




 **Does Screening for MRSA Colonization Have A Role In Healthcare-Associated Infection Prevention Programs?** 




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 **Antimicrobial Resistance is an Important Public Health Problem** 

 **BAD BUGS, NO DRUGS** 
As Antibiotic Discovery Stagnates ...
A Public Health Crisis Brews



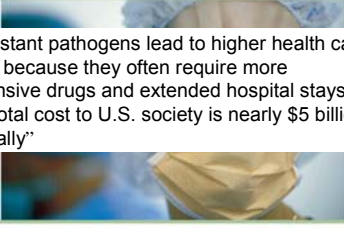
 **IDSA**
Infectious Diseases Society of America
July 2004





BAD BUGS, NO DRUGS


As Antibiotic Discovery Stagnates ...
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“Resistant pathogens lead to higher health care costs because they often require more expensive drugs and extended hospital stays. . . . The total cost to U.S. society is nearly \$5 billion annually”






July 2004






MRSA is an Important Part of The Antimicrobial Resistance Problem





Prevalence of Multidrug-Resistance Among HAI Pathogens Reported to NHSN, 2006-2007

Pathogen	% of all HAI
MRSA	8%
VRE	4%
Carbapenem-resistant <i>P. aeruginosa</i>	2%
Extended-spectrum cephalosporin-resistant <i>K. pneumoniae</i>	1%
Extended-spectrum cephalosporin-resistant <i>E. coli</i>	0.5%
Carbapenem-resistant <i>A. baumannii</i> , <i>K. pneumoniae</i> , <i>K. oxytoca</i> , and <i>E. coli</i>	0.5%



Healthcare-Associated MRSA Infections Are Expensive

Medical plus Societal costs for a Chicago Teaching Hospital:

- \$60,984 (2008 dollars) per infection
- Almost \$5 million total costs attributable to MRSA per year

Roberts RR et al. *Clinical Infectious Diseases* 2009;49:1175-84

Outcomes for MRSA Infection are Worse than For MSSA Infection



Summary of Unadjusted Results of Studies Comparing Mortality of MRSA and MSSA Bacteremia

Cosgrove et al. *Clinical Infectious Diseases* 2003;36:53-59



Limitations in Therapeutic Options For MRSA Exist, and Appear to Be Getting Worse

- Vancomycin susceptibility in MRSA is decreasing over time
 - Infections caused by vancomycin-susceptible MRSA organisms with MICs of ≥ 1 mg/mL appear to respond less effectively to vancomycin than do infections caused by organisms with MICs of <1 mg/mL.
- Reports of linezolid and daptomycin resistance among MRSA poses concern for future durability of these agents



Sakoulas and Moellering. *Clinical Infectious Diseases* 2008; 46:S360-7



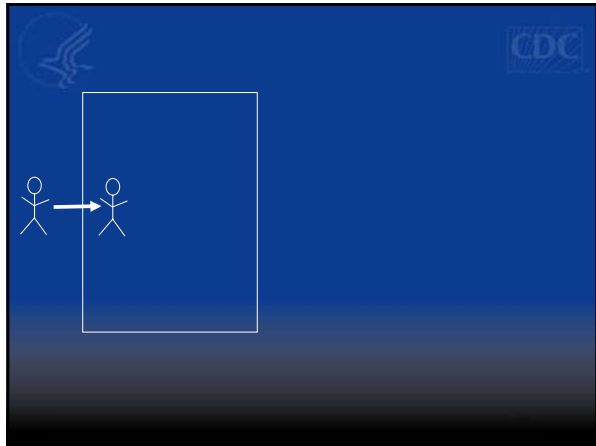
MRSA is an Important Part of
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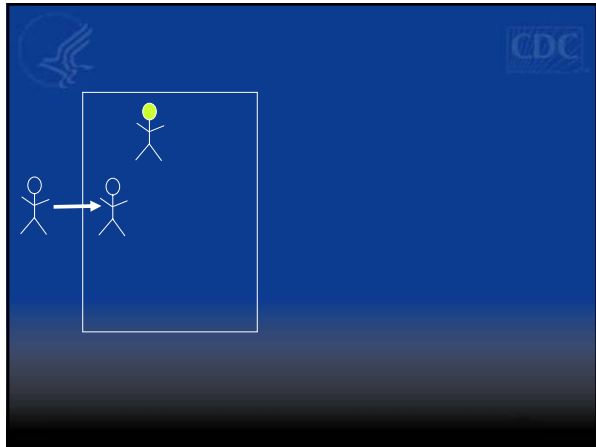


