

MRSA Screening: Con

Daniel J. Diekema, MD, D(ABMM)
Professor of Internal Medicine and Pathology
University of Iowa Carver College of Medicine

Disclosures (all > \$10K):
Research funding from Pfizer, Merck, Astellas, Schering, bioMerieux

Defining the Intervention

- “Active Detection and Isolation (ADI)”
 - Screening patients for MRSA carriage, upon admission and periodically during hospitalization, and placing identified carriers in contact precautions
 - Will not discuss decolonization or “source control”, which doesn’t require identifying carriers to implement
 - Will not discuss the myriad variations of ADI

Establishing common ground

- MRSA is a very bad bug
- Infection prevention practices should be designed to prevent MRSA transmission and infection
- There *is* a role for ADI in MRSA prevention
 - One of several “second tier” interventions to be considered when “first tier” interventions fail to prevent MDRO transmission

<http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf>

Why shouldn't all hospitals institute ADI for MRSA control?

- The effectiveness of ADI remains in question
- ADI interventions are complex and resource intensive
- ADI may have unintended adverse consequences
- ADI is not necessary for MRSA prevention
- ADI is a misguided and unsustainable infection prevention approach

The effectiveness of universal ADI remains in question.....

Effectiveness of ADI for MRSA

- Two systematic reviews, CDC guidance, and SHEA/APIC policy statements all summarize the literature and come to the same conclusion:
 - Existing evidence does not justify adoption of MRSA ADI as a routine infection prevention measure.....why?

Cooper BS, et al. Health Technol Assess 2003;7:1-194.
McGinagle KL, et al. Clin Infect Dis 2008;46:1717-25.
Siegel JD, et al. www.cdc.gov 2006.
Weber SG, et al. ICHE 2007;28:249-60.

ADI: State of the Science

- Literature complicated, conflicting, and of "suboptimal" quality
 - All studies demonstrating effectiveness of ADI are quasiexperimental; many are single center, retrospective evaluations of outbreaks
 - Most studies used inappropriate statistical analysis
 - Conflicting data on ADI:
 - The only published experimental (controlled) study, showed no benefit of ADI
 - Quasi-experimental studies using interventions other than ADI showed similar MRSA reductions

Cooper BS, et al. Health Technol Assess 2003;7:1-194.
McGinagle KL, et al. Clin Infect Dis 2008;46:1717-25.
Siegel JD, et al. www.cdc.gov 2006.

One systematic review

- Examined studies of screening and isolation to reduce MRSA colonization & infection:
 - 46/254 studies met criteria for review
 - Most were interrupted time series (before/after)
 - Few were planned prospective studies
 - 45/46 employed multiple interventions
 - Consideration of potential confounders, measures to prevent bias, & appropriate statistical analyses "were mostly lacking"
 - 23/24 time-series studies used inappropriate statistical analyses...

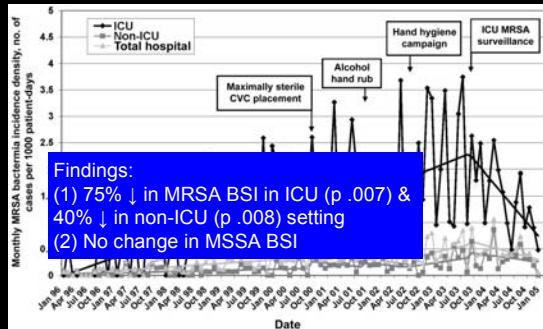
Cooper BS et al. Health Technology Assessment 2003; 7:1-194.

Best Evidence for Effectiveness

- Design: Interrupted times series
- Setting: Brigham & Women's Hosp, 1996-2004
- Interventions: sterile barrier precautions for CL placement, alcohol hand rub, hand hygiene campaign, MRSA ASC on admission & weekly for ICU patients → CP for infected/colonized patients
- Outcome: Health care associated MRSA BSI

Huang S et al. Clin Infect Dis 2006;43:971-8.

