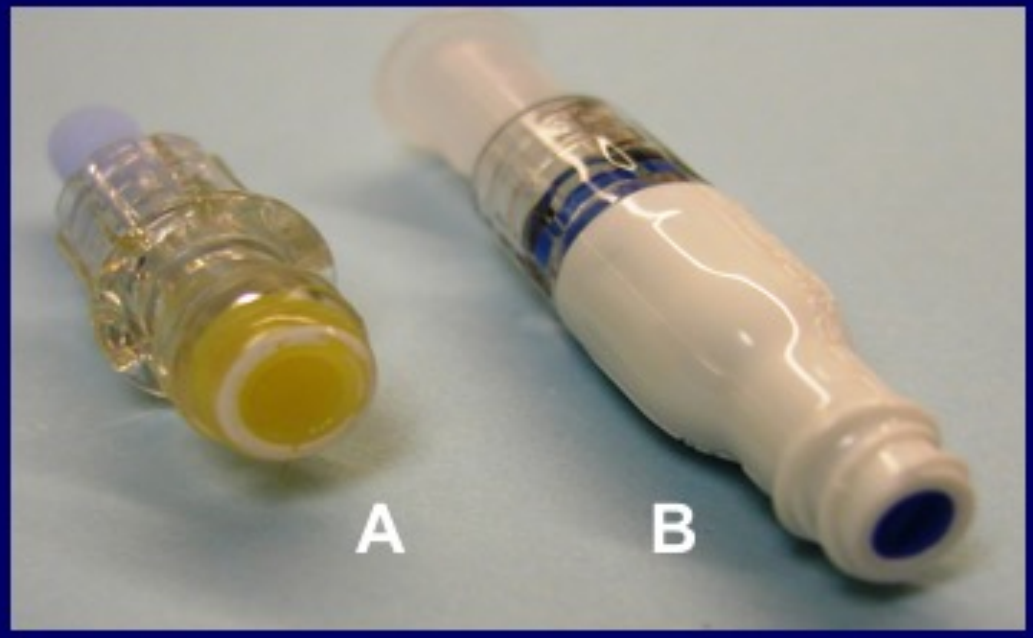
- Maragakis: ICHE, 2006
- Rupp: Clin Infect Dis, 2007
- Salgado: ICHE, 2007
- Field: ICHE, 2007
- Toscano: AJIC, 2009
- Jarvis: Clin Infect Dis, 2009

(Figure from Jarvis, Infect Control Today, 2010)

Outbreak of Bloodstream Infection Temporally Associated with the Use of an Intravascular Needleless Valve

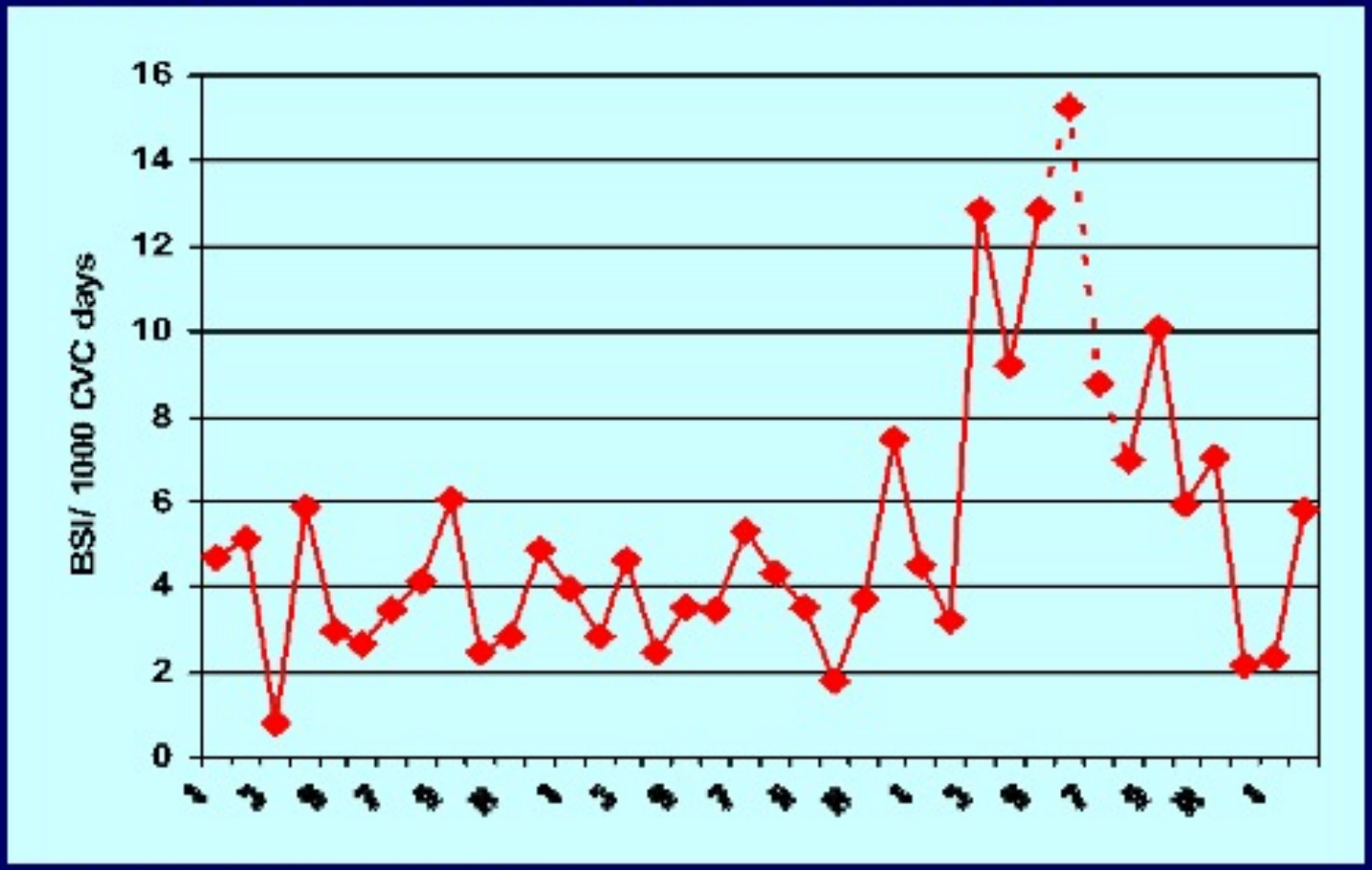
Mark E. Rupp, Lee A. Sholtz, Dawn R. Jourdan, Nedra D. Marion, Laura K. Tyner, Paul D. Fey, Peter C. Iwen and James R. Anderson