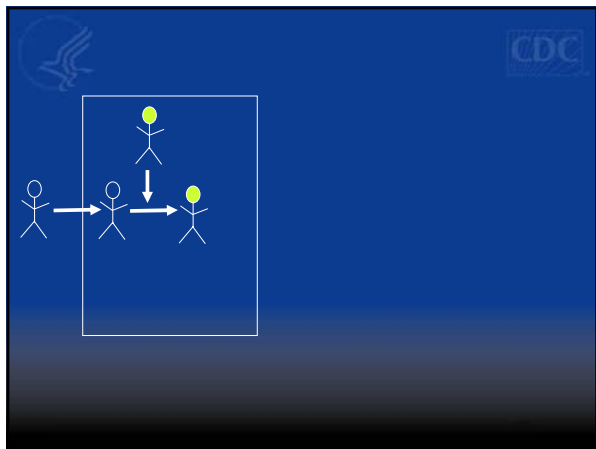
Epidemiology of
Healthcare-Associated
MRSA

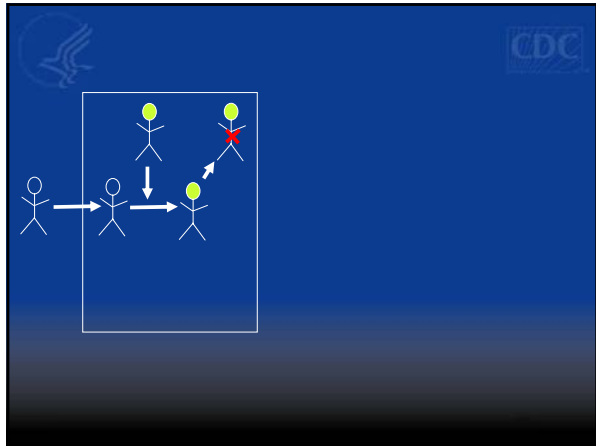


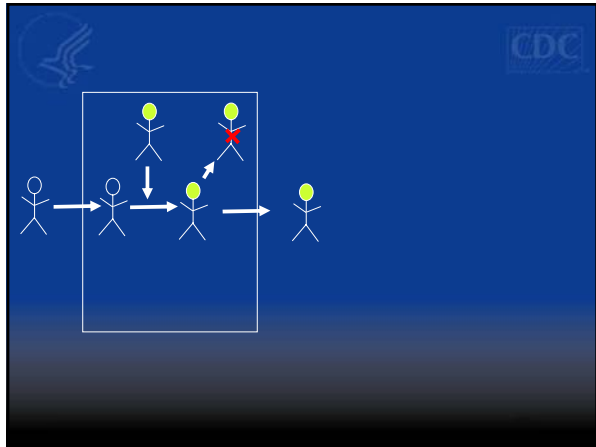
The emergence of Healthcare-Associated
MRSA has been due to transmission of
relatively few clones, not *de novo* selection
from susceptible *S. aureus* strains

