

# Is There a Role for Decolonization?

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# Disclosures

- Conducting a clinical trial for which Sage Products and Molnlycke are providing contributed product to participating hospitals

# Digestive Decolonization

- Will not address digestive decontamination
  - Meta-analysis by SuDDICU Canadian Study Group determined a trial was needed <sup>1</sup>
  - Canadian Critical Care Trials group conducting a trial <sup>2</sup>

<sup>1</sup> Daneman N et al. Lancet ID 2013; 13(4):328-41

<sup>2</sup> <http://www.ccctg.ca/Programs/SuDDICU-study.aspx>

# Body Surface Decolonization

Attempt to remove body surface bacteria to prevent infection

Differs from most strategies which seek to prevent new acquisition, but do not benefit those already harboring AROs

- **Attempt to Eradicate**

- Value in eradicating carriage of prevalent AROs to reduce risk for future infection

- **Attempt to Temporarily Reduce Risk**

- Value in temporarily reducing carriage of AROs and other pathogens during times at high risk for infection

- **Attempt to Reduce Transmission**

- Reduction in ARO bioburden shown to reduce transmission by reducing environmental and staff contamination

# Decolonization for Eradication

- **High Risk Individuals**

- Eradication regimen only known for MRSA

- Mupirocin alone or mupirocin/CHG combination

- Employs test of cure

- Inpatient

- Patients requesting removal from contact precautions

- Outpatient

- Recurrent MRSA infections
- High risk for hardware infection
- High risk skin conditions
- By request
- Any recently hospitalized MRSA carrier (trial ongoing)

# Decolonization for Temporary Risk Reduction

- **High Risk Settings**
  - ICUs
  - Burn Centers
  - Oncology and Infusion Centers
  - Pre-operative

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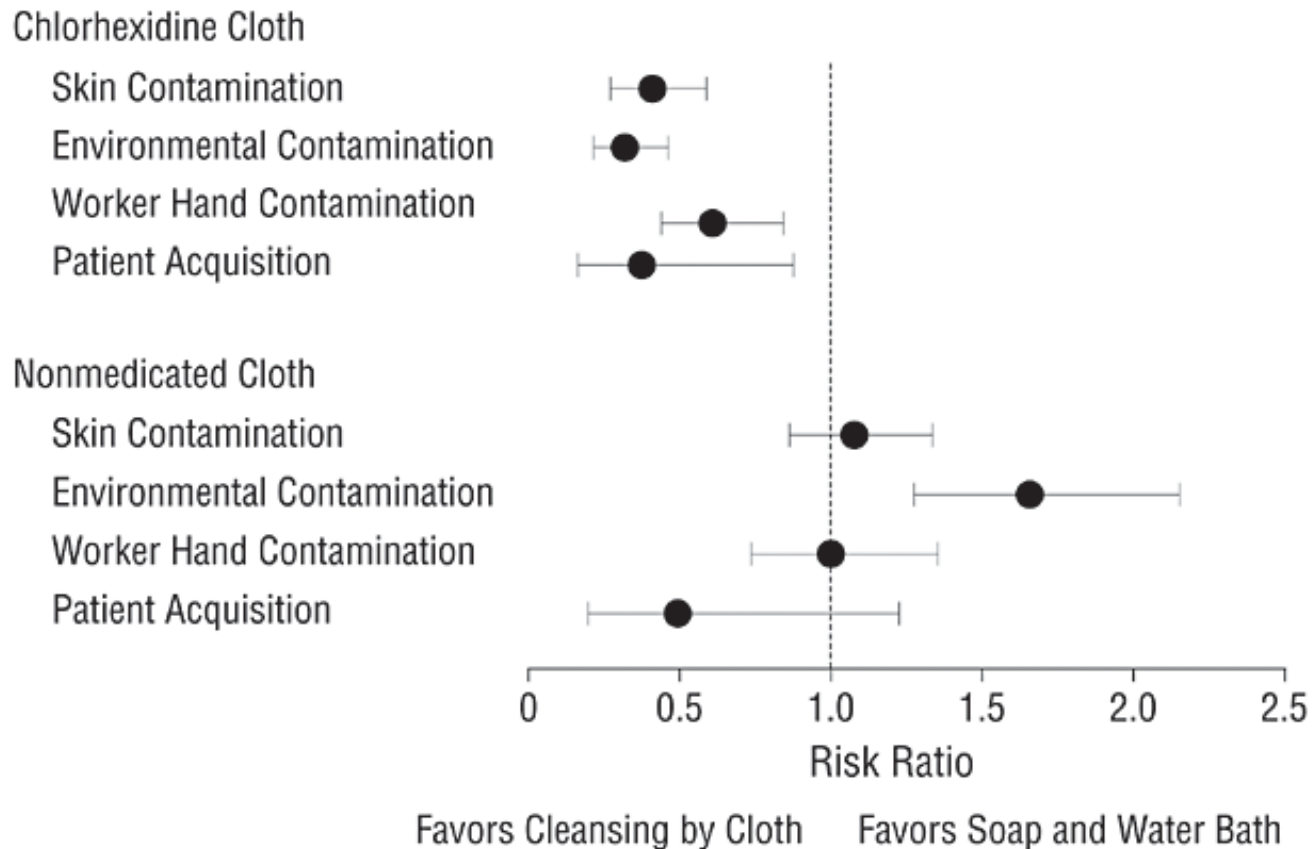
# Decolonization Regimens for Temporary Risk Reduction

