MRSA control The Dutch Way



Séminaire de pathologie infectieuse

Jeudi 25 novembre 2004 à 12h30 Cliniques Universitaires de l'UCL à Mont-Godinne Auditoire J. Heremans, Yvoir

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Preventing the spread of MRSA: common sense and observational studies

The golden cocci ...









MRSA

Staphylococcus aureus



Risk and outcome of nosocomial Staphylococcus aureus bacteraemia in nasal carriers versus non-carriers

Heiman FL Wertheim, Margreet C Vos, Alewijn Ott, Alex van Belkum, Andreas Voss, Jan AJ W Kluytmans, Peter HJ van Keulen, Christina MJE Vandenbroucke-Grauls, Marlene HMMeester, Henri A Verbrugh

Staphylococcus aureus is the second most frequent cause of nosocomial blood infections. We screened 14008 non-bacteraemic, non-surgical patients for *S aureus* nasal carriage at admission, and monitored them for development of bacteraemia. Nosocomial *S aureus* bacteraemia was three times more frequent in *S aureus* carriers (40/3420, $1 \cdot 2\%$) than in non-carriers (41/10588, $0 \cdot 4\%$; relative risk $3 \cdot 0$, 95% CI $2 \cdot 0 - 4 \cdot 7$). However, in bacteraemic patients, all-cause mortality was significantly higher in non-carriers (19/41, 46%) than in carriers (seven/40, 18%, $p=0 \cdot 005$). Additionally, *S aureus* bacteraemia-related death was significantly higher in non-carriers than in carriers (13/41 [32%] *vs* three/40 [8%], $p=0 \cdot 006$). *S aureus* nasal carriers and non-carriers differ significantly in risk and outcome of nosocomial *S aureus* bacteraemia. Genotyping revealed that 80% of strains causing bacteraemia in carriers were endogenous.

Lancet 2004;364:703-05

Nosocomial *S. aureus* bacteraemia



	Yes	No	RR
Carrier	40 (1.2%)	3388 (98.8%)	3.0
Non- carrier	41 (0.4%)	10547 (99.6%)	1.0

Nasal and subsequent bloodstream isolate clonally related in 80% of patients

Lancet 2004;364:703-05

Mortality of S. aureus bacteraemia



%	Carrier	Non- carrier	р
Overall	18	43	0.005

Lancet 2004;364:703-05

Risc factors for developing MRSA infections

(prospective cohort study in 479 MRSA colonized pts)

- intensive care treatment*
- three or more antibiotics
- pressure ulcers *
- surgical wounds
- nasogastric or endotracheal tubes
- drains
- urinary or intravenous * catheterization

Coello et al, J Hosp Infect 1997;37:39-46

* independent risc factors



Why continue to fight MRSA

- Higher transmissibility ?*
- Problems with treatment
- Higher virulence (mortality) ?
- Increased incidence of infections!
- Higher costs
- New threats

Nosocomial infections: Importance of cross-transmission



Organism	Number of	Proportion of
	isolates	transmissions (%)
E.faecalis	169	51
E.faecium	61	38
S.aureus	458	26
A.baumannii	30	20
P.aeruginosa	135	17
K.pneumoniae	81	12
E.cloacae	86	12
E.coli	159	11
S.maltophilia	73	5
Sum	1270	24

1,828 German ICU patients

4,962 isolates (18 months)

Grundmann et al; Crit Care Med, in press Problems with treatment



- Fewer effective antibiotics
- Vancomycin less active against S. aureus
- More side-effects of Rx
- Higher costs (drugs, extended stay, more diagnostic, TDM)
- Empiric treatment possibly insufficient
- Hardly new antibiotics

Higher virulence







Higher mortality



 Prospective study with 815 patients with nosocomial S. aureus BSI (CID 2003;37:1453-9)

	MSSA	MRSA
Aantal	433	382
Herstel	86,4%	70,4%
Overleden (niet infectie gerelateerd)	8,5%	17,8%
Overleden (infectie gerelateerd)	5,1%	11,8%

RR: 2,32 95% CI: 1,42 – 3,79





 Meta-analysis S. aureus BSI (CID 2003;36:53-59)

- 1980-2000

31 studies with 3963 patients2603 MSSA and 1360 MRSA

 11 studies corrected for confounders using multivariate analysis



Furthermore





MRSA infections increase the incidence of nosocomial S. aureus infections

S. aureus bacteremia in England & Wales

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S. aureus bacteremia in England & Wales

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Patients with SSI, corrected for type of surgery (CID 2003;36:592-8)

	Geen infectie	MSSA	MRSA
Aantal	193	165	25
Mediane opnameduur na OK	5	14	23
Mediane opnameduur na infectie	0	10	15
Kosten (mediaan in K \$)	29	53	92

Extra-costs linked to *S. aureus* infections in ICU patients



Costs	MRSA (N = 24)	MSSA (N = 64)	No infection (N = 128)
Length of stay	37,278 €	27,755 €	9,745 €
Medical procedures	12,345 €	10,632 €	5,791 €

Lepelletier D et al. Pathol Biol 2004; 52: 474-79



June 2002 first patient in the USA

MMWR juli 2002 (26);565-567

Some say that they look for MRSA





Diagnosis, surveillance and control of MRSA

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You can't control

what you don't

"see"

90 HCFs in 30 countries

9% wrong microbiological methods

Richet et al ICHE 2003;24:334-341

Culture/identification

- use enhancing media <A-I> (without 45% false-negative)
- one set of cultures enough <A-II> *
- when looking for a new strain do not use selective media <A-I>
- create selective media for screening of known strains <B-I>
- S. aureus: latex-agglutination (CF, prot A, surface antigens) <A-II>
- confirmation by tube-coagulase, DNase, AccuProbe <A-II>
 * still two in Nijmegen





Sometimes they try to hide ...









mecA positive

OXA 1-2 mg/l



- Cave: heteroresistent MRSA strains with an MIC around the breakpoint <A>
- Use a dilution method plus oxa-1 disc or oxa-screen agar <A-I>

<C-

- In MRSA always test vancomycine en mupirocine
- In oxacillin susceptible strains resistant to: quinolones, aminoglycosides, macrolides, clinda, or tetracyclin → PBP2a or het mec-A gen <C-II>
- Any strain suspicious for MR needs to be tested for PBP2a or *mecA*-gen.

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- Glycopeptide Intermediate Staphylococcus aureus
- Problem: to seperate susceptibel strains (MIC 0,5–2 μ g/ml) from intermediate strains (MIC 4–8 μ g/ml) by disc-diffucsion
- NCCLS = vancomycine agar screen test (low sensitivity)

Screening op v	verminderde gevoeligheid voor glycopeptiden met Etest
Antibiotica:	vancomycine en teicoplanine
Medium:	Brain Heart Infusion agar
Inoculum:	2 McFarland
Incubatietijd:	48 uur
Temperatuur:	35°C
Interpretatie:	R = vanco & teico \ge 8, or teico \ge 12

Incidence of Nosocomial and Imported MRSA cases per 1,000 admission detected by clinical cultures Erasme hospital, 1990-2002



Courtesy: M. Struelens

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www.wip.nl







Cooper et al BMJ September 2004

Controlling of multi-resistant m.o.'s

- Block their way into your hospital
 - Search & destroy strategy
- Immediate reaction when first detected
 - Screening, isolation and decolonization
- Controlling epidemic spread
 - Maximum measurements: isolation, screening, flagging, closing wards, ...





- Scutari
- S. aureus limitