MRSA - learning from the best

- Are we the best?
- Why are we the best?
- The practice of S&D
- Proposal to the UK Government

Margreet C. Vos. Jan 2005, Erasmus MC, Rotterdam the Netherlands
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SEARCH AND DESTROY

BY:

- early detection
- early identification and containment of the reservoir
- reservoir: patients, HCWs, environment

HOW:

- isolation of patients proven AND at risk
- screening of asymptomatic carriers
- cohorting of patients and personnel
- eradication of carriersonship
- education of personnel
- desinfection
CRITICAL SUCCESS FACTORS: NATIONAL

- National policy proclaimed ‘benchmark’ by Health Inspectorate
- National laboratory guideline on detection of MRSA
- National guideline for transporting patients from abroad

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CRITICAL SUCCESS FACTORS: LOCAL

- Infection control committees
- All hospitals implement national policy
- Infection control facilities
- Trained HCWs
Risk classification of patients and HCWs

- Class A: proven carriers of MRSA
- Class B: high risk of being MRSA carrier
- Class C: increased risk of carrying MRSA
**MEASURES: PATIENTS**

- **Class A (proven) & B (high risk):**
  - Strict isolation upon admission
  - always gloves, gowns, masks, caps
  - Cohort nursing
  - Class A: Notification in computer system
  - Screen class B patients (multiple sites!)
  - Class A: treatment as soon as possible

- **Class C (increased risk):**
  - Screen and limit contact (single room)
  - until proven negative
MEASURES: HCWs

- **Class A**: Proven positive
  - Banned from work
  - With skin lesions: until proven negative
  - No skin lesions: until 2 days after R screening for 1 year after treatment

- **Class B**: High risk
  - Culture
  - Only work on their own department until proven negative

- **Class C**: Increased risk (worked abroad)
  - Culture, no limitations
OUTBREAK MANAGEMENT: THE UNEXPECTED PATIENT

- **Roommates:** strict isolation (class B)
- **ALL other patients on same ward:** culture, but no isolation (class C)
- **discharged patients:** culture, swabs sent by post
  - Compliance 90-95%
  - Effectiveness controlled by laboratory
- **HCWs:** class C (culture)
THE SECOND MRSA:

- MRSA outbreak committee

- Ward is closed for admissions
  - No entrance without gown, gloves, cap, mask
  - Personnel stay on closed wards (lunch etc)
  - Daily disinfection of rooms and passage

- Culture round (patients and HCWs) is repeated with each new finding

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CLOSED WARDS:

opened after:
1. All personnel
2. All patients are proven negative
AND after

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And after:

3. Disinfection of the entire ward
⇒ disposal of all not-disinfected paraphernalia
Feasible in low-endemicity situations
MRSA in the community: PREVALENCE DATA

- Dutch prevalence rate 2000-2002: 0-0.06%
- UK prevalence rate: 2001: 1.5%

- de novo strains in the community:
  PVL+, SCCmec IV

Outbreaks: Denmark, USA

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Search & Destroy
a plethora of measures not evidence-based?

Or empirical measures that do work?

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S & D lacks evidence but this is not an argument to stop successful strategies and not to start a successful strategy?

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Proposal to the Government: basic principles

- Half-hearted practices and following guidelines:
  \[\Rightarrow\] failure and frustration

- Use common sense and observational studies
Proposal to the Government
starting points and basic principles

- Include all 3 reservoirs: minimize risk on transmission

1. Patient
2. and HCW:
   - early detection, early isolation, early treatment
3. Environment
   - Desinfection

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Proposal to the Government

- controlled prospective "case-control" study:
  - two arms

- Cases: treated arm
  - Regions with S&D in all HCCs

- Controls: No change in infection control

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Case-Control: where?

Region:

defined large geographic area where patients receive their health care and where health service is adherent

selection for case regions:
new hospitals and or low(er) bed occupancy?

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Cases-Control: how?

3 RESERVOIRS

Debulking phase: 6 months

Health care centers:
Reservoir and multiplication areas

Test high risk patients:
Cohorting, isolation
and treat proven cases

only once screening HCW:
cohorting

Desinfection after
dismission positive cases

MRSA+: input
Patients: 2-5%
HCW: 5-10%

Select
High risk groups

Patients receive health care in nearby centers

Transmission in the community:
50% in households

MRSA+: output
Patients: 10-15%
HCW: 5-10%

Patients: 2-5%
HCW: 5-10%

HCW: 5-10%
Cases-Control: how?