Clin Infect Dis 2007



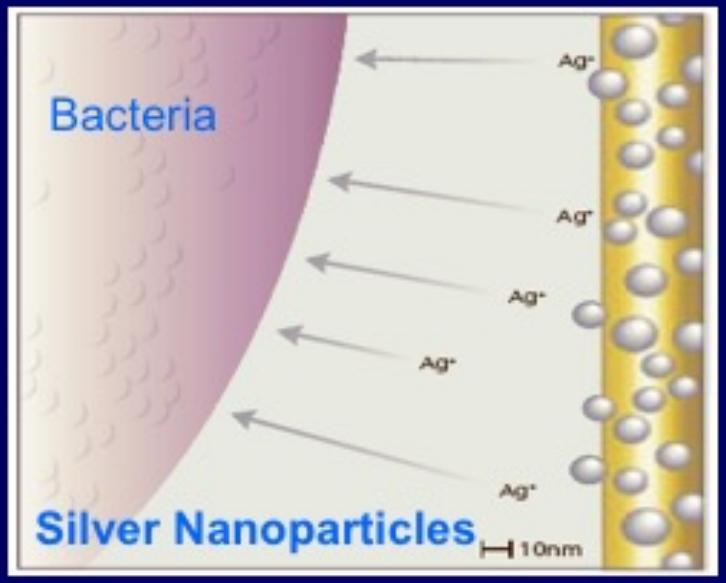
A: Interlink IV Access System, Baxter
B: SmartSite Plus, Alaris Medical Systems

BSI Critical Care Units



8 critical care areas, 132 beds.
Baseline: 38,250 CVC days, rate 3.87/1000 CVC d
Outbreak: 10,340 CVC d, rate 10.64/1000 CVC d
(2.82 fold increase) ($p < 0.0001$)
Post removal: rate 5.59/1000 CVC d ($p= 0.02$)

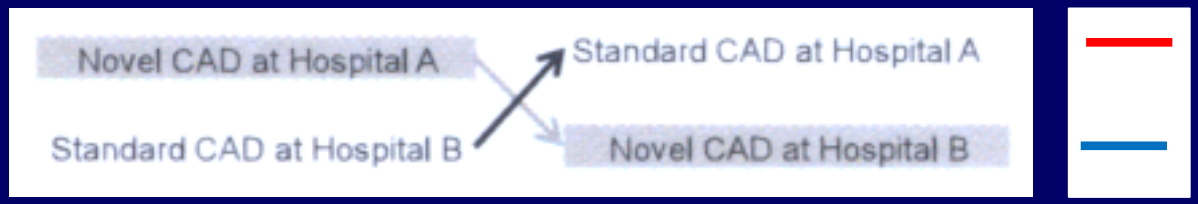
Silver coated connector valves

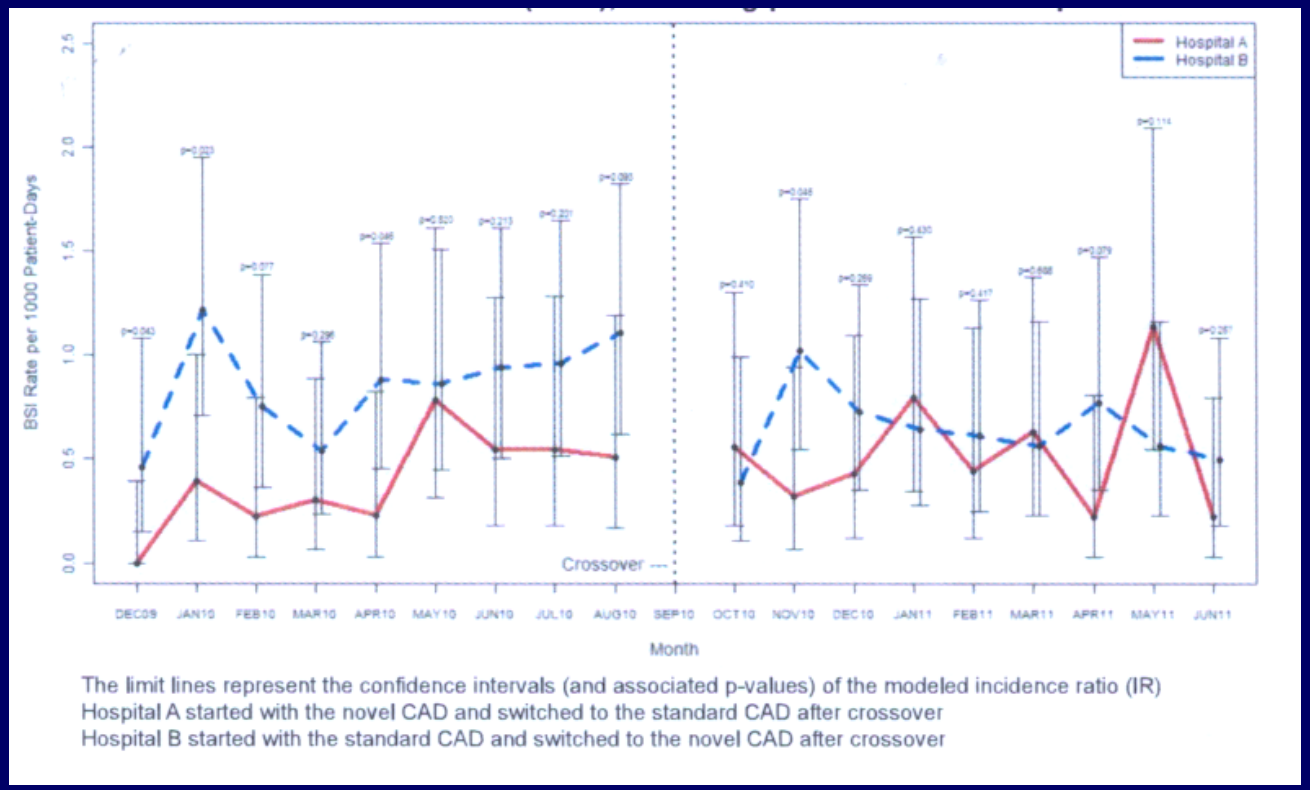


- 2 silver coated IV connector valves on the market. Very little clinical data re: effect on colonization of catheters or Bloodstream infection

Comparison of a Novel Silver-Coated Needleless Connector and a Standard Needleless Connector for the Prevention Of CLA-BSI

JT Jacob, et al. ICHE, 2015



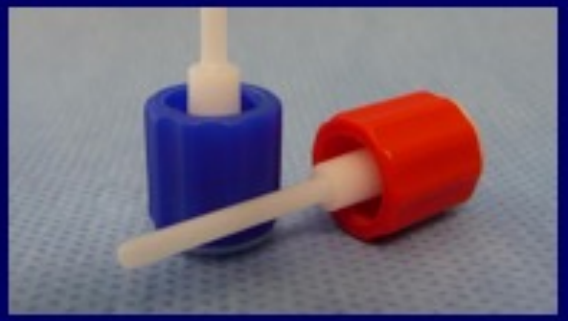


The limit lines represent the confidence intervals (and associated p-values) of the modeled incidence ratio (IR)
Hospital A started with the novel CAD and switched to the standard CAD after crossover
Hospital B started with the standard CAD and switched to the novel CAD after crossover

CLA-BSI rate:
1.79/1000 CVC d vs
1.21/1000 CVC d

IR = 0.68 [95% CI 0.52-0.89] P = 0.005

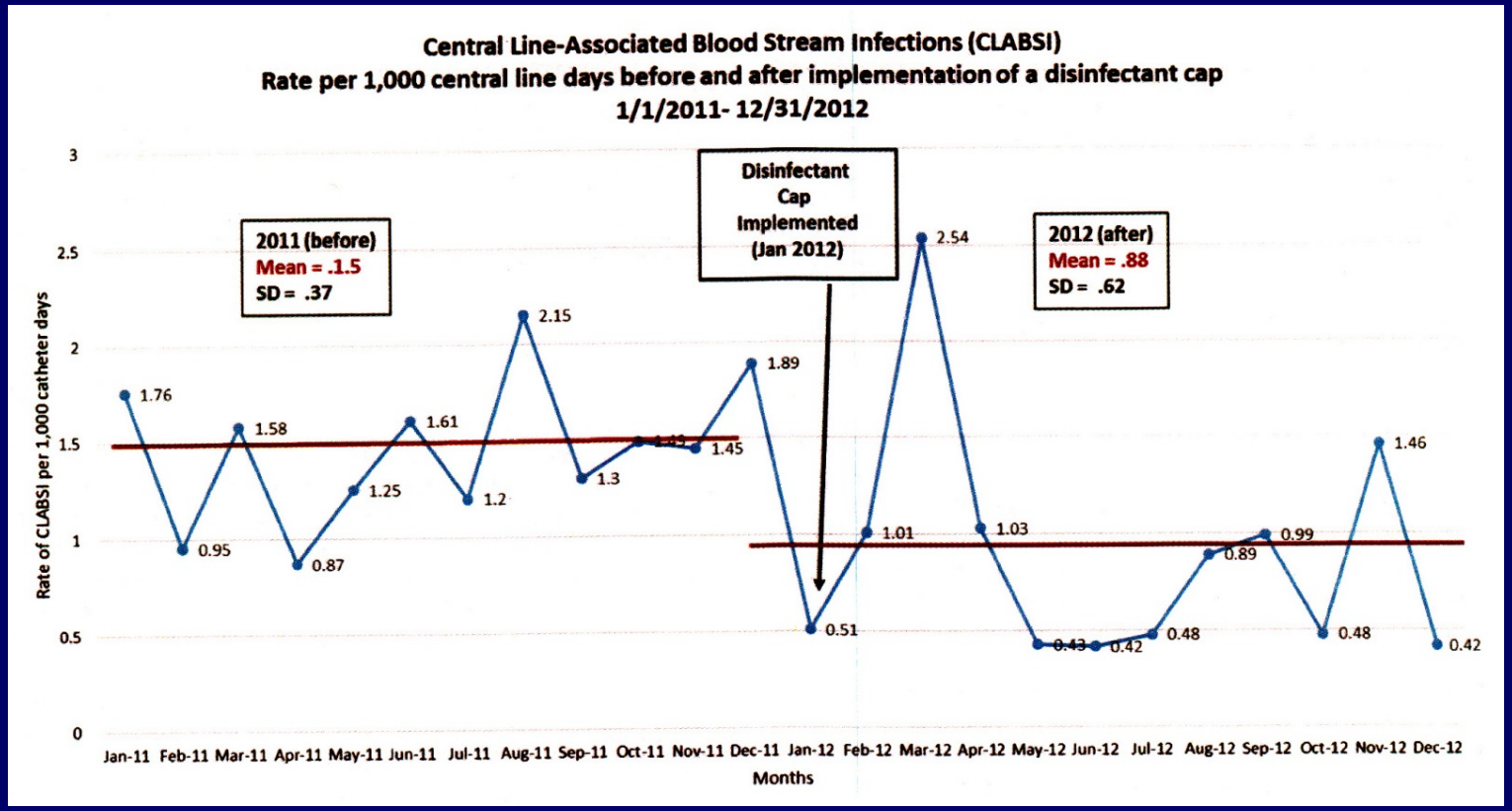
Antiseptic Caps



Impact of universal disinfectant cap implementation on central line–associated bloodstream infections

Katreena Collette Merrill RN, PhD [a,*], Sharon Sumner RN, BS [b], Lorraine Linford RN, BS, CNSC [c], Carrie Taylor RN, MS, CIC [b], Christopher Macintosh RN, BS [d]

