

**MRSA – Is Search & Destroy the Way to Go?**  
**Prof. Andreas Voss, Radboud University Nijmegen Medical Centre, Netherlands**  
**Sponsored by WHO Patient Safety Challenge – Clean Care is Safer Care**



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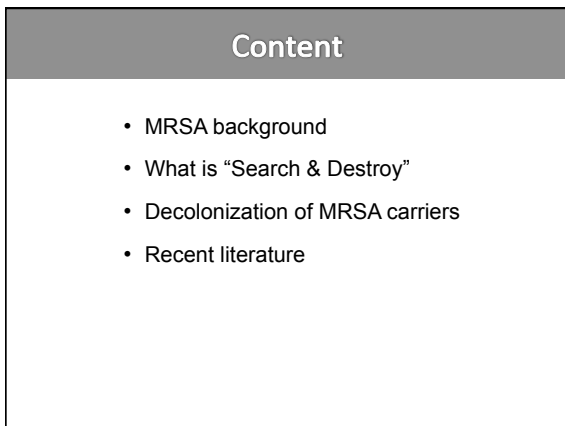
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**Intrinsic resistance**

- Penicillins, Cephalosporines, Carbapenems (think empiric treatment)

**Possible multi-resistance**

- Clindamycine/erythromycine (think bone & joint infections)
- Ciprofloxacin (think oral treatment of STAU infections)
- Rifampicin (think THP etc. infections)
- Aminoglycosides (think endocarditis)
- Mupirocin (think decolonization)

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**Most importantly ...**

- More infections
- Higher mortality
- Higher costs

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*Staphylococcus aureus*



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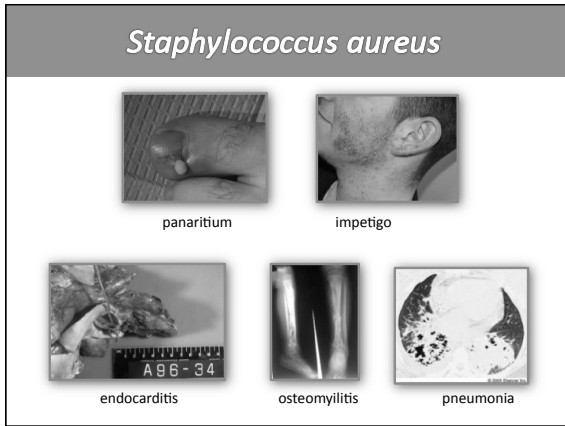
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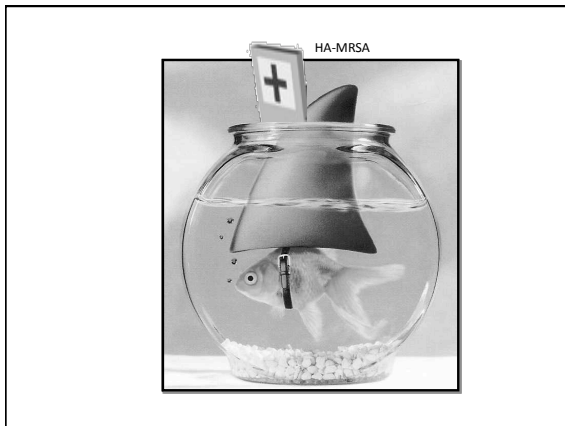
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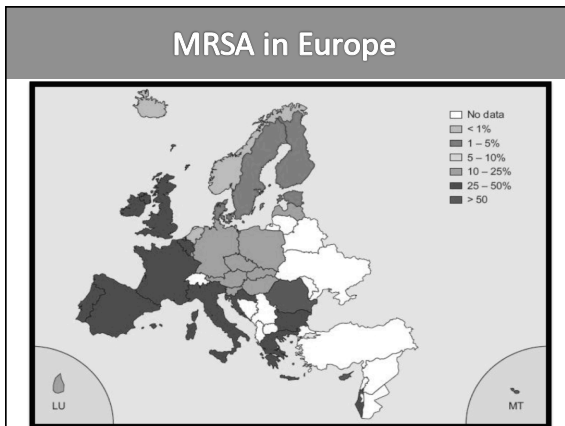
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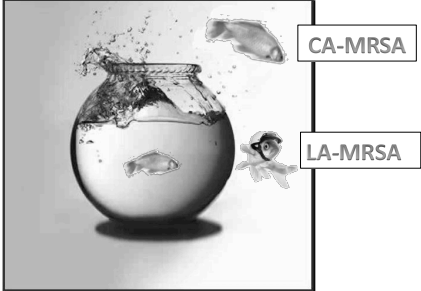
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**More about MRSA**