Best Evidence for Effectiveness



Huang, SS, et al. Clin Infect Dis 2006;43:971-8.

Best Evidence for Ineffectiveness

- Controlled, experimental study involving ~22,000 surgical patients, U. of Geneva Hospital, 2004-05
- Cross-over design in 12 wards (9 months in each phase):
 - Nasal & perineal MRSA swabs by PCR with CP & decolonization (mupirocin nasal ointment & CHG bathing x 5 days) for all (+) pts
 - No screening or decolonization

	Control period	Intervention period	Incidence rate ratio (CI95)
MRSA infections/1,000 patient days	0.91	1.11	1.2 (0.9-1.7)
MRSA SSIs/100 procedures	0.99	1.14	1.2 (0.8-1.7)
MRSA acquisition/1,000 patient days	1.59	1.69	1.1 (0.8-1.4)

Harbarth S et al. JAMA 2008;299:1149-57.

The universal ADI intervention is complex and resource intensive.....

Preparing for ADI

Meet with the lab director to discuss:

- Laboratory costs (Who pays?)
 - \$1-3 million in lab costs for large hospital
- Laboratory personnel and workflow
 - How many new tests? How often to test?
- Turnaround time and test performance
 - Cultures take 2-3 days to return
 - To isolate, or not to isolate?
 - Faster TAT options:
 - Chromagar (\$5 per plate), 18-24 hour TAT
 - Real time PCR (\$25-45/test), 1-4 hours TAT

Preparing for ADI

Meet with nursing and administration to discuss:

- Increased staffing and isolation needs
- If only 15% of MRSA detected on clinical culture, ASC may increase contact precaution use by 2-4 fold!
- Cohorting? Glove/gown use? Patient placement? Patient/family/staff education?
 - Major impact on budget for isolation needs
 - Enhanced educational mission
 - Major impact on bed management

Diekema DJ, Edmond MB. Clin Infect Dis 2007;44:1101-7.

Preparing for ADI

Effects on patient throughput

- ADI complicates bed management, unless you have all private rooms
- Internal gridlock: boarding in ER, worsening ER overcrowding, ambulance diversion
- Patients on CP on average waited 6.6 days longer for a bed in a LTCF
- Patients on CP (+ cx from prior admit) waited 1 hour longer in the ED (time from admission order until arrival on ward)

Salgado CD, Farr BM. Infect Control Hosp Epidemiol 2006;27:116-121.
Diekema DJ, Edmond MB. Clin Infect Dis 2007;44:1101-7.
Goldszer RC et al. J Clin Outcomes Manage 2002;9:5534-6.
McLemore A, Bearman G, Edmond M, SHEA 2009.

Preparing for ADI: New process measures

- HCW may not adhere to contact isolation
 - 2 studies place baseline adherence at ~20-30%!
 - Afif W, et al. Am J Infect Control 2002;30:430-433
 - Cromer AL, et al. Am J Infect Control 2004;32:451-5
- Observation of adherence to all aspects of contact precautions must be incorporated into hand hygiene observation
 - New tools, additional training
 - Increased efforts to improve adherence
- It makes no sense to seek out more patients for contact isolation, if HCWs are not adhering!

Diekema DJ, Edmond MB. Clin Infect Dis 2007;44:1101-7.

Does ADI achieve its primary process goal? (to isolate all carriers...)

- In 2007, ADI mandated in IL hospitals (ICU)
- ICU point prev. surveys (PPS) performed (N, 26)

Percent of patients:	Adult	Neonatal
Swabbed at admission	94.9	97.9
Admission cx positive	9.3	1.3
Point prev. cx positive	12.4	5.3
<u>In CP at time of PPS- total:</u>	26.3	7.5
pts with + admission cx:	86.8	85.7
pts with + MRSA on PPS:	52.0	39.3

Lin M, et al. Fifth Decennial Meeting, abstract 1383. Atlanta, GA. March 2010.

ADI may have unintended adverse consequences....