- **Antiseptic Soap**
  - Chlorhexidine (CHG)
    - 2% no rinse cloth (Bed Bath)
    - 4% liquid with rinse (Shower)
- **Antiseptic Soap plus Nasal Ointment**
  - CHG plus mupirocin ointment
  - Special targeting of nasal reservoir of *Staphylococcus aureus* (MSSA and MRSA) <sup>1</sup>
    - Virulent and common
    - #1 ventilator associated pneumonia
    - #1 surgical site infection
    - #2 central line infections

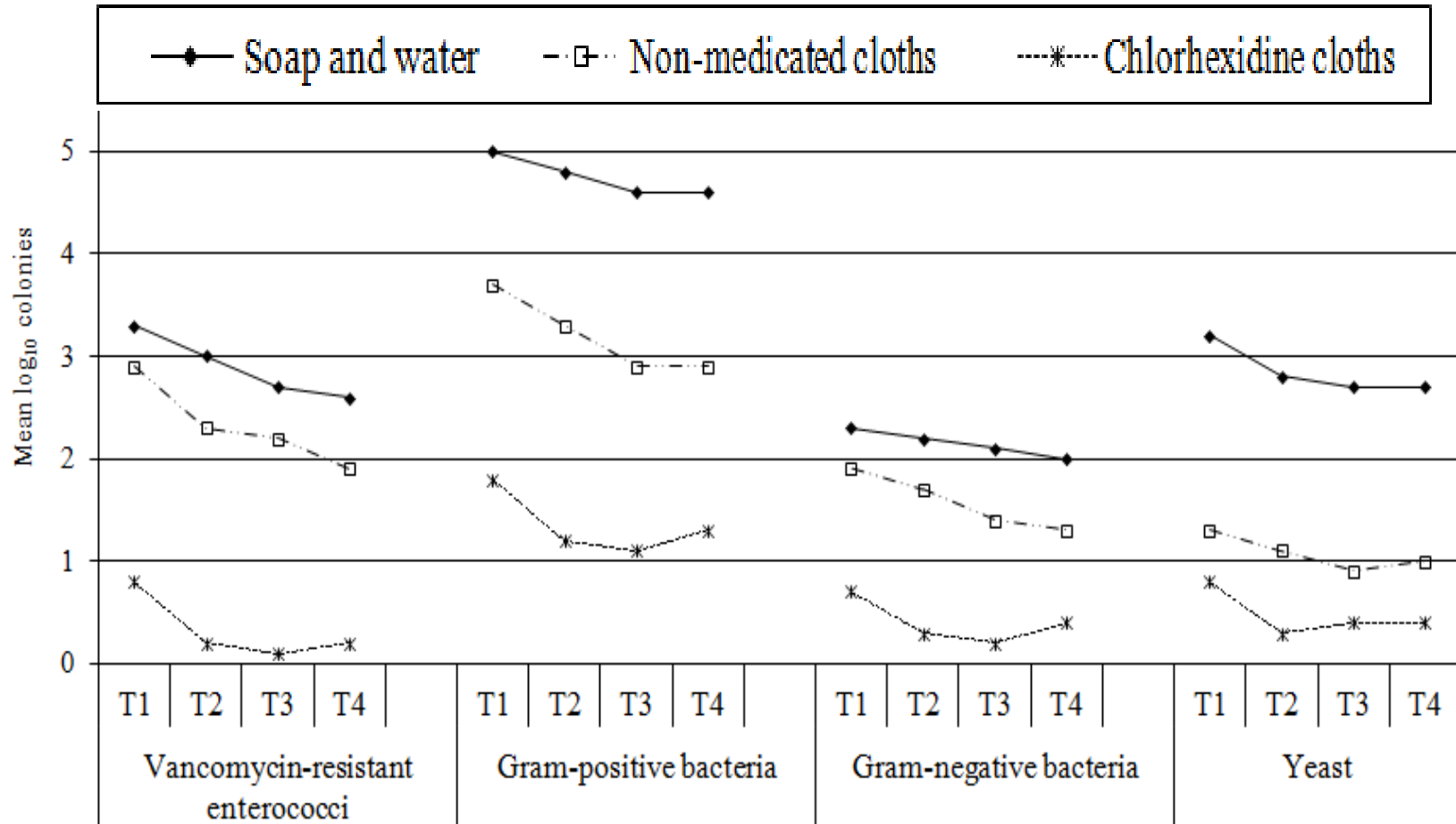
<sup>1</sup> Sievert D et al. ICHE 2013; 34(1)



# CHG Impact on Skin, Environment, Staff Contamination and VRE Acquisition



# Bioburden on Inguinal Skin by Cleansing Method



# ICU Universal Decolonization

## CHG vs CHG + mupirocin

### Cluster randomized trials

- Universal CHG antiseptic soap
  - Adult ICUs (23% reduction AROs (VRE), 28% reduction BSI) <sup>1</sup>
  - Pediatric ICUs (35% reduction in BSI and CLABSI) <sup>2</sup>
  - Bone marrow transplant units included <sup>1</sup>
- Universal CHG antiseptic soap plus mupirocin ointment
  - 37% reduction in MRSA clinical cultures
  - 44% reduction in all-pathogen bacteremia
  - Large scale trial, community hospitals

BSI = Bloodstream Infection  
CLABSI = Central line associated BSI

<sup>1</sup> Climo et al. NEJM 2013;368:533-42

<sup>2</sup> Milstone et al. Lancet 2013; 381(9872):1099-1106

<sup>3</sup> Huang et al. NEJM 2013;368:2255-2265

ORIGINAL ARTICLE

# 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.

# Decolonization in Academic Adult ICUs

- 9 adult ICUs, 6 academic medical centers
  - Randomized cross-over design of daily 2% CHG vs non-CHG cloth bathing (6 months each)
  - Aug 2007 – Feb 2009
  - All units performing admission MRSA/VRE screens
  - ~8,000 individuals participated
- Outcomes
  - Composite: MRSA and VRE acquisition
  - All-cause ICU-attributable BSI
    - Primary BSI
    - CLABSI