CA-MRSA

LA-MRSA

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**Types of MRSA**

- E-MRSA
- HA-MRSA (HO-CA-MRSA, HO-LA-MRSA)
- CA-MRSA (CO-HA-MRSA, CO-LA-MRSA)
- LA-MRSA

The only type of MRSA I find important:

- DCHYCI-JTMHTGROI-MRSA\*

\* Don't care how you call it – just tell me how to get rid of it-MRSA

Idea: Scott Weese

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**CA-MRSA**



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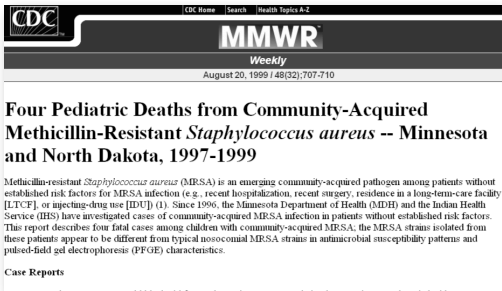
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**First cases of CA-MRSA in the USA**



**Four Pediatric Deaths from Community-Acquired Methicillin-Resistant *Staphylococcus aureus* -- Minnesota and North Dakota, 1997-1999**

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an emerging community-acquired pathogen among patients without established risk factors for MRSA infection (e.g., recent hospitalization, recent surgery, residence in a long-term-care facility [LTCF], or injecting-drug use [IDU]) (1). Since 1996, the Minnesota Department of Health (MDH) and the Indian Health Service (IHS) have investigated cases of community-acquired MRSA infection in patients without established risk factors. This report describes four fatal cases among children with community-acquired MRSA; the MRSA strains isolated from these patients appear to be different from typical nosocomial MRSA strains in antimicrobial susceptibility patterns and pulsed-field gel electrophoresis (PFGE) characteristics.

**Case Reports**

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**Risk-groups for CA-MRSA**

- Aboriginals
- Native Americans
- Prison inmates
- Sauna visitors
- Sport Teams
- Homosexual men
- Military recruits
- Kindergarten kids

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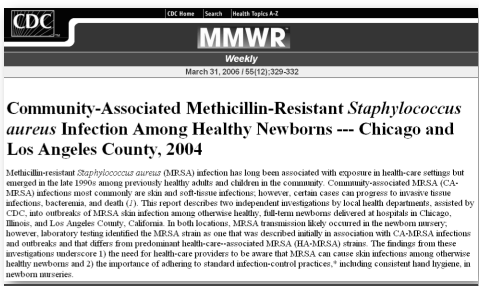
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**Nosocomial CA-MRSA infections**



**Community-Associated Methicillin-Resistant *Staphylococcus aureus* Infection Among Healthy Newborns --- Chicago and Los Angeles County, 2004**

Methicillin-resistant *Staphylococcus aureus* (MRSA) infection has long been associated with exposure in health-care settings but emerged in the late 1990s among previously healthy adults and children in the community. Community-associated MRSA (CA-MRSA) infections most commonly are skin and soft-tissue infections; however, certain cases can progress to invasive tissue infections, bacteremia, and death (1). This report describes two independent investigations by local health departments, assisted by CDC, into outbreaks of MRSA skin infection among otherwise healthy, full-term newborns delivered at hospitals in Chicago, Illinois, and Los Angeles County, California. In both locations, MRSA transmission likely occurred in the newborn nursery; however, laboratory testing identified the MRSA strain as one that was described initially in association with CA-MRSA infections and outbreaks and that differs from predominant health-care-associated MRSA (HA-MRSA) strains. The findings from these investigations underscore 1) the need for health-care providers to be aware that MRSA can cause skin infections among otherwise healthy newborns and 2) the importance of adhering to standard infection-control practices,\* including consistent hand hygiene, in newborn nurseries.