Adverse Effects of Isolation Psychological

• Studies using validated psychometric scales

Venue	Patients	Findings	P
4 geriatric rehabilitation wards, UK	22 pts in contact precautions vs 20 non-isolated patients	↑ depression ↑ anxiety ↔ anger	<0.01 <0.01 0.06
U. of South Florida	27 pts in contact precautions vs 24 non-isolated patients	↑ depression ↑ anxiety	<0.001 <0.001
Spinal cord injury center, UK	16 pts in contact precautions vs 16 non-isolated patients	↑ anger	0.037

Tarzi S et al. J Hospital Infection 2001;49:250-254.
Catalano G et al. Southern Med J 2003;96:141-145.
Kennedy P, Hamilton LR. Spinal Cord 1997;35:617-619.

Adverse Effects of Isolation Reduction of nurse & physician visits

Location	HCWs observed	Findings for patients in contact precautions	P
Duke U. Medical ICU	All	50% ↓ in contacts/hour	0.03
UVA Surgical ICU & wards	All	ICU: 56% ↓ in contacts/hour Ward: 47% ↓ in contacts/hour	<0.001 <0.001
U. of Michigan Medical wards	Physicians	52% ↓ in exam of patients by attending physicians	<0.001

Kirkland KB, Weinstein JM. Lancet 1999;354:1177-1178
Evans HL et al. Surgery 2003;134:180-188.
Saint S et al. Am J Infect Control 2003;31:354-356.

Adverse Effects of Isolation Safety issues

Study performed at Brigham & Women's Hospital & Sunnybrook & Women's (Toronto); n=450

	Isolated	Non-isolated	RR	P
VS incomplete	15%	9%	1.9	<.001
Days w/ no VS recorded	6%	1%	2.5	.02
Days w/ no nursing notes	14%	7%	1.8	<.001
Days w/ no MD progress note	26%	13%	2.9	<.001
Adverse events/1000 days	32	16	2.20	<.001
Supportive care failure*/1000 patient days	11	1	8.27	<.001
Patient complaint	25%	3%	23.5	<.001

*falls, pressure ulcers, fluid/electrolyte disorders

Stelfox HT et al. JAMA 2003;290:1899-1905.

Risk Perspective: Risk of Contact Precautions vs. MRSA Risk

Event	Risk
Depression in isolated patients	1:3
Adverse events in isolated patients	1:3
MRSA colonization	1:30
MRSA infection	1:120



The risk of an adverse event due to contact precautions is 40-fold higher than the risk of developing MRSA infection

Morgan DJ et al. Am J Infect Control 2009;37:85-93.

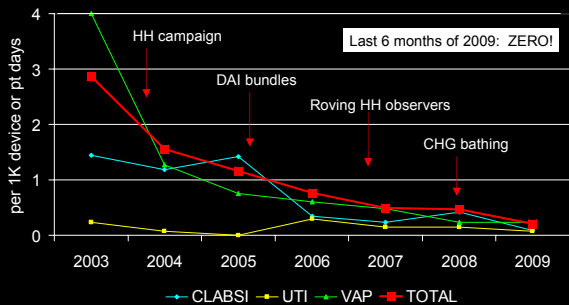
ADI is not necessary for MRSA prevention.....

Reducing MRSA without ADI

Setting	Interventions	Outcome	↓ in MRSA
Adult ICUs 820-beds Virginia	Hand hygiene Surv/Feedback Bundles, CHG	Device-assoc MRSA infxn rates	2006: 73% 2009: 90%
Hosp wide 840-beds Australia	Hand hygiene Environ cleaning Culture change	MRSA BSI rates	57%
Hosp wide 350-beds Australia	Hand hygiene Surv/Feedback	New MRSA MRSA BSI rates	43% 40%

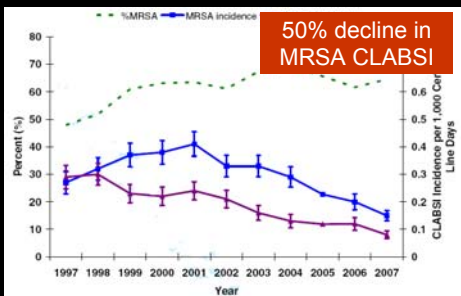
Edmond MB, et al. AJIC 2008;36:4613. Fifth Decennial Mtg, Atlanta, GA.
Johnson PD, et al. Med J Aust 2005;183:509.
Harrington G, et al. JCHE 2007;28:837.