AJIC, 2014

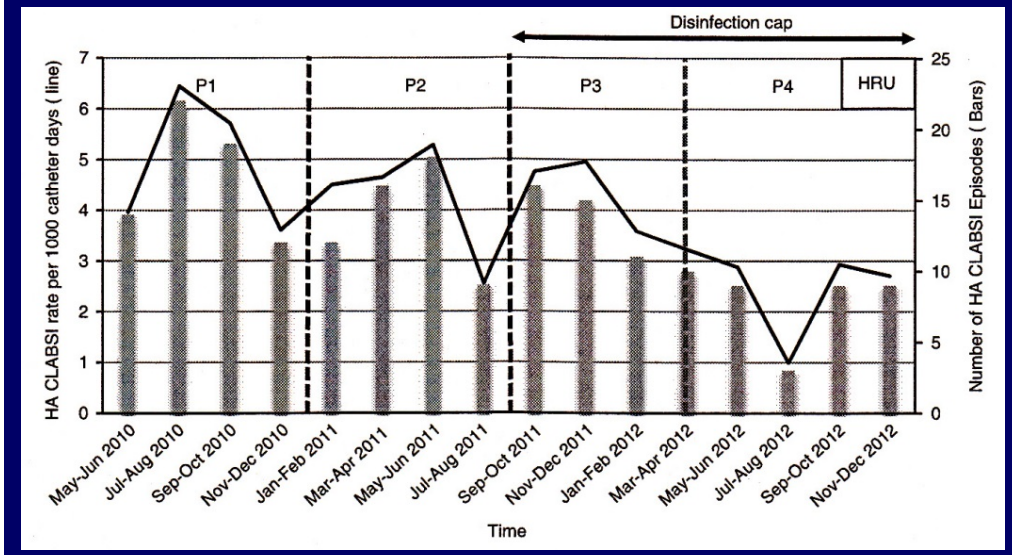


- CLA-BSI decreased from 1.5/1000 CVC d to 0.88/1000 CVC d, p = 0.004

Use of Disinfection Cap to Reduce Central-Line–Associated Bloodstream Infection and Blood Culture Contamination Among Hematology–Oncology Patients

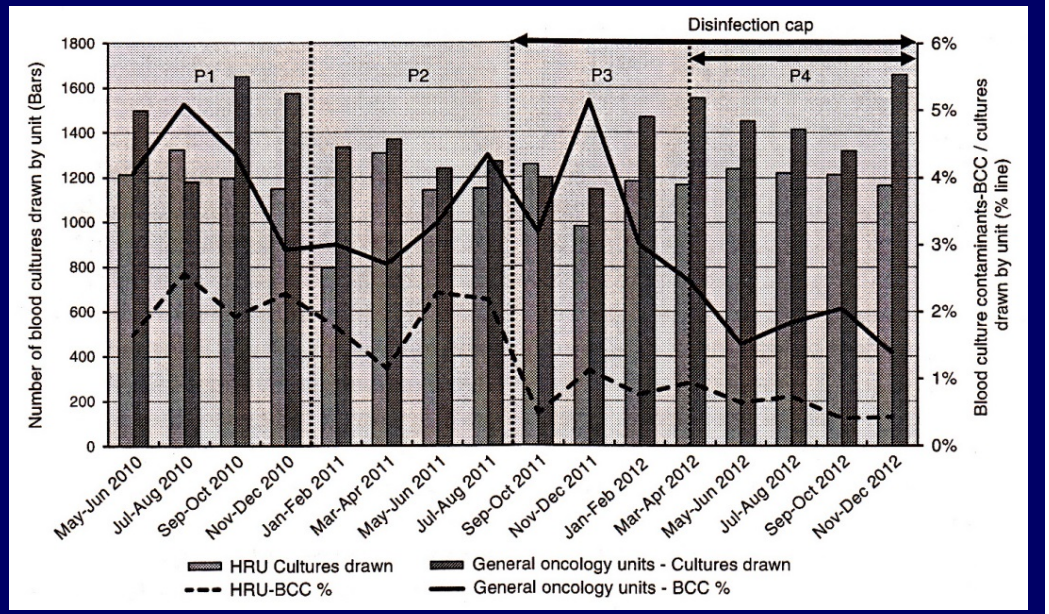
Mini Kamboj, MD;[1,3,4] Rachel Blair, MPH;[1] Natalie Bell, RN;[1,2] Crystal Son, MPH;[1] Yao-Ting Huang, MPH, PhD;[3] Mary Dowling, MSN, RN;[2] Allison Lipitz-Snyderman, PhD;[5] Janet Eagan, RN, MPH, CIC;[1] Kent Sepkowitz, MD[1,3,4]

ICHE, 2015



CLA-BSI in high-risk pts: Rate per 1000 CVC d: 4.93, 4.22, 4.47, 2.34 (P1-P4 respectively)

Blood culture contamination rate by CoNS



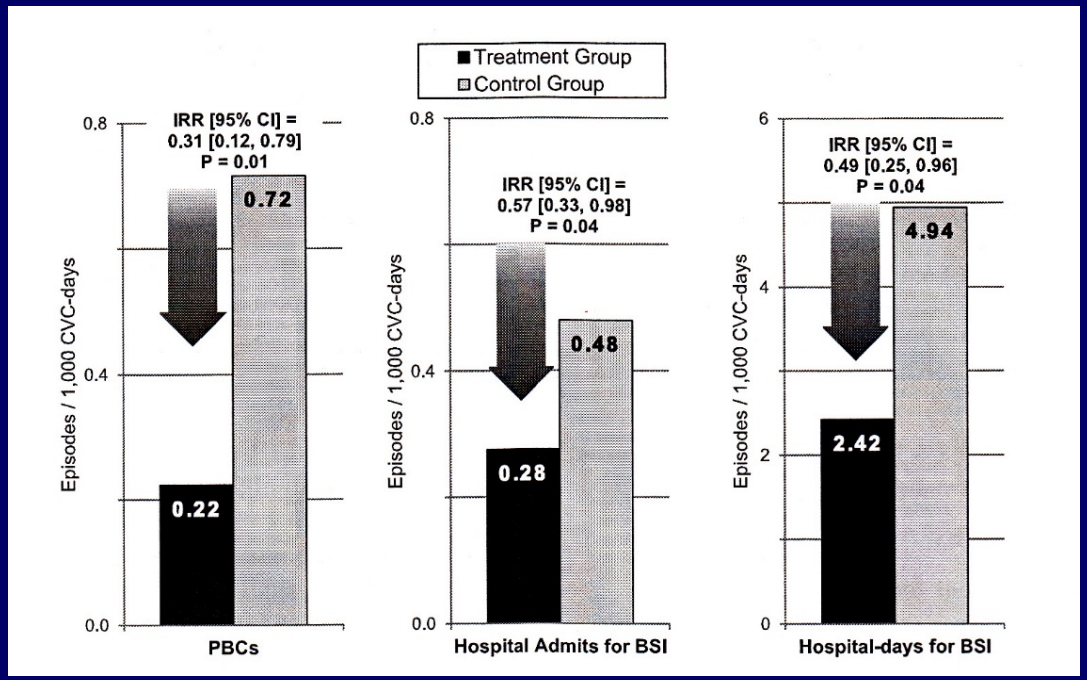
AJKD

Original Investigation

Dialysis Catheter–Related Bloodstream Infections: A Cluster-Randomized Trial of the ClearGuard HD Antimicrobial Barrier Cap