**Transmission of CA-MRSA in the hospital**

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**Conclusion CA-MRSA**

- New type of MRSA, different and independent of HA-MRSA.
- More virulent (severe SSTI, necrotizing pneumonia)
- More frequently in the healthy young patients without „typical“ risk-factors
- Now emerging as nosocomial pathogen
- CA-MRSA = challenge to countries presently using ‘Search&Destroy’

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**Risk-groups for CA-MRSA**

- Aboriginals
- Native Americans
- Prison inmates
- Sauna visitors
- Sport Teams
- Homosexual men
- Military recruits
- Kindergarden kids
- Animal lovers




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**Methicillin-resistant *Staphylococcus aureus* in Pig Farming**

Andreas Voss,\*† Frans Loeffen,\* Judith Bakker,\*  
 Corne Klaassen,† and Mireille Wulf\*

We conducted a study among a group of 26 regional pig farmers to determine the methicillin-resistant *Staphylococcus aureus* prevalence rate and found it was >760 times greater than the rate of patients admitted to Dutch hospitals. While spa-type t108 is apparently a more widespread clone among pig farmers and their environment, we did find other spa-types.

2004: 23% of farmers MRSA+      2006: 50% of farmers MRSA+

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**Risk for ST398 carriage**

- All persons in direct contact with pigs and calves
  - Farmers, their help, and other persons coming into the stables
  - Veterinarians
  - Animals transport personnel
  - Slaughterhouse personnel (part with living animals)
- Persons living on pig and calve farms

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**Fact about ST398 MRSA**

- Global problem
- Less transmissible than HA-MRSA
  - Main spread to persons in contact with pigs & calves
  - ... but permanently & broadly present !
- Assumed to be less virulent than HA-MRSA
  - ... but due to high occurrence many cases
- Multi-drug resistant ST398 MRSA reported
- PVL-pos ST398 reported
- First outbreaks reported
- Cases without animal contacts are described

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**Future of MRSA**



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**What is Search & Destroy?**



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**How to control MRSA – the Dutch way!**



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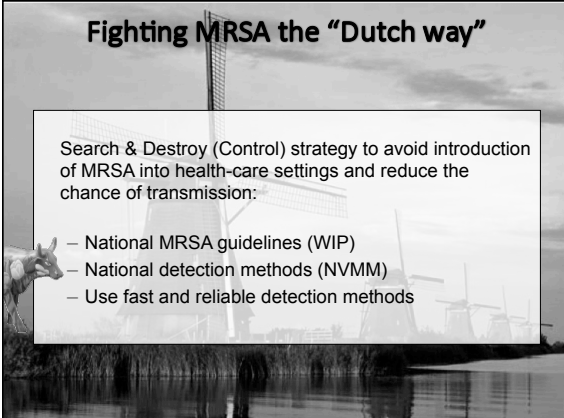
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**Fighting MRSA the “Dutch way”**

Search & Destroy (Control) strategy to avoid introduction of MRSA into health-care settings and reduce the chance of transmission:

- National MRSA guidelines (WIP)
- National detection methods (NVMM)
- Use fast and reliable detection methods



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**Key elements of the Dutch MRSA guidelines**

- Isolation and screening of **risk-patients** on admission
  - ◇ at all times
  - ◇ colonized and infected patients
- Decolonization of MRSA carriers

Consequent actions when transmissions occurs

- ◇ screening of all patients and HCWs at risk
- ◇ MRSA-positive HCWs not allowed to work

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**MRSA isolation measures in the NL**

- Placement in isolation room
  - ◇ with anteroom and negative pressure
- Gloves, gowns and face-masks
  - ◇ for all entering the room
- Handhygiene

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**What others do ...**

- Isolation and screening of risk-patients on admission
  - ◇ can't determine patients at risk
  - ◇ only certain departments!
  - ◇ not when too busy/weekends
  - ◇ only infected patients
- No decolonization of MRSA carriers
- Screening of all patients but not HCWs → consequently MRSA-positive HCWs may continue to spread