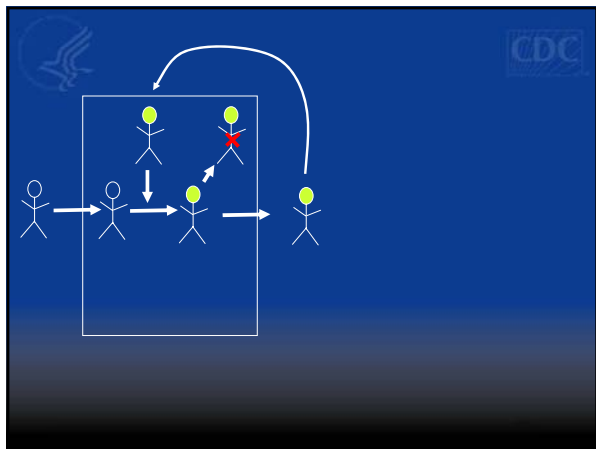


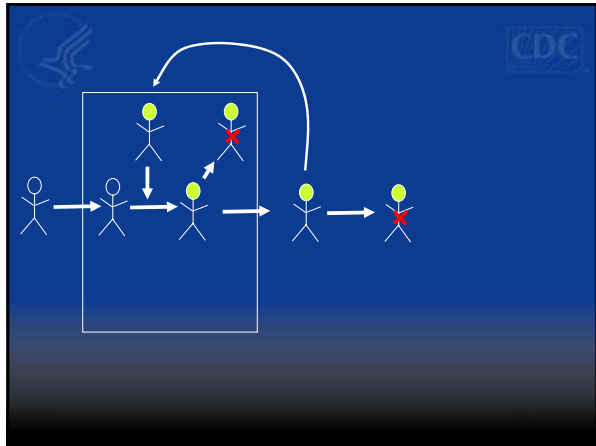


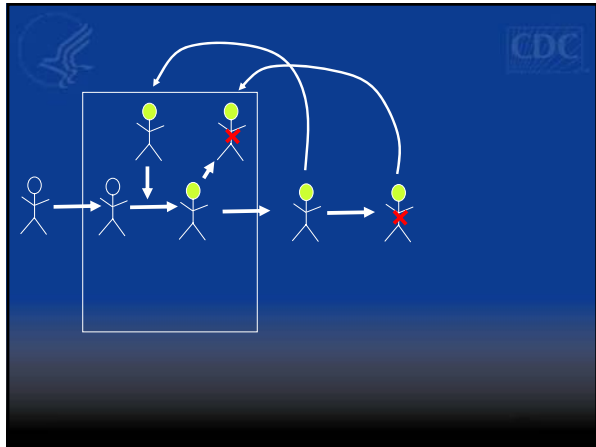


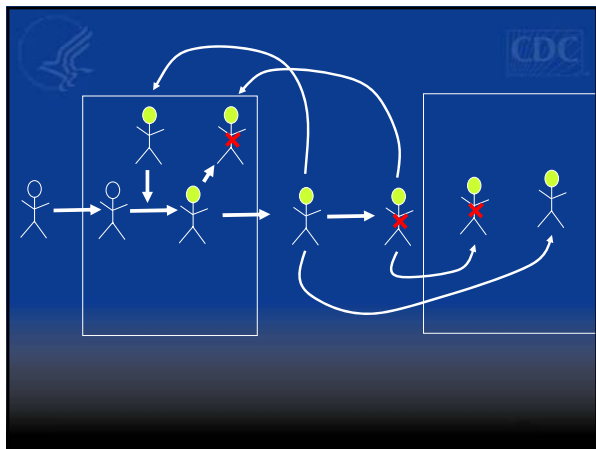


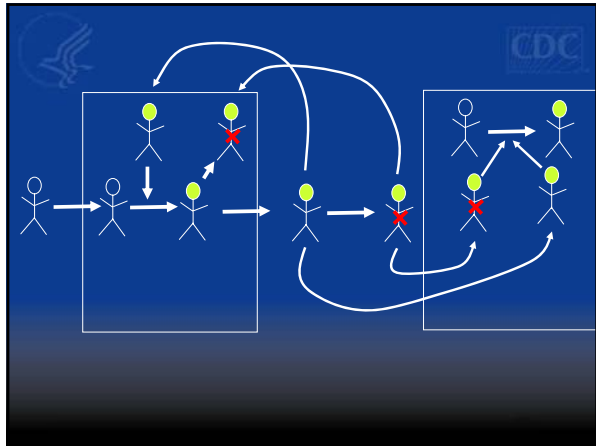












Acquisition of MRSA Colonization Has Consequences that Extend Beyond One Hospitalization

- Patients can carry MRSA with them for months or years
 - Infections may develop following hospital discharge, or during subsequent admissions
 - 29% of patients with new MRSA acquisition developed infection in the subsequent 18 months, half of these following hospital discharge
 - Huang and Platt. Clin Infect Dis 2004;36:281
 - When patients are readmitted to the same or another healthcare facility, they serve as a potential reservoir of transmission