Jeffrey L. Hymes, MD,[1] Ann Mooney, MSN, RN, CNN,[2] Carly Van Zandt, MS,[2] Laurie Lynch, PhD,[3] Robert Ziebol, BS,[3] and Douglas Killion, MBA[3]

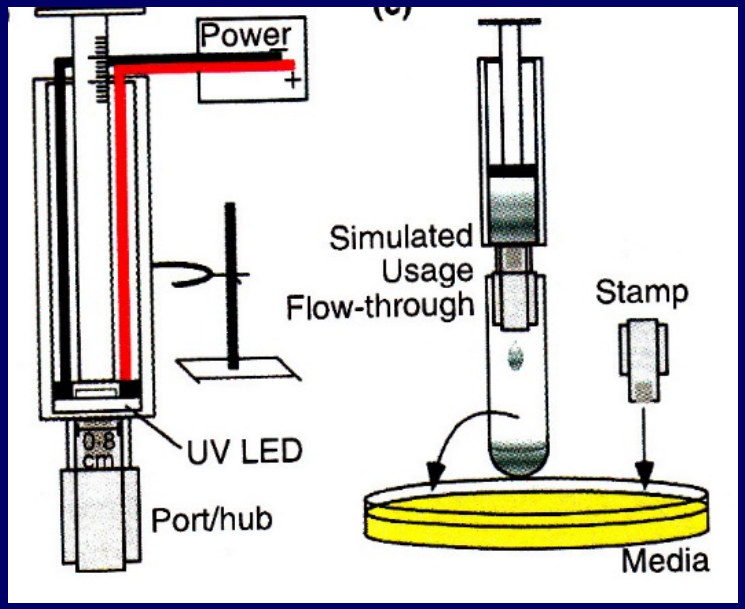
- 12 month, prospective, cluster-randomized study in 40 HD units.
- 2470 pts; 350,000 CVC days
- 56% lower (+) Bld Cx rate (p=0.01)
- 40% decrease in hospital admissions for BSI (p=0.04); 31% less hospital days (p=NS)

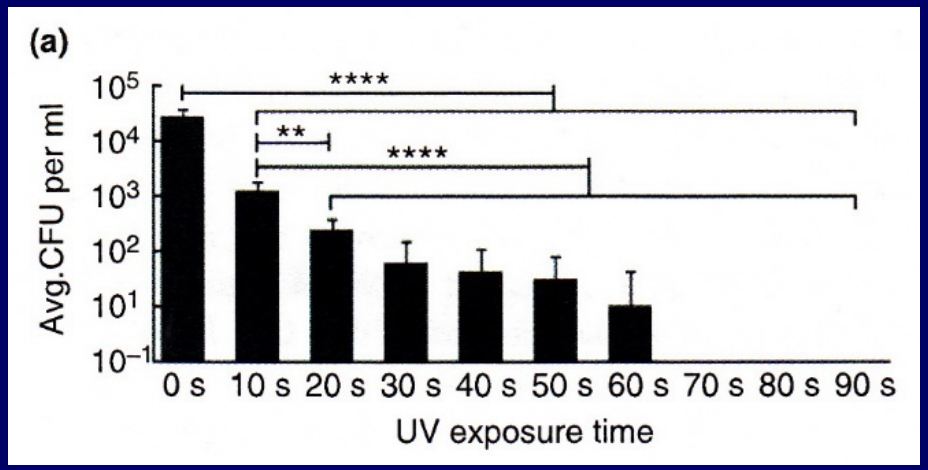


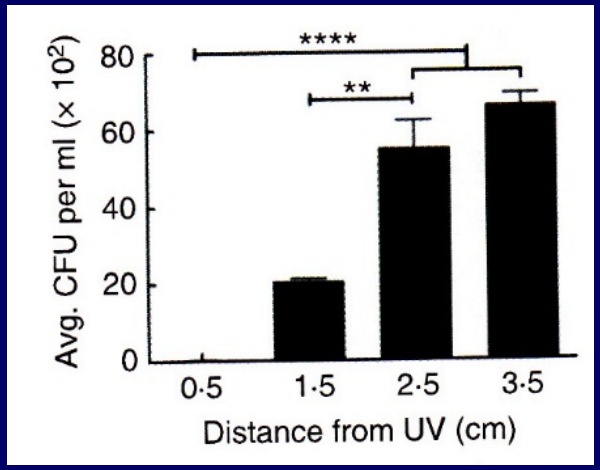
Results for last 6 months of the study

UV light-emitting diode disinfection

Hutchens, et al. J Applied Micro, 2015







- 285 nm UV LED effectively disinfected needleless connectors with 60s exposure at 0.5 cm.

Chlorhexidine Patient Bathing

Effectiveness of Chlorhexidine Bathing to Reduce Catheter-Associated Bloodstream Infections in Medical Intensive Care Unit Patients

Susan C. Bleasdale, MD; William E. Trick, MD; Ines M. Gonzalez, MD; Rosie D. Lyles, MD; Mary K. Hayden, MD; Robert A. Weinstein, MD

Arch Intern Med 2007

- Daily CHG baths in ICU patients decreased BSI from 16.8 to 6.4/1000 CVC d.

Effect of Daily Chlorhexidine Bathing on Hospital-Acquired Infection

Michael W. Climo, M.D., Deborah S. Yokoe, M.D., M.P.H., David K. Warren, M.D., Trish M. Perl, M.D., Maureen Bolon, M.D., Loreen A. Herwaldt, M.D., Robert A. Weinstein, M.D., Kent A. Sepkowitz, M.D., John A. Jernigan, M.D., Kakotan Sanogo, M.S., and Edward S. Wong, M.D.