MRSA infections: >90% reduction in adult ICUs



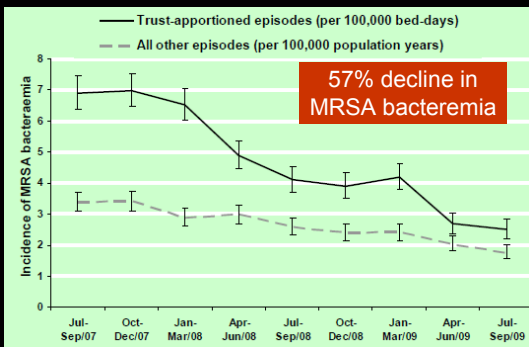
Edmond MB, et al. 5th Decennial Mtg, Atlanta, GA, March 2010.

Trends in *S. aureus* CLABSIs in ICUs, NHSN 1997-2007



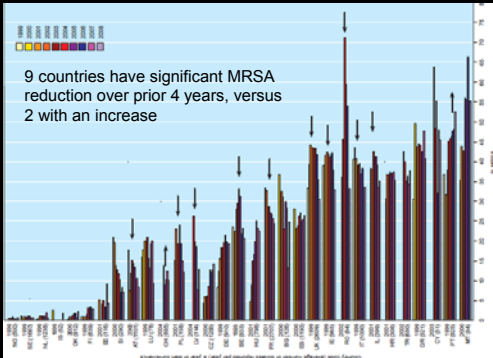
Burton DC et al. JAMA 2009;301:727-736.

UK Experience



http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1259152023516

EARSS Data: % MRSA



http://www.rivm.nl/earss/result/Monitoring_reports/

Don't take it from me!

[Dr. Jernigan] also said the hospitals' experience argues against the universal testing, or active surveillance, of hospital patients for MRSA, an ongoing debate in hospitals.

"I think this shows that hospital-wide active surveillance is not necessary to show a big decrease in MRSA," he said.

Sack K. New York Times, March 26, 2009

ADI is misguided and unsustainable infection prevention approach.....

To prevent MRSA infections, must one identify the entire reservoir? What about other HAI pathogens?

ICU Infections due to MRSA
National Healthcare Safety Network, 2006-2007

463 hospitals, ~25,000 infections

Infection	% due to MRSA
CLABSI	6
UTI	1
VAP	13
TOTAL	8

Hidron AI et al. Infect Control Hosp Epidemiol 2008;29:996-1011.

EPIC II: ICU infections worldwide
1265 ICUs in 75 countries

Organism	% total ICU infxns	% change EPIC
Gram pos	47	↓12%
<i>S. aureus</i>	21	↓11%
MRSA	10	↓9%
Gram neg	62	↑20%

Vincent et al. JAMA 2009;302:2323. Opal. JAMA 2009;302:2367.
Spencer RC. Eur J Clin Microbiol Infect Dis 1996;15:281.

Eight in 10 hospital infections going unreported 'because of Government targets'

© Common hospital superbugs "The Department has achieved significant reductions in MRSA bloodstream and C. diff infections, for which it set national targets," he said.

"But, in so doing, it has taken its eye off the ball regarding all other health care-associated infections – which actually constitute most by far, four-fifths, of all infections."