Healthcare Facilities Serve as Amplifiers of MRSA Transmission

MRSA Carriage Rates at Admission, Veterans Hospitals 2006-2007 (n=14)

Table 7. Overall unit-specific admission prevalence (%)

Unit Type	n	# Prevalent Cases	# Admissions	Admission Prevalence (%)
LTAC	7	504	1884	26.75
LTC	11	621	2620	23.70
LTC/Rehab	3	132	1462	9.03
Med/CardiacICU	3	459	3113	14.74
Med/SurgICU	9	1503	10226	14.70
Med/SurgWard	13	3786	27832	13.60
MedICU	5	667	4040	16.51
MedWard	14	4089	23757	17.21
SurgICU	4	545	5078	10.73
SurgWard	4	1048	7912	13.25

MRSA Carriage Rates in General Population=1.5%



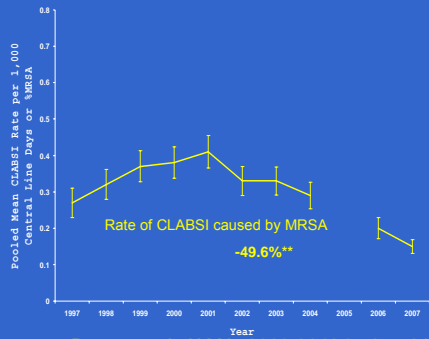
Healthcare Facilities Serve as Amplifiers of MRSA Transmission



Two Strategies for Preventing Healthcare-Associated MRSA Infection

- Preventing acquisition of MRSA colonization (i.e. preventing transmission)
- Preventing Infection Among Patients Colonized with MRSA (i.e. preventing endogenous infection)

Trends in %MRSA and Rates of MRSA Central Line-Associated Bloodstream Infections (CLABSIs)—United States, 1997-2007

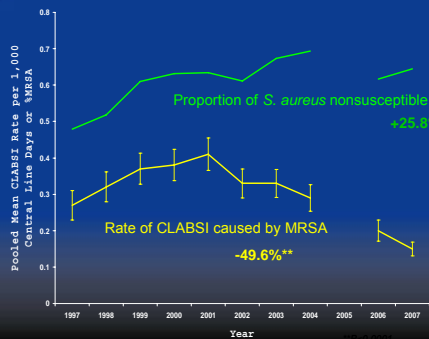


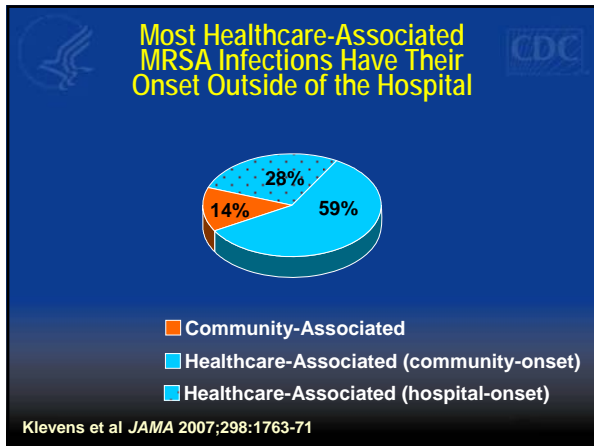
Burton et al. JAMA. 2009;301(7):727-736

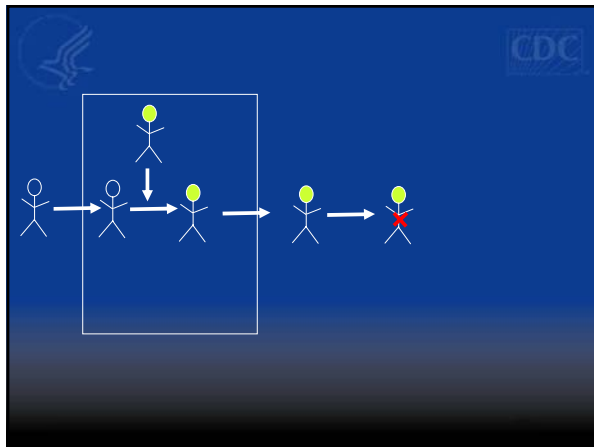
Preventing hospital-onset device and procedure-associated infections, while important, is not a sufficient approach to the problem of healthcare-associated MRSA