Climo et al. N Engl J Med 2013;368:533-42

# Decolonization Success

	Intervention	Control	
<b>MDRO acquisition</b>			
No. of infections	127	165	0.03
Incidence rate (no./1000 patient-days)	5.10	6.60	
<b>VRE acquisition</b>			
No. of infections	80	107	0.05
Incidence rate (no./1000 patient-days)	3.21	4.28	
<b>MRSA acquisition</b>			
No. of infections	47	58	0.29
Incidence rate (no./1000 patient-days)	1.89	2.32	
<b>Hospital-acquired bloodstream infection</b>			
No. of infections	119	165	0.007
Incidence rate (no./1000 patient-days)	4.78	6.60	
<b>Primary bloodstream infection</b>			
No. of infections	90	131	0.006
Incidence rate (no./1000 patient-days)	3.61	5.24	
<b>Central-catheter-associated bloodstream infection</b>			
No. of infections	21	43	0.004
Incidence rate (no./1000 catheter-days)	1.55	3.30	

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## 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 Gombosov, 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\*

- Hospital Corporation of America
- Harvard Pilgrim Healthcare Institute/Harvard Medical School
- University of California Irvine
- Rush University
- CDC Prevention Epicenters Steering Committee

# Universal vs Targeted ICU Decolonization

Randomized hospitals and all their adult ICUs to:

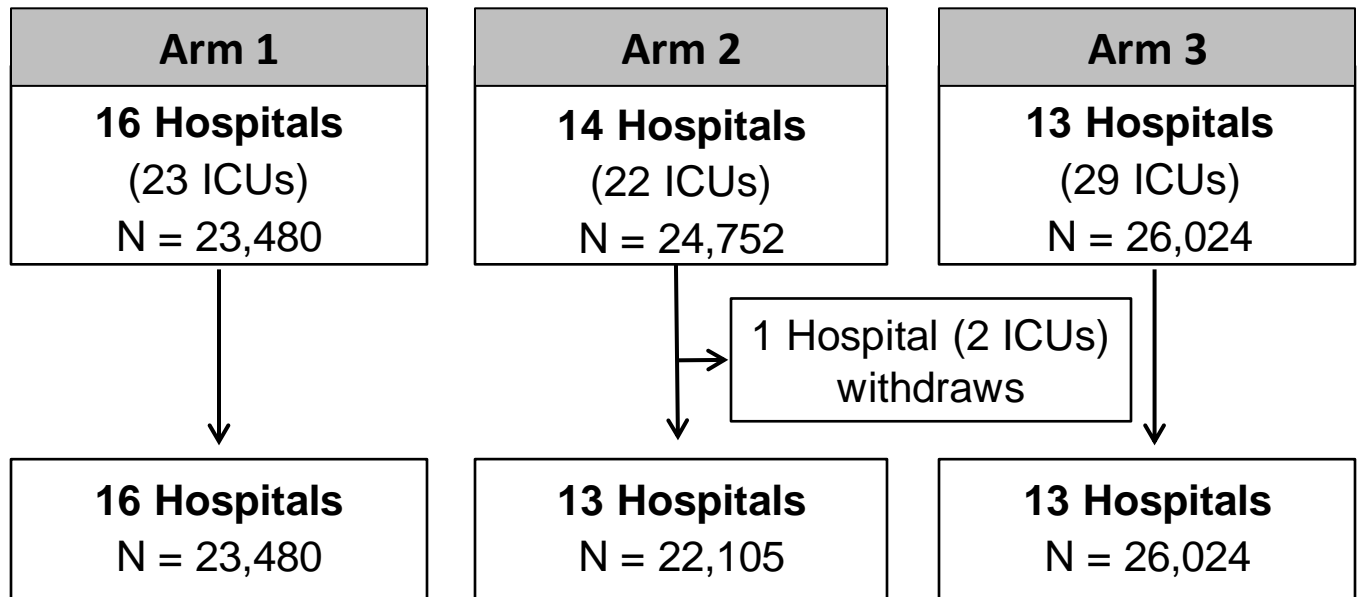
- **Arm 1: Routine Care**
  - Screened all patients; isolated known MRSA+
- **Arm 2: Targeted Decolonization**
  - Screened all patients; isolated if known MRSA+
  - Decolonized if MRSA+
- **Arm 3: Universal Decolonization**
  - No screening; isolated if known MRSA+
  - Decolonized all