NEJM 2013

- 28% decrease in bloodstream infections (P = 0.007)

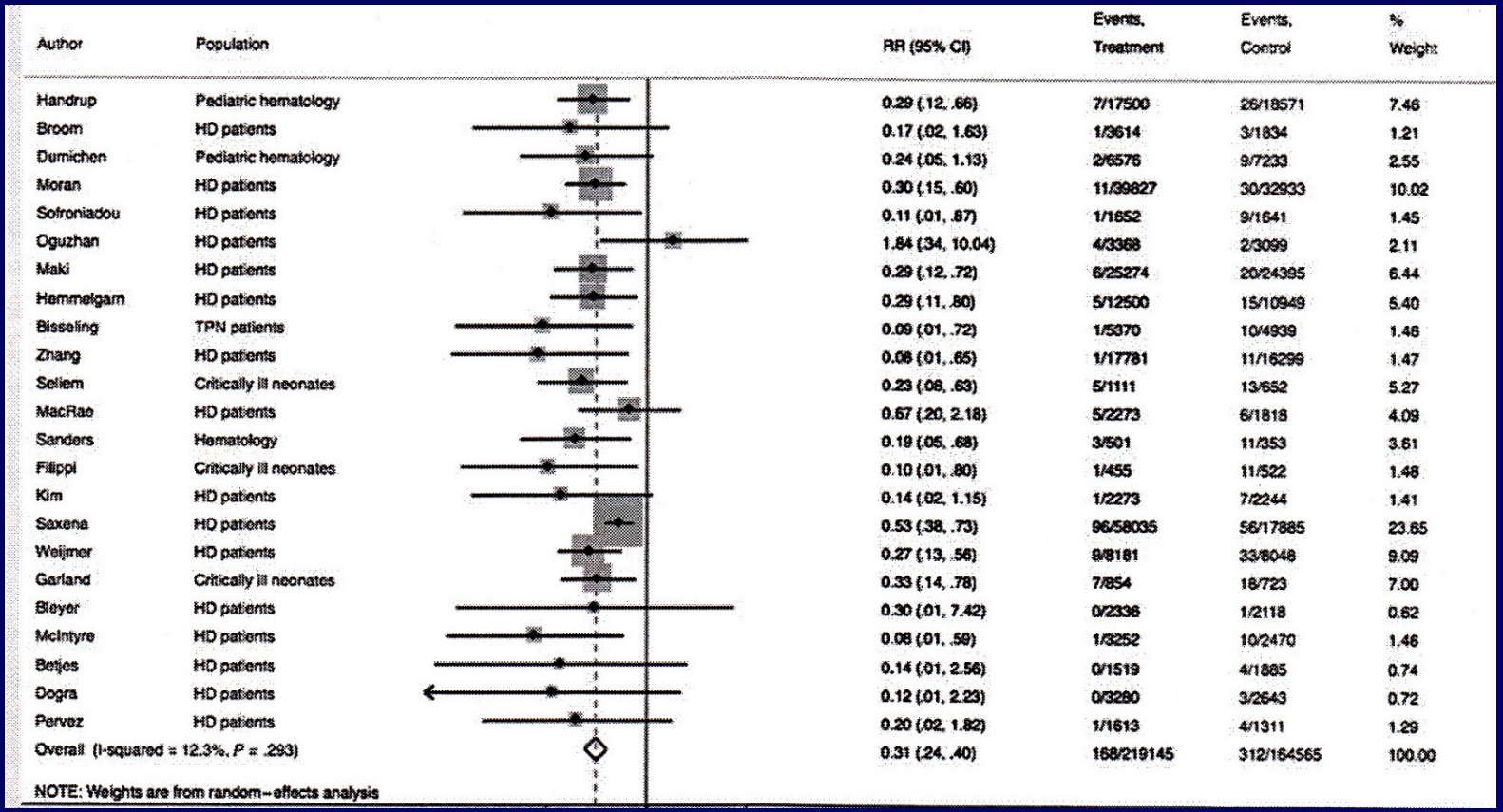
Targeted versus Universal Decolonization to Prevent ICU Infection

Susan S. Huang, M.D., M.P.H., Edward Septimus, M.D., Ken Kleinman, Sc.D., Julia Moody, M.S., Jason Hickok, M.B.A., R.N., Taliser R. Avery, M.S., Julie Lankiewicz, M.P.H., Adrijana Gombosev, B.S., Leah Terpstra, B.A., Fallon Hartford, M.S., Mary K. Hayden, M.D., John A. Jernigan, M.D., Robert A. Weinstein, M.D., Victoria J. Fraser, M.D., Katherine Haffenreffer, B.S., Eric Cui, B.S., Rebecca E. Kaganov, B.A., Karen Lolans, B.S., Jonathan B. Perlin, M.D., Ph.D., and Richard Platt, M.D., for the CDC Prevention Epicenters Program and the AHRQ DECIDE Network and Healthcare-Associated Infections Program*

NEJM 2013

- HR for BSI (intervention vs baseline): 0.99 vs 0.78 vs 0.56 (P = <0.001)

Anti-Infective Catheter Lock Solutions



Author	Population	RR (95% CI)	Events, Treatment	Events, Control	% Weight
Handrup	Pediatric hematology	0.29 (.12, .66)	7/17500	26/18571	7.46
Broom	HD patients	0.17 (.02, 1.63)	1/3614	3/1834	1.21
Dumichen	Pediatric hematology	0.24 (.05, 1.13)	2/6576	9/7233	2.55
Moran	HD patients	0.30 (.15, .60)	11/39827	30/32933	10.02
Sofroniadou	HD patients	0.11 (.01, .87)	1/1652	9/1641	1.45
Oguzhan	HD patients	1.84 (.34, 10.04)	4/3368	2/3099	2.11
Maki	HD patients	0.29 (.12, .72)	6/25274	20/24395	6.44
Hemmelgarn	HD patients	0.29 (.11, .80)	5/12500	15/10949	5.40
Bisseling	TPN patients	0.09 (.01, .72)	1/5370	10/4939	1.46
Zhang	HD patients	0.08 (.01, .65)	1/17781	11/16299	1.47
Seliem	Critically ill neonates	0.23 (.08, .63)	5/1111	13/652	5.27
MacRae	HD patients	0.67 (.20, 2.18)	5/2273	6/1818	4.09
Sanders	Hematology	0.19 (.05, .68)	3/501	11/353	3.61
Filippi	Critically ill neonates	0.10 (.01, .80)	1/455	11/522	1.48
Kim	HD patients	0.14 (.02, 1.15)	1/2273	7/2244	1.41
Saxena	HD patients	0.53 (.38, .73)	96/58035	56/17885	23.65
Weijmer	HD patients	0.27 (.13, .56)	9/8181	33/8048	9.09
Garland	Critically ill neonates	0.33 (.14, .78)	7/854	18/723	7.00
Bleyer	HD patients	0.30 (.01, 7.42)	0/2336	1/2118	0.62
McIntyre	HD patients	0.08 (.01, .59)	1/3252	10/2470	1.46
Betjes	HD patients	0.14 (.01, 2.56)	0/1519	4/1885	0.74
Dogra	HD patients	0.12 (.01, 2.23)	0/3280	3/2643	0.72
Pervez	HD patients	0.20 (.02, 1.82)	1/1613	4/1311	1.29
Overall (I-squared = 12.3%, P = .293)		0.31 (.24, .40)	168/219145	312/164565	100.00