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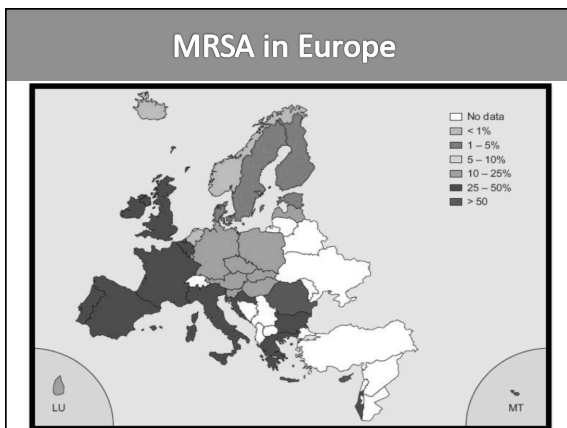
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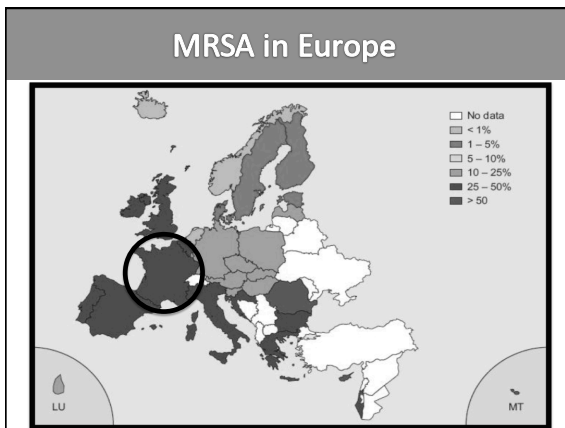
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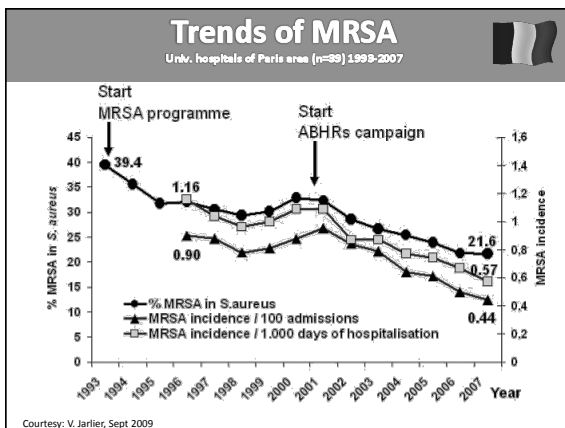
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What did our French colleagues do?

- Isolation Interventions
- Promotion of Hand Hygiene
- Identification of patients with MRSA infections or colonizations
- Feedback
- Annual reports

**MRSA CONTROL:**  
the major components count not the details

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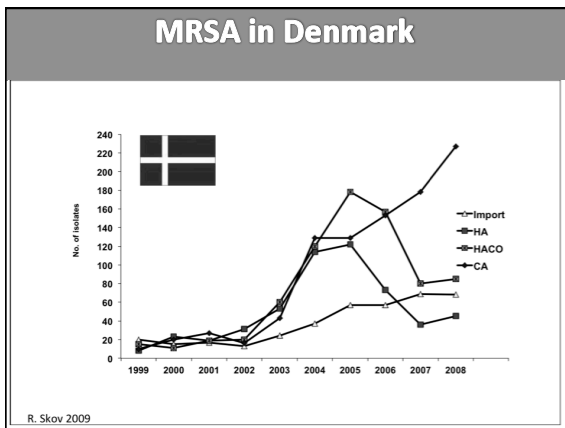
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The battle against HA-MRSA seems easy

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The control of CA+ LA-MRSA is a problem



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**Is the good strategy all that's count in the fight against MRSA and other HRMOs?**

While important other factors count:

- Compliance with basic infection control measures
- Infrastructure of the hospital
- HCW-patient ratio
- Antibiotic use control
- Cooperation of all healthcare sectors
- Farming (!) & food (?)