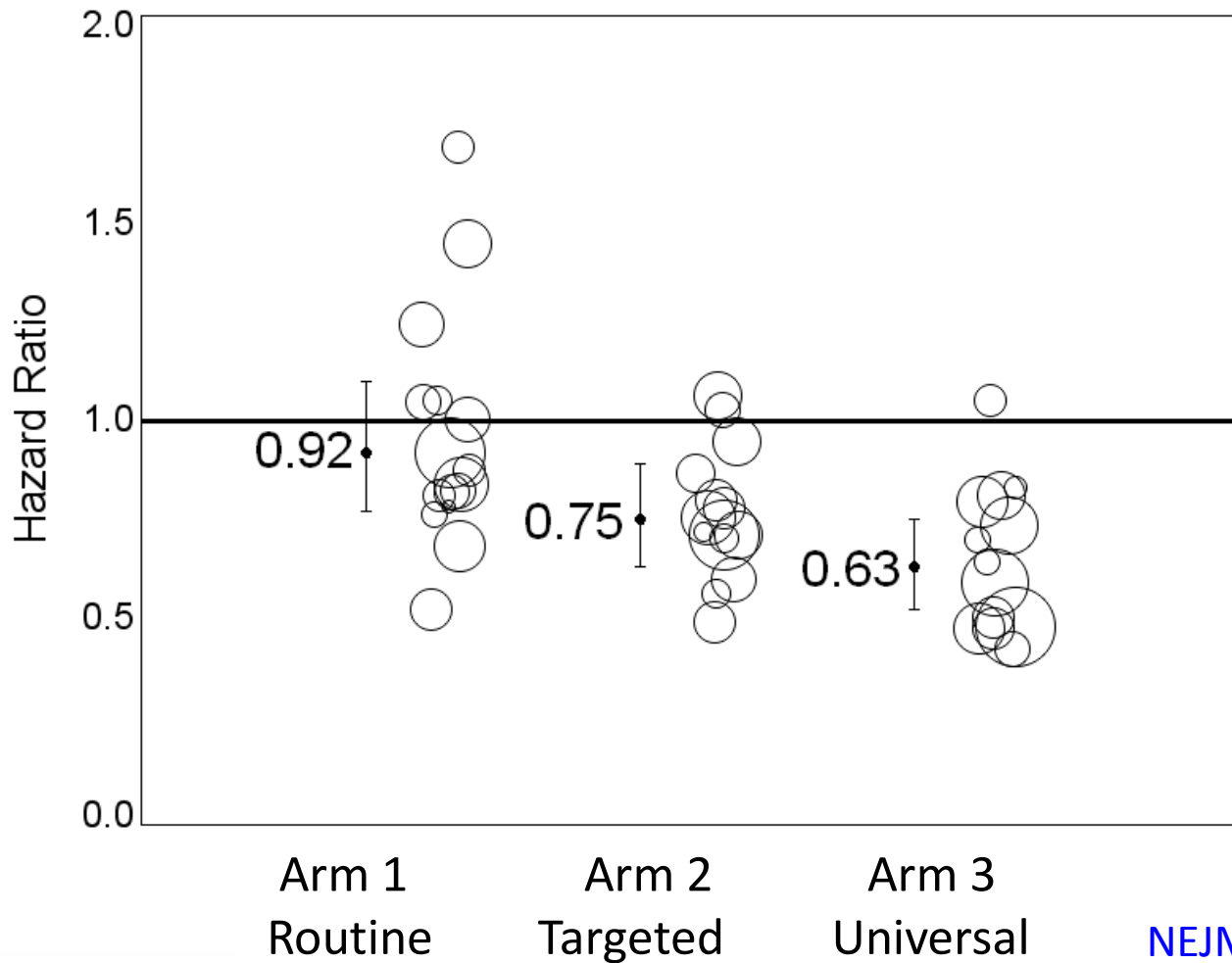
# Intervention Period

Intervention: 43 hospitals, 74 adult ICUs  
74,256 patients  
282,803 ICU patient days