NOTE: Weights are from random-effects analysis

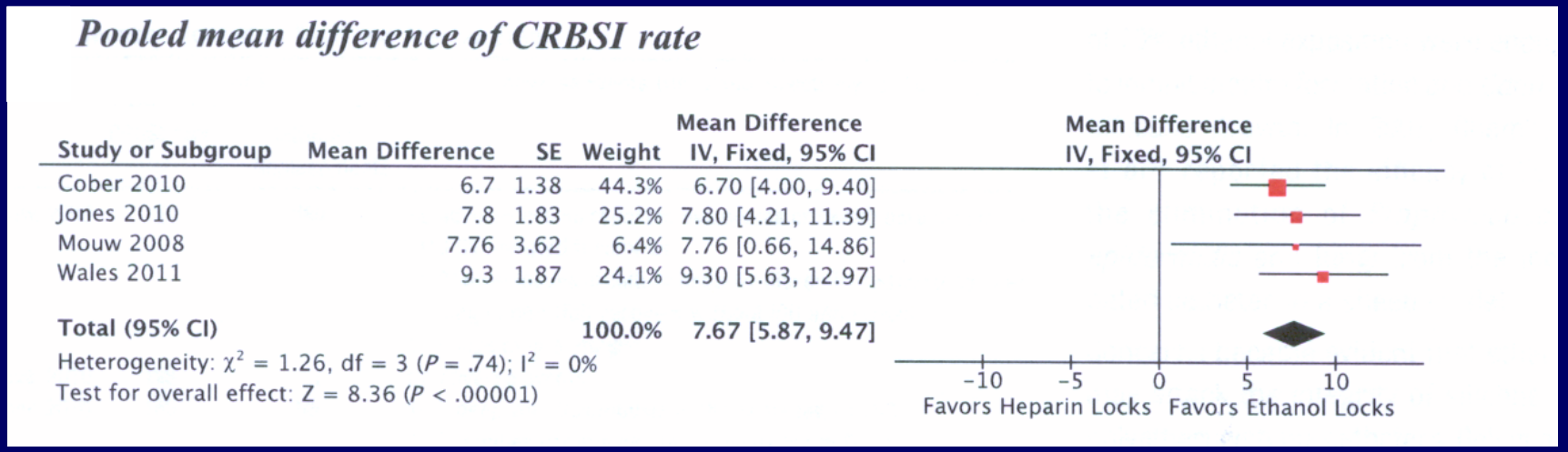
* 23 studies, 2896 patients, 69% decrease in CLABSI
RR: 0.31 95CI (.24-.40)
* 32% decrease in exit site infections
* Mortality 16% decrease (NS)

Conclusion: Anti-Infective Lock solutions are useful in certain circumstances. Additional study to assess optimal solution (antibiotics, alcohol, taurolidine, trisodium citrate, EDTA, nitroglycerin, etc) and populations

Zacharioudakis, et al. CID, 2015

Ethanol Locks to Prevent Catheter-Related Bloodstream Infections in Parenteral Nutrition: A Meta-Analysis

Oliveira C, et al. Pediatrics, 2012

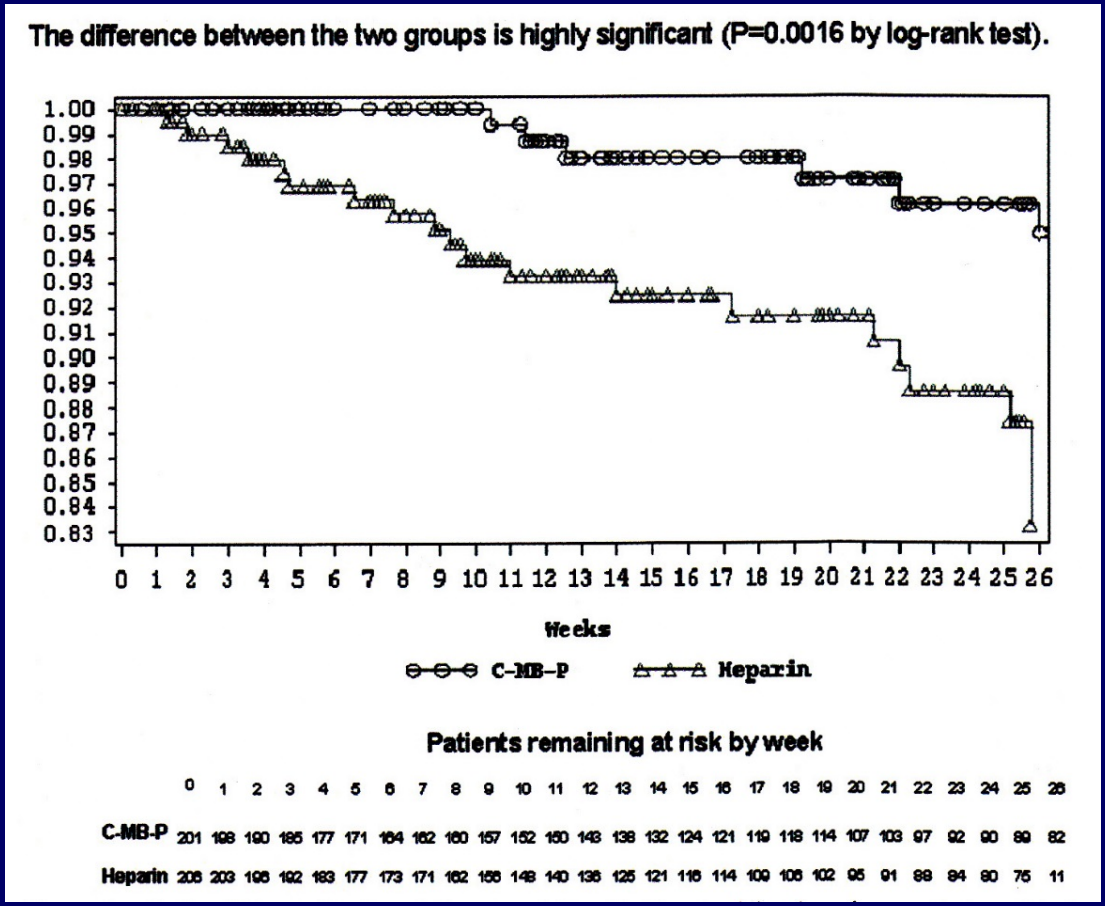


- Risk ratio for CR-BSI: 0.19 (95% CI 0.12-0.32)
- Risk ratio for catheter replacement: 0.28 (95% CI 0.06-1.23)
- Rare Toxicty: Etoh assoc with clotting, dizziness, CVC mechanical compromise, protein ppt, etc.