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# MRSA – Is Search & Destroy the Way to Go?

**Prof. Andreas Voss, Radboud University Nijmegen Medical Centre, Netherlands**  
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**Uncomplicated MRSA carriage**

MRSA carrier has no MRSA associated infection, has no skin lesions, and no foreign-body material that forms a connection between the internal and external environment (e.g., urinary catheter, external trachea) and

MRSA is localized in the nose only and

MRSA isolate expresses in vitro susceptibility to mupirocin

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**Complicated MRSA carriage**

MRSA carrier has skin lesions or foreign-body material that forms a connection between the internal and external environment or

Failure of preceding treatments according to the recommendations for uncomplicated carriage or

MRSA is cultured at extra-nasal sites (perineum, throat, wounds etc.) independent of nasal carriage or

MRSA isolate expresses in vitro resistance to mupirocin

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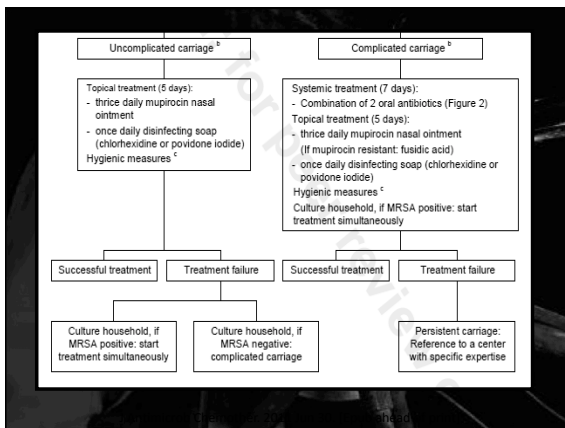
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- Implementation of GL increases treatment success
- 60% of MRSA carriers were successfully decolonised after the first eradication
- Risk factors for decolonisation failure: COPD, throat-perineum carriage, and carriage among household contacts (uncomplicated); throat carriage and dependence in activities of daily living (complicated)

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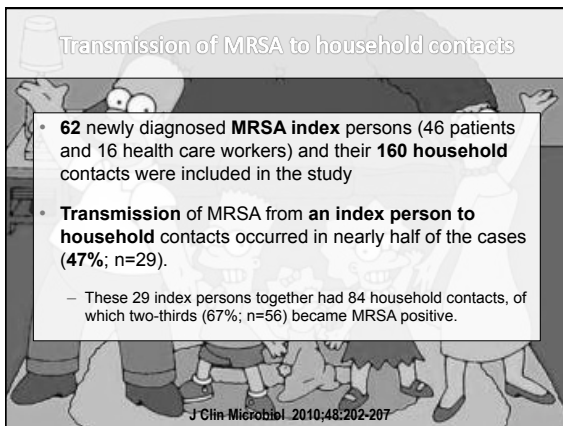
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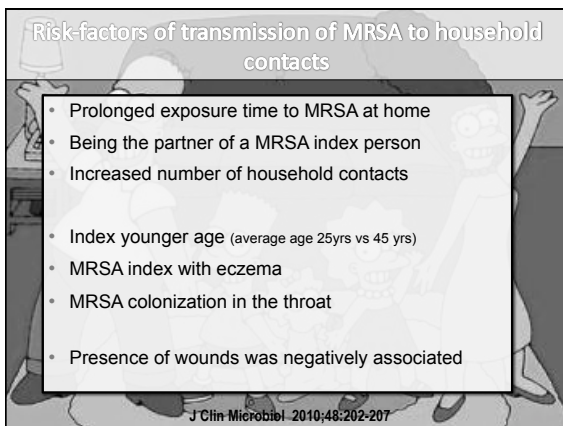
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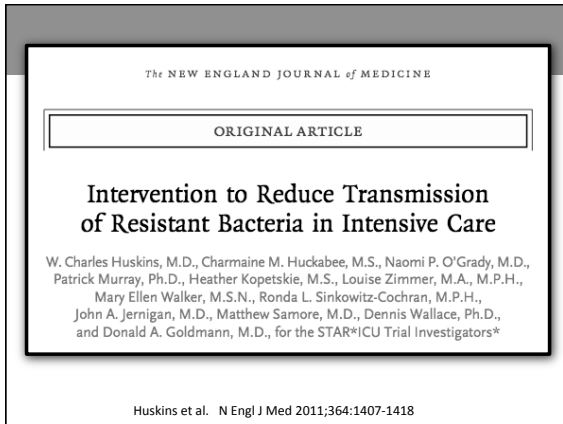
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**Intervention to reduce transmission of MRSA and VRE**