3 RESERVOIRS

Fine tuning phase: years

Health care centers:
Reservoir and multiplication areas

- MRSA+: input
  - Patients: 0-4%
  - HCW: 5%

- Select High risk groups

Start with treatment HCWs
Cohorting high risk groups pending results
Cohorting HCWs

Screen all admissions
Screen HCWs on a regular base

Isolation and treatment
Desinfection after dismissal positive cases

MRSA+: output
- Patients: 1%
- HCW: 1%

Patients receive health care in nearby centers

Transmission in the community:
50% in households
"Case regions":

- subdivision within hospitals into:
  - proven negative
  - proven positive
  - pending results

- for patients, HCWs, materials, diagnostics etc:
  - cohort nursing
  - Active surveillance on definite negative dept.
Proposal to the Government

Needed:

- isolation facilities
- rapid detection techniques: hours, real time PCR
- national guideline: definitions, risk classes, measures
- electronic warning of positive patients
- reference laboratory and molecular typing
- motivation
- education
- investment
UK: E-MRSA

Experiences what happened if no uniform strategy and/or facilities are not sufficient.
Case-Control: Why?

- Taking < 3 reservoirs or include part of a hospital/region:
  - Proven not to be successful:

  Cepeda, Lancet online: 7 January 2005 patients/ICU

- Evidence is needed:

  Cooper et al BMJ 2004:
  Conclusion: Current isolation measures recommended in national guidelines should continue to be applied until further research establishes otherwise.
The Patient

Fig. 1. Staphylococcus aureus air counts from 157 persisting carriers and 16 patients with staphylococcal lesions (mean of 2 exami-
inations).
Figure 1  Detection rate of multi-resistant Gram-positive and Gram-negative bacteria on different environmental items. (■) Gram-positive pathogens; (□) Gram-negative pathogens.

Table I  Contamination of room door handles* by methicillin-sensitive/methicillin-resistant Staphylococcus aureus (MSSA/MRSA) in a hospital

<table>
<thead>
<tr>
<th>Contaminants</th>
<th>No. of room door handles contaminated/No. of room door handles examined (%)</th>
<th>No. of room door handles contaminated at a density (cfu/door handle)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–9 10–99 100–999 1000–9999 10 000–99 999</td>
<td></td>
</tr>
<tr>
<td>MSSA</td>
<td>41/196 (20.9)</td>
<td>28 8 2 1 2</td>
</tr>
<tr>
<td>MRSA</td>
<td>17/196 (8.7)</td>
<td>14 1 1 1 0</td>
</tr>
<tr>
<td>MSSA and MRSA</td>
<td>5/196 (2.6)</td>
<td>4 1 0 0 0</td>
</tr>
<tr>
<td>MSSA and/or MRSA</td>
<td>53/196 (27.0)</td>
<td>38 8 3 2 2</td>
</tr>
</tbody>
</table>

*The handles on a door inside and outside of a room were considered a single site.
MRSA survival on sterile goods packaging

Log$_{10}$ colony forming units (cfu)/mL

Time (weeks)

## The HCW: a source

<table>
<thead>
<tr>
<th>Index Case</th>
<th>No. of MRSA Outbreaks</th>
<th>No. of MRSA Outbreaks With Colonized HCWs</th>
<th>No. of Secondary Colonized HCWs*</th>
<th>No. of Secondary Colonized Patients†</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCW from foreign hospital</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>HCW with relapse</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Patient from foreign hospital</td>
<td>8</td>
<td>7</td>
<td>36‡</td>
<td>5</td>
</tr>
<tr>
<td>Unidentified index case</td>
<td>5</td>
<td>2</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>13</td>
<td>51§</td>
<td>40</td>
</tr>
</tbody>
</table>
**HCW: a reservoir**

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Blood*</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>18</td>
<td>74</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wound</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>14</td>
<td>37</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>IVI</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Urine</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Chest</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total no. infections</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>39</td>
<td>67</td>
<td>67</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>Infection rate** (%)</td>
<td>29</td>
<td>22</td>
<td>10</td>
<td>26</td>
<td>25</td>
<td>6</td>
<td>18</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

| No. staff positive | 0    | 0    | 2    | 4    | 8    | 40   | 14   | 19   | 42   | 42   | 42   |
| Staff positivity rate (%) | 1    | 1    | 1    | 2    | 3    | 1    | 44   | 44   | 44   | 44   | 44   |

| Total S. aureus | 83 (2.4) | 88 (1.1) | 100 (12.0) | 121 (14.9) | 182 (40.0) |
| B/C performed | 9431 | 9895 | 10778 | 12028 | 13258 |

| B/C positivity rate (%) | 0.021 | 0.010 | 0.11 | 0.15 | 0.56 |
| MRSA | 0.86 | 0.86 | 0.82 | 0.86 | 0.78 |
| MSSA | 117.2 | 115.7 | 122.3 | 124.5 | 125.8 |
| Nursing utilization (%) | 20.0 | 21.0 | 21.3 | 21.5 | 21.8 |

Farrington et al, Q J Med, 1998
War against MRSA

evidence based?

We cannot give you the evidence, but you can!

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