A novel antimicrobial and antithrombotic lock solution for hemodialysis catheters: A multi-center, controlled, randomized trial*

Dennis G. Maki, MD; Stephen R. Ash, MD; Roland K. Winger, BS, PE; Philip Lavin, PhD; for the AZEPTIC Trial Investigators

Crit Care Med 2011



- Prospective, Randomized, Multi-Ctr trial
- 25 HD units, 407 pts, 50K CVC days
- 7% citrate, 0.15% methylene blue, 0.15% methylparaben, 0.015% propylparaben (C-MB-P)
- 0.82 vs 0.24 CRBSI/1000 CVC d; RR 0.29 (0.12-0.7, p = 0.005)

Statewide Survey of Technologic CLA-BSI Prevention

- Nebraska statewide survey of hospitals (25 PPS/65 CAH)
- Response: 17 PPS (68%), 25 CAH (40%)

Technology	PPS (%)	CAH (%)
CHG Dressing	94	73
Antibiotic or Antiseptic CVC	47	31
Passive port disinfection	35	54
CHG bathing in ICU	65	8
CVC lock soln	17	12

Rupp et al. AJIC, 2016

Scope of the Problem
What about Peripheral IVs???

Yearly Use of Peripheral IVs

- Little systematic data regarding complications: infection, phlebitis, infiltration, extravasation

The Risk of Bloodstream Infection in Adults With Different Intravascular Devices: A Systematic Review of 200 Published Prospective Studies

DENNIS G. MAKI, MD; DANIEL M. KLUGER, MD; AND CHRISTOPHER J. CRNICH, MD

Mayo Clin Proc, 2006

- Review of 110 studies, 10,910 catheters
- 0.1 BSI/100 devices; 0.5 (95% CI 0.2–0.7)/1000 device days
- 9 studies that required microbial concordance between catheter and blood culture: 0.6 BSI/1000 device d
- 1 per 1000 devices x 330 Million/2.25 attempts per successful IV start = 146,000 episodes of BSI

Status of Vascular Access at the University of Nebraska Medical Center

- Series of point prevalence surveys in all units during summer 2015
- All units visited on at least 3 occasions
- 755 patients
  - 59 (8%) No vascular access
  - 414 (55%) peripheral IV only
  - 239 (32%) CVC only
  - 43 (6%) both CVC and PIV

Rupp ME. Unpublished Observations

Peripheral IVs

Problems with securement

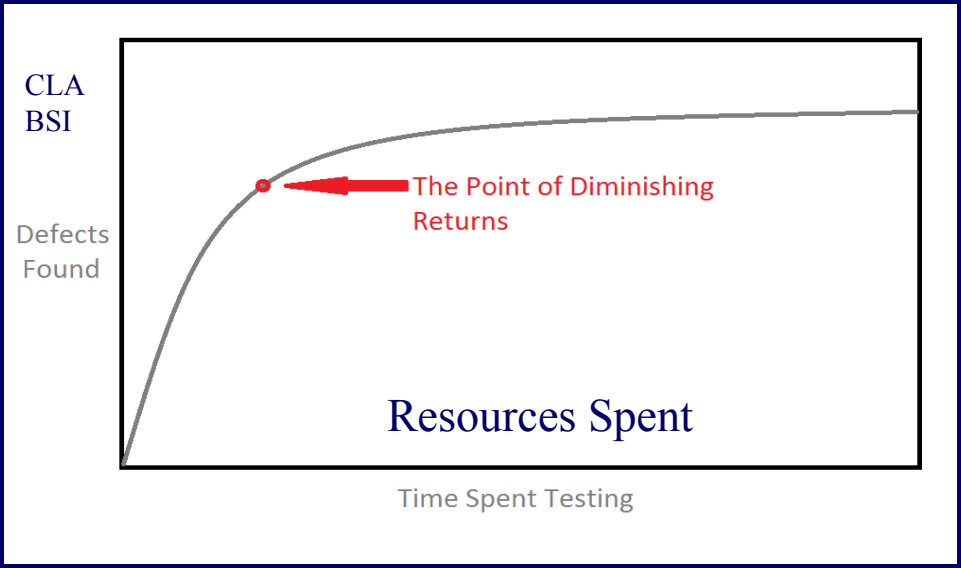
Arterial Catheters & Dressings

Prevention of IV Catheter-Related Bloodstream Infection

- Practice Measures
  - Education and Training
  - Appropriate staffing
  - Insertion and Care Bundle
    - CHG skin prep
    - Sterile barrier precautions
    - Avoid femoral site
    - Scrub the hub
  - Removal of CVCs
- Technologic Innovations
  - Antimicrobial-Coated CVC
  - CHG impregnated dressings
  - CHG patient bathing
  - Catheter Flush/Lock soln
  - Antimicrobial-Coated Connectors
  - Antiseptic Caps

Prevention of IV Catheter-Related Bloodstream Infection and "Getting to Zero"

- Cost Effectiveness
- Point of Diminishing Returns




Questions & Comments
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April 12, 2017	*(FREE … WHO Teleclass - Europe)* **PRACTICAL STEPS TO DEVELOP AND SUSTAIN AN EFFECTIVE NATIONAL HAND HYGIENE PROGRAMME AND ITS IMPACT ON ANTIMICROBIAL RESISTANCE** Speaker: **Professor Lindsay Grayson**, World Health Organization, Melbourne, Australia *Sponsored by the World Health Organization Infection Control Global Unit (www.who.int/gpsc/en)*
April 25, 2017	*(FREE European Teleclass … Denver Russell Memorial Teleclass Lecture)* **DO'S AND DONT'S FOR HOSPITAL CLEANING** Speaker: **Dr. Stephanie Dancer**, Health Protection Scotland
April 27, 2017	**COST ANALYSIS OF UNIVERSAL SCREENING VS. RISK FACTOR-BASED SCREENING FOR MRSA** Speaker: **Dr. Virginia Roth**, University of Ottawa
May 5, 2017	*(FREE … WHO Teleclass - Europe)* **SPECIAL LECTURE FOR 5 MAY** Speaker: **Prof. Didier Pittet**, World Health Organization, Geneva *Sponsored by the World Health Organization Infection Control Global Unit (www.who.int/gpsc/en)*

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