- Aim:**

Effect of **surveillance for MRSA and VRE** colonization and of the expanded **use of barrier precautions** (intervention) as compared with existing practice (control)

Huskins et al. N Engl J Med 2011;364:1407-1418

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**Precautions taken**

Table 1. Minimum Requirements for Hand Hygiene and Use of Gloves and Gowns by Health Care Providers during Contacts with Patients or Their Immediate Environment.\*

Type of Contact†	Standard Precautions			Universal Gloving				Contact Precautions				
	Hand Hygiene‡	Gloves§	Gowns¶	Hand Hygiene‡	Gloves§	Gowns¶	Hand Hygiene‡	Gloves§	Gowns¶	Hand Hygiene‡	Gloves§	Gowns¶
	before contact	after contact		before contact	after contact		before contact	after contact		before contact	after contact	
Sterile	+	+	+	+	+	+	+	+	+	+	+	+
Contaminated	+	+	+	+	+	+	+	+	+	+	+	+
Blood or body fluid	+	+	+	+	+	+	+	+	+	+	+	+
Invasive device	+	+	+	+	+	+	+	+	+	+	+	+
Other patient	+	+		+	+	+	+	+	+	+	+	+
Environment only		+			+	+		+	+		+	+

Control                      Intervention unknown                      Intervention known pos.

Huskins et al. N Engl J Med 2011;364:1407-1418

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**Intervention to reduce transmission of MRSA and VRE**

- **Result:**

The **mean (±SE) ICU-level incidence** of events of colonization or infection with MRSA or VRE per 1000 patient-days at risk, adjusted for baseline incidence, **did not differ significantly between the intervention and control ICUs** (40.4±3.3 and 35.6±3.7 in the two groups, respectively; P=0.35).

Huskins et al. N Engl J Med 2011;364:1407-1418

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**Questions/Comments**

- How many patients of the control group underwent expanded contact precautions because of clinical samples with HRMO?
- The average time until results were known and assignment of a patient to care with (full) contact precautions was 5-6 days!
- Where other preventive measures applied?
  - ed.: probably not – e.g. HH compliance low: 15-60%

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**VA initiative to prevent MRSA**

THE NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

**Veterans Affairs Initiative to Prevent Methicillin-Resistant *Staphylococcus aureus* Infections**

Rajiv Jain, M.D., Stephen M. Kralovic, M.D., M.P.H., Martin E. Evans, M.D., Meredith Ambrose, M.H.A., Loretta A. Simbarti, M.S., D. Scott Obrosky, M.S., Marta L. Render, M.D., Ron W. Freyberg, M.S., John A. Jernigan, M.D., Robert R. Muder, M.D., LaToya J. Miller, M.P.H., and Gary A. Roselle, M.D.

Jain et al. N Engl J Med 2011;364:1419-30.

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**Methods**

- A “MRSA bundle” was implemented in 2007 in acute care VA hospitals nationwide in an effort to decrease HAIs with MRSA.
- The bundle consisted of **universal nasal surveillance** for MRSA, **contact precautions** for patients colonized or infected with MRSA, **hand hygiene**, and a **change in the institutional culture** whereby infection control would become the responsibility of everyone who had contact with patients.

Jain et al. N Engl J Med 2011;364:1419-30.

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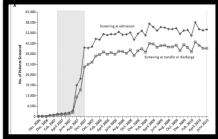
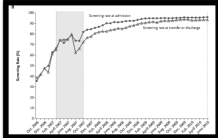
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**Results (1)**

- A total of 1,712,537 surveillance screening tests (10/2007 to 06/2010)
- Percentage of patients who were screened at admission increased from 82% to 96%

Jain et al. N Engl J Med 2011;364:1419-30.