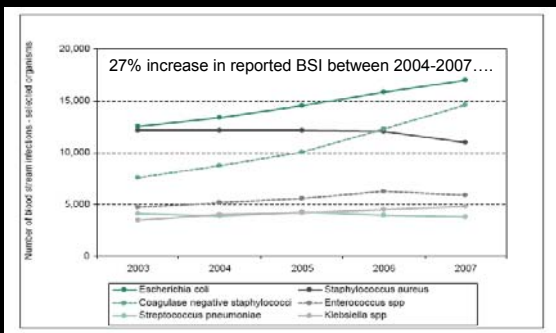
Rates of MRSA and C. diff have fallen in recent years but still affect more than 2,000 patients a month, official figures show.

However, the PAC report warns that there is evidence that other infections are on the rise.

A voluntary reporting system run by the Health Protection Agency found that bloodstream infections in hospitals rose by 30 per cent between 2003 and 2007.

www.telegraph.co.uk
www.hpa.org.uk

Taking your eye off the ball...



<http://www.publications.parliament.uk/pa/cm200809/cmselect/cmpublic/812/81205.htm>

Infection Prevention

- Overarching goal: decrease all infections to the irreducible minimum
 - Will also reduce those due to MRSA
- Principles:
 1. Implement evidence-based, non-pathogen specific interventions
 2. Monitor and provide feedback on compliance with process metrics
 3. Invest resources in building infrastructure

Assanasen S, Edmond M, Bearman G. Am J Infect Control 2008;36:407-13.

Conclusions

- Population-based (horizontal) infection prevention approaches have the greatest impact (10% MRSA + 90% "other")
- MRSA ADI has unintended consequences that impact patient safety, well being & satisfaction
- Approach to MRSA control must be an institution-specific, local decision developed in the context of the institution's priorities and resources

Acknowledgements

- Michael B. Edmond, MD, MPH
- Loren A. Herwaldt, MD

<http://haicontroversies.blogspot.com/>

CONTROVERSIES IN HOSPITAL INFECTION PREVENTION


WHY ISN'T HE FINDER BEING ISSUED IN INFECTION PREVENTION

Are MRSA infections more costly?

How much extra cost, morbidity and mortality are attributable to antibiotic resistance? The conventional wisdom is "a lot". However, those most likely to develop serious infections with resistant pathogens are usually much sicker than those infected with susceptible bugs. It's not sure that our traditional ways of "adjusting" for these differences are adequate. Nonetheless, the most extreme estimates of worse outcomes are always cited (including by me!). Len Merzelle's group in Rhode Island have an interesting paper in this month's issue of JGIM that points out how difficult it can be to adjust for differences in population characteristics when comparing cohorts infected with susceptible versus resistant pathogens. They examined 182 patients with *S. aureus* bloodstream infection, comparing those with MRSA versus MSSA infections. Using standard multivariable regression analysis, hospital costs and lengths of stay were higher for the MRSA cohort. However, when they used a propensity scoring method, there were no differences noted in costs or lengths of hospital stay.

POSTED BY TAN AT 9:08 PM 0 COMMENTS

Labels: MRSA



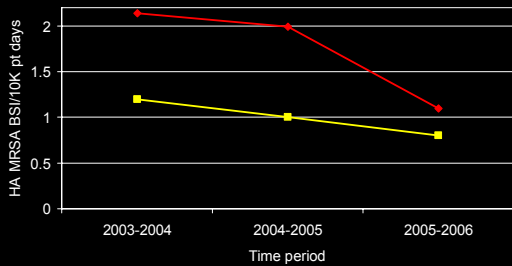
WHAT TYPES OF PRECAUTIONS HAVE BEEN IMPLEMENTED AT YOUR HOSPITAL FOR PATIENTS WHO ARE INFECTED OR CONFIRMED WITH MRSA? (CHECK ALL THAT APPLY)

- Private rooms, not at negative pressure
- Negative pressure rooms
- Surgical mask for all care
- Stop mask for all care
- Stop mask for aerosol generating procedures
- Contact precautions

Change your vote

Vote on this

Which hospital has been more successful in MRSA control?