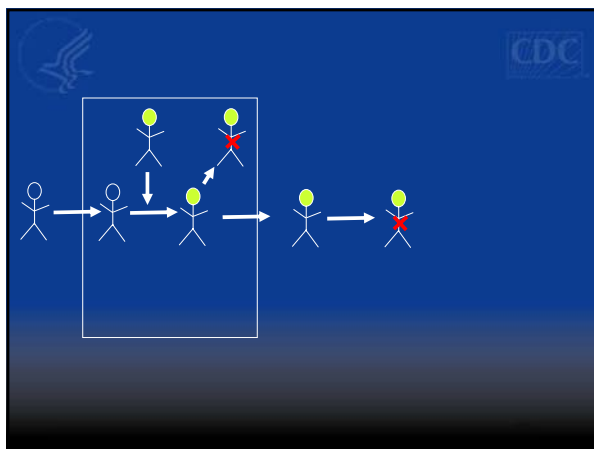
- Does not directly address the antimicrobial resistance issue
- Does not address the majority of healthcare-associated MRSA infections that occur

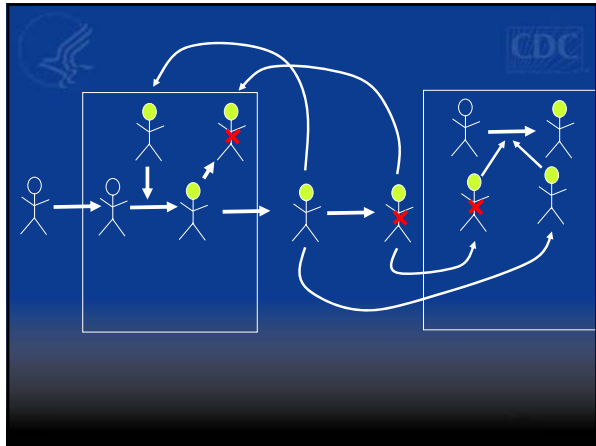
Trends in %MRSA and Rates of MRSA Central Line-Associated Bloodstream Infections (CLABSIs)—United States, 1997-2007















Preventing Transmission is Critically Important in Controlling Healthcare-Associated MRSA

How Do We Prevent MRSA Transmission in the Healthcare Setting?



- **General approach**
 - Optimizing antimicrobial use
 - Standard precautions for all patients
- **Targeted approach**
 - Additional infection control measures to prevent transmission from colonized individuals (e.g. Contact Precautions)

Antibiotic Management alone does not appear to effectively control MRSA transmission

Use of Standard Precautions alone is not as effective at preventing transmission in comparison to strategies that use additional infection control precautions (e.g. Contact Precautions)






Comparing Rates of MRSA Transmission: Standard Precautions vs. Contact Precautions



	Source	
	Isolated	Unisolated
Transmissions	5	10
Patient-days	558	71.5
Rates	0.009	0.140

RR=15.6, 95% CI=5.3-45.6, p<0.0001

Jernigan, et al. Am J Epi 1996;143:496-504.



 **Vriens et al. Infect Control Hospital Epidemiol 2002;23:491** 

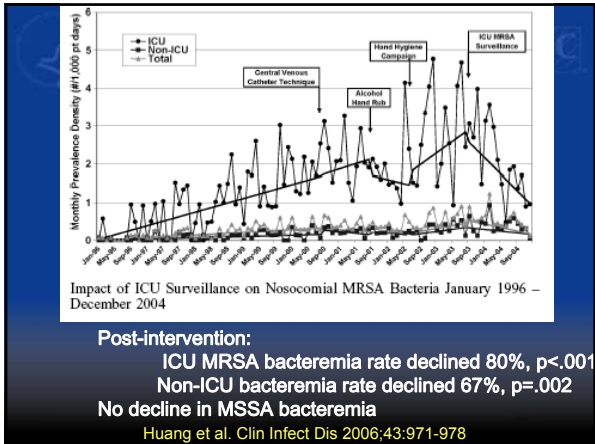
- Between 1992-2001, screening cultures taken twice weekly on all patients in SICU
- 3 MRSA-colonized patients admitted and isolated at admission
 - Single transmission documented
- 3 MRSA-colonized patients admitted, but not isolated at time of admission
 - 37 transmissions documented