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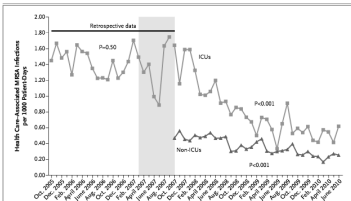
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**Results (2)**

- Rate of MRSA **transmission** in the ICUs was reduced by 17%, in the non-ICUs by 21%.
- Rate of **MRSA-HAI's** declined from 1.64 to 0.62 per 1000 patient-days, a decrease of 62%

Jain et al.  
N Engl J Med  
2011;364:1419-30.



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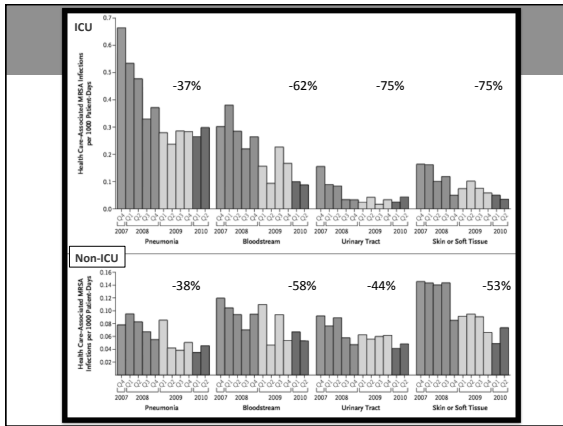
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**MRSA – Is Search & Destroy the Way to Go?**  
**Prof. Andreas Voss, Radboud University Nijmegen Medical Centre, Netherlands**  
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**Questions/comments**

- Huskins vs Jain – culture vs PCR – capture 40% vs >80% of patient days = optimize treatment early
- The interventions (screening, contact precautions & culture change) effect transmission ... how can a **small effect on transmission** (17% red.) have such a **large effect on HAIs** (62% red.)?
- Other concurrent interventions?

Jain et al. N Engl J Med 2011;364:1419-30.

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**Comments on both studies**

- Which component of the bundle contributed to the overall reduction in HAIs – or failed to do so?
- Is it even about the measures in the “bundle”, or is the effect due to other concurrent measures that “intrinsicly” occur while implementing the bundle:
  - CEO support and commitment to infection control
  - Culture change including improvement of basic infection control measures (including HH)

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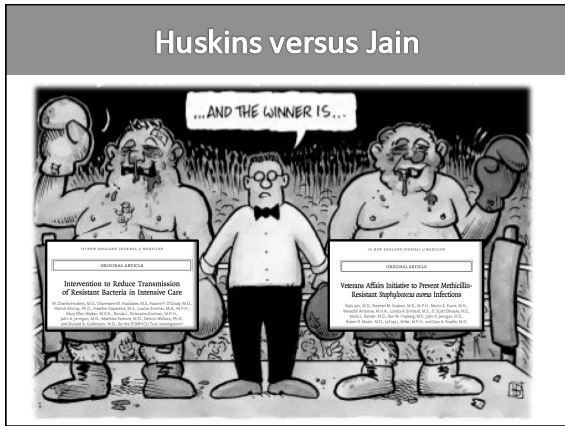
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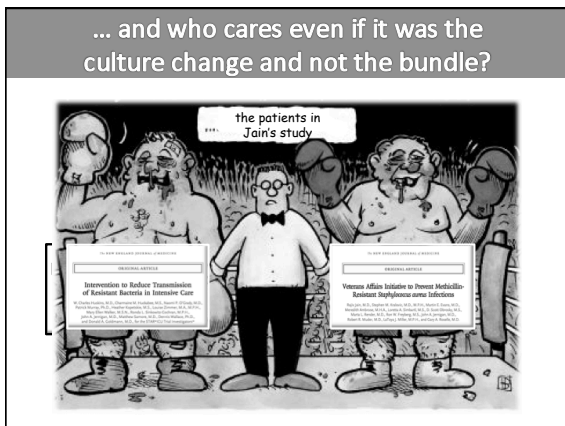
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