**As  
Randomized**



# MRSA Clinical Cultures



**Overall P=0.01**

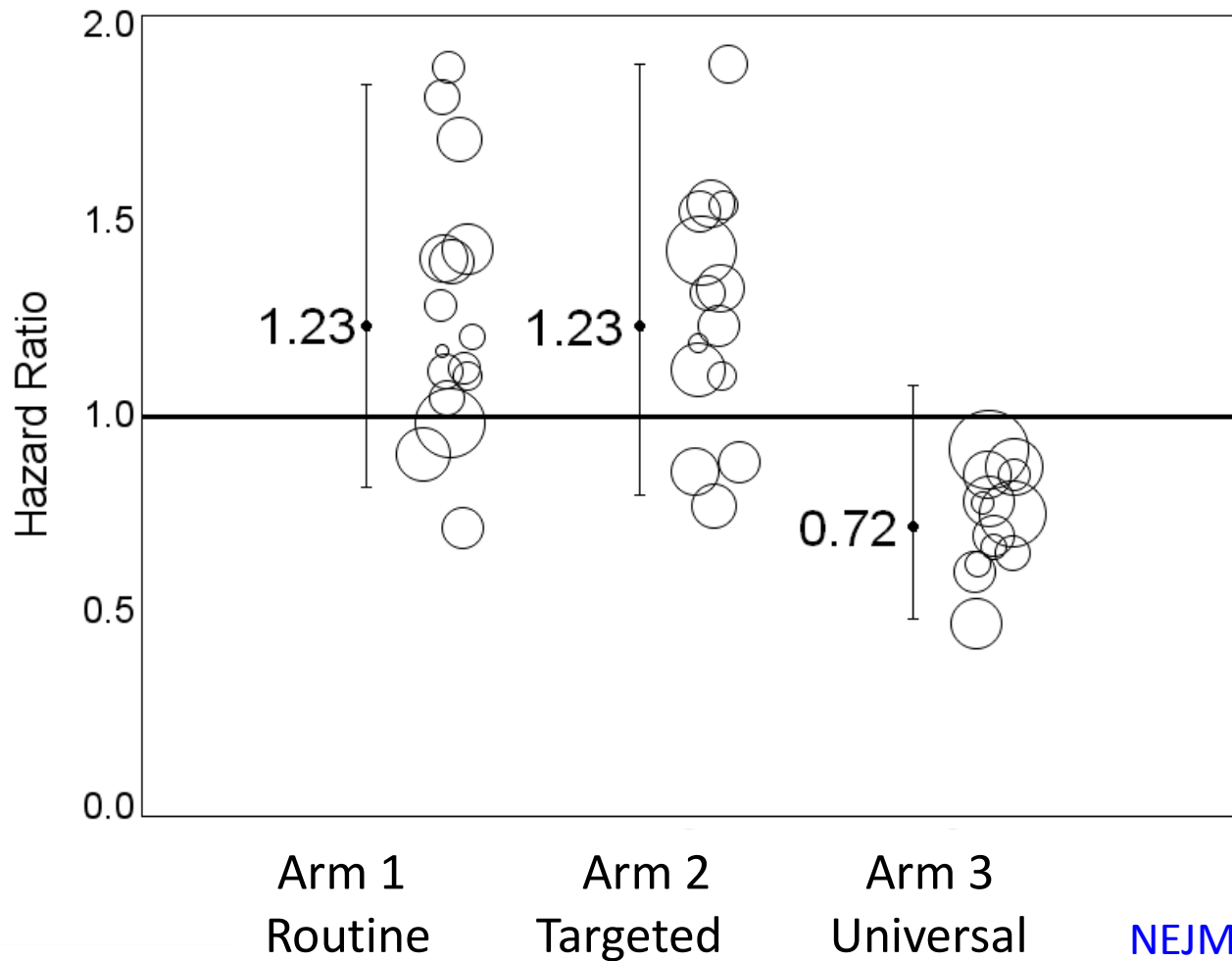
Arm 2 vs 1 P=0.09

**Arm 3 vs 1 P<0.003**

Arm 3 vs 2 P=0.16

NEJM Jun 2013;368:2255-2265

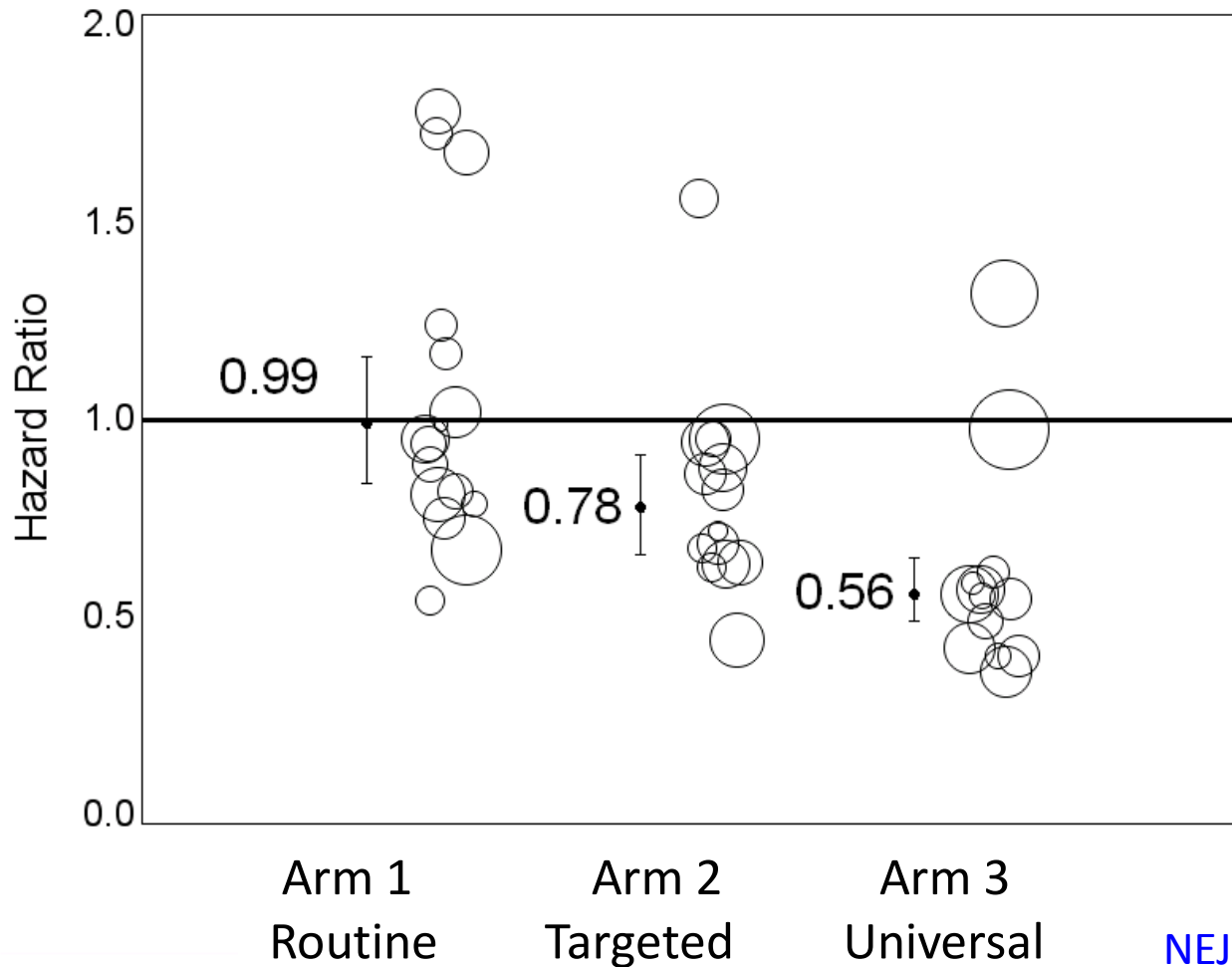
# MRSA Bloodstream Infection



Overall P=0.11

NEJM Jun 2013;368:2255-2265

# All Pathogen Bloodstream Infection



**Overall P<0.0001**

**Arm 2 vs 1 P=0.04**

**Arm 3 vs 1 P<0.0001**

**Arm 3 vs 2 P=0.003**

NEJM Jun 2013;368:2255-2265

# Universal vs Targeted ICU Decolonization

## 3-Group Cluster Randomized Trial in ICU settings

- Universal decolonization with CHG plus mupirocin significantly better than screening and isolation for reducing both MRSA clinical cultures and all-pathogen bloodstream infection
- Universal decolonization significantly better than targeted decolonization at reducing all-pathogen bloodstream infection

# ICU Decolonization Evidence Summary

Author	Study Year	Study Type	Hospital	ICU	N	Findings	Publication	Funding
Vernon	10/02-12/03	Observational	1	1	1,787	65% less VRE acquisition 40-70% less VRE on skin, HCW hands, environment	Arch Intern Med 2006; 166:306-312	CDC, Sage
Climo	12/04-1/06	Observational	4	6	5,293	66% less VRE BSI 32% less MRSA acquisition 50% less VRE acquisition	Crit Care Med 2009; 37:1858-1865	CDC
Bleasdale	12/05-6/06	Observational	1	2	836	61% less primary BSI	Arch Intern Med 2007; 167(19):2073-2079	CDC, Sage
Popovich	9/04-10/06	Observational	1	1	3,816	87% less CLABSI 41% less blood contaminants	ICHE 2009; 30(10):959-63	CDC
Climo	8/07-2/09	Cluster RCT	6	9	7,727	23% less MRSA/VRE acquisition	N Engl J Med 2013; 368:533-42	CDC (Sage: product)
Milestone	2/08-9/10	Cluster RCT	5	10	4,947	36% less total BSI (as treated)	Lancet. 2013; 381(9872):1099-106	Sage, NIH
Huang	1/09-9/11	Cluster RCT	43	74	122,646	37% less MRSA clinical cultures 44% less all-cause BSI	IDWeek 2012; 2013 In press	AHRQ, CDC, HCA

# *S. aureus* Pre-Op Decolonization

- **Screen → Targeted Decolonization**
- **Trials screening for any *S aureus* (MRSA/MSSA)**
  - Admitted to hospital (mostly to surgical units) <sup>1</sup>
    - 5-day CHG+mupirocin: 55% reduction *S. aureus* infection
  - Cardiac surgery
    - Mupirocin only: 50% reduction in *S aureus* infection <sup>2</sup>
- **Pre-op screening for MRSA → Targeted Decolonization**
  - One trial, insufficient MRSA prevalence (3%) <sup>3</sup>

<sup>1</sup> Bode et al. NEJM 2010;362:9-17

<sup>2</sup> Perl et al. NEJM 2002;346:1871-7

<sup>3</sup> Harbarth et al. JAMA. 2008;299(10):1149-1157

# Decolonization to Prevent Transmission

- **Reduces contamination and transmission**
  - Reduces bioburden in current carriers
  - Eradicates, reduces prevalence of current carriers
  - More effective than screening and isolation



# Recommendations

- **Universal Decolonization**
  - Daily CHG plus 5-day mupirocin in ICUs for MRSA and BSIs
  - Daily CHG for BSIs and VRE
    - May not be as successful for reducing MRSA
- **Targeted Decolonization for *S. aureus* (MRSA and MSSA)**
  - Pre-op admitted patients
  - Pre-op cardiac surgical patients
- **Monitor for Resistance**
  - Serial collections or point prevalence sampling