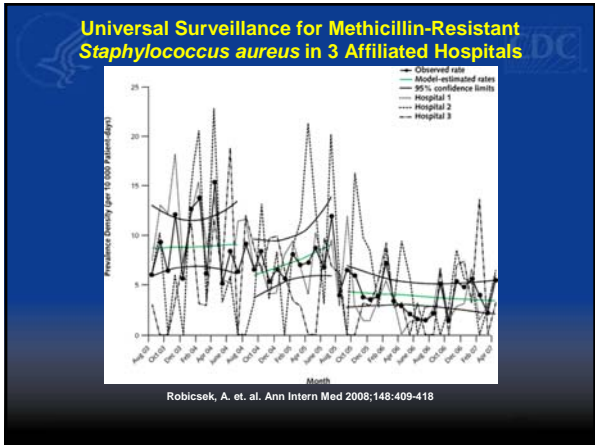
 **“Iceberg Effect”** 

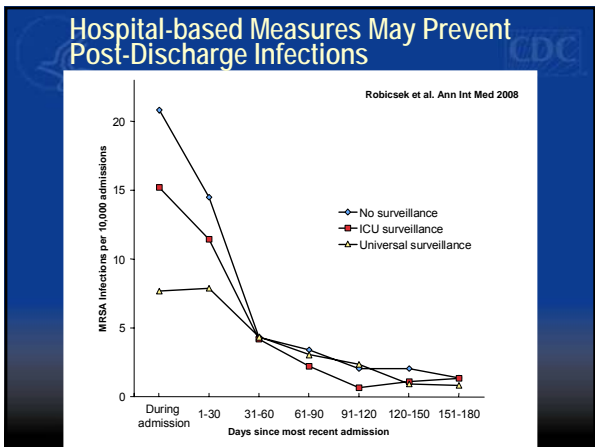
- 76-85% of MRSA carriers admitted to acute care hospitals will remain unrecognized if clinical cultures alone are used to identify them

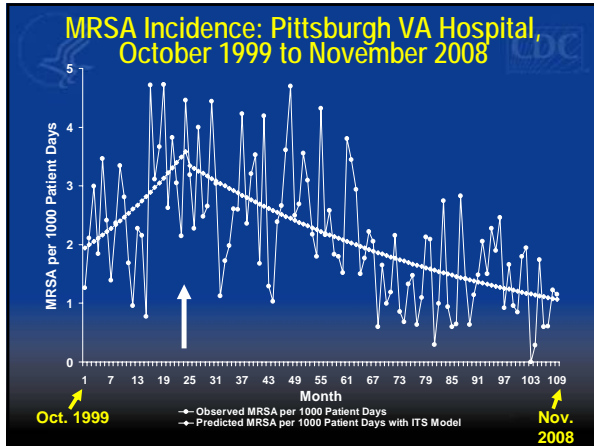
Salgado et al. *Infect Control Hosp Epidemiol* 2006; 27:116-121
Lucet et al. *Infect Control Hosp Epidemiol* 2005;26:121-126
Jernigan et al. *Infect Control Hosp Epidemiol* 2003;24:409-414

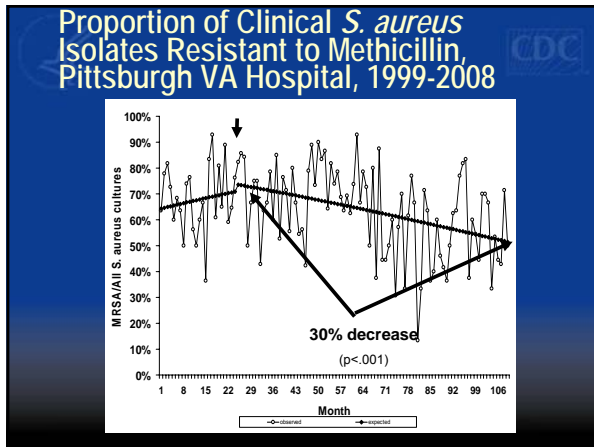
 **What is the Evidence that Use of Active Surveillance is Effective?** 