Robicsek et al. Ann Intern Med 2008;148:409-18
University of Iowa (unpublished data)

ASC-CP Ethical Issues

- Given the potential for harm, should informed consent be obtained?
- Does patient autonomy trump public health? What to do with patients who refuse cultures?
- Unfair distribution of burdens & benefits--colonized patient bears burden of isolation (& no benefit) while the benefit accrues to uncolonized patients
- Is it fair to isolate colonized patients, when the data for effectiveness of this approach are questionable & other control methods are available?
- Should hospitals implementing ADI increase nurse:patient ratios to mitigate the safety concerns?
- Should self-pay patients be charged for a test that provides no direct benefit to them & is not needed for their care?
- Can the cost of active surveillance be justified? What is the opportunity cost?

Edmond MB, Lyckholm L, Diekema DJ. Public Health Ethics 2008;1:235-245.

STAR ICU Trial

- Federally funded, randomized multicenter study of 19 ICUs comparing ADI to standard care (CP for clinical cultures only)

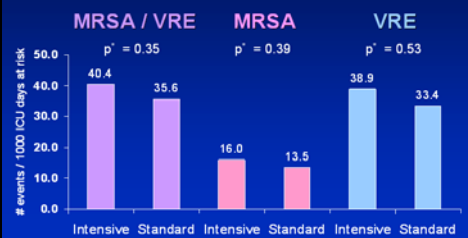
New colonization or infection	ASC-CP	Standard
MRSA	16%	13%
VRE	39%	33%
MRSA or VRE	40%	36%

Huskins C. Presented at SHEA Annual Meeting, April 2007.

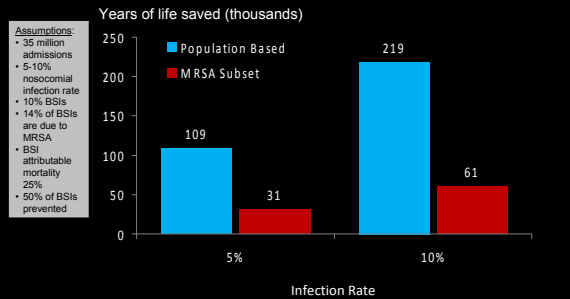
The only randomized trial of ASC for MRSA control had a long (~5 d) lab turnaround time

Huskins C, et al. SHEA 2007 (unpublished data).

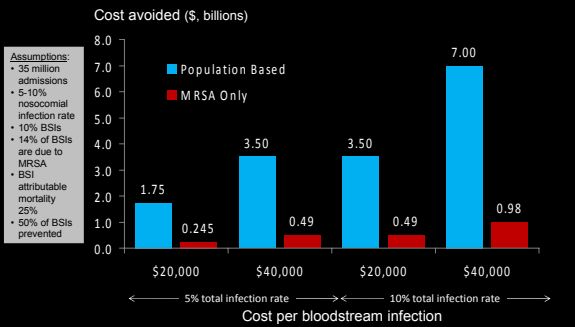
Incidence Density of New Colonization / Infection Events during Intervention Period Adjusted for Baseline



National Estimates of Savings Expected from Two Infection Control Approaches



National Estimates of Savings Expected from Two Infection Control Approaches



Conflicting data on ADI

- Harbarth, et al. JAMA 2008;299:1149-57.
 - Largest controlled trial of ASCs
 - Prospective crossover design: surgery wards
 - **No difference in MRSA infection rates**
- Robicsek, et al. Ann IM 2008;148:409-18.
 - Evanston/NW Healthcare: 3 hospitals
 - No ASC → ASC in ICUs → Universal ASC + decolonization with mupirocin and CHG
 - No control group
 - **70% reduction in MRSA infection rates**

VA Directive: Results so far

- MRSA prevention initiative began 1/07
 - 18 highly selected sites began 1 yr earlier
- Included screen of all admissions
- From '06 to '08, MRSA rates increased
 - 15% ↑ in 18 sites, 54% ↑ elsewhere
- From '07 to '08, MRSA rates increased
 - 2% ↑ at 18 sites, 36% ↑ elsewhere

IDS/ICAAC 2008, abstract K-3469.

Annual Cost of Enhanced Infection Control Alternative strategies