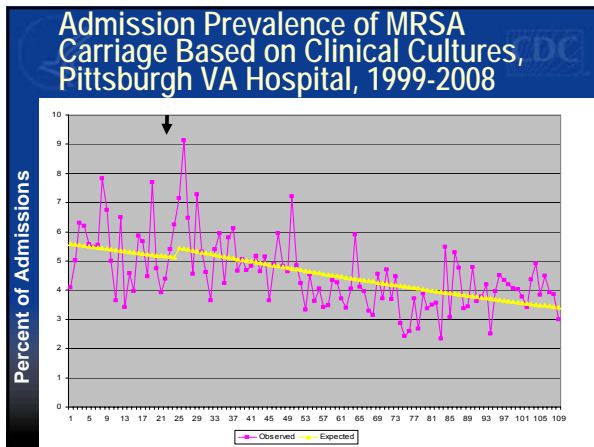












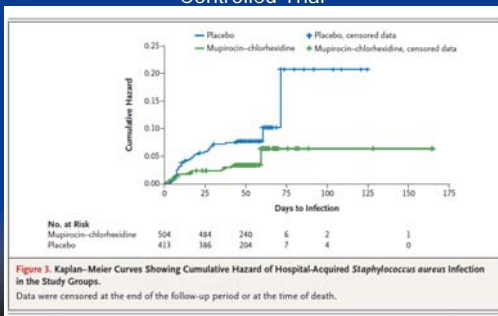
Results of a Multicenter MRSA Prevention Collaborative



- Intervention
 - 3 hospitals in geographically distinct areas of US (Montana, Pennsylvania, Kentucky)
 - Active Surveillance in ICUs, Contact Precautions for MRSA carriers, Hand hygiene promotion, Systems/Behavioral Change Strategies
 - ICU intervention focus, housewide evaluation
- 18 months post-intervention
 - Reduction in MRSA incidence in all three hospitals (26%, 31, 62%, pooled result $p < .001$)
 - Increase % *S. aureus* susceptible to methicillin (7%, 15%, 28%, pooled result $p = .02$)

Ellingston et al. Abstract Presentation, SHEA 2009

Preventing Surgical-site infections in nasal carriers of *Staphylococcus aureus* Using Active Surveillance: Randomized Double-Blind, Placebo Controlled Trial



Bode et al. N Engl J Med 2010;362:9-17

Conclusions of Two Systematic Reviews on Use of Active Surveillance and Isolation for Controlling MRSA




- "There is evidence that concerted efforts that include isolation can reduce MRSA even in endemic settings. Current isolation measures recommended in national guidelines should continue to be applied until further research establishes otherwise."
 - Cooper et al. *BMJ* 2004;329:533
- "Evidence from multiple observational studies suggest that use of ASCs reduces the incidence of MRSA infection....."
 - McGinagle et al. *Clin Infect Dis* 2008;46:1717-25




Summary

- We are currently experiencing a crisis in antimicrobial resistance in healthcare, and MRSA is a major part of the problem
- Our response needs to be multi-faceted, and must include both measures to prevent transmission and prevent infections among MRSA-colonized individuals



Summary (continued)

- Effective prevention of transmission has benefits that persist beyond a single hospitalization, and is currently the most logical strategy for preventing the "downstream" adverse effects of healthcare-acquired MRSA acquisition
 - Usual facility-based surveillance strategies do not capture these downstream events, and therefore grossly underestimate the burden of consequences resulting from healthcare-acquired MRSA acquisition



Summary (continued)

- The weight of the current evidence suggests that strategies that use active surveillance are more effective at preventing epidemic and endemic MRSA transmission than strategies that do not
 - Given the current burden of the MRSA problem and evidence suggesting uncontrolled transmission in healthcare settings, active surveillance-based strategies should be widely employed
- The optimal strategy for implementation of active surveillance has yet to be fully determined (e.g. universal screening versus screening in targeted settings and patient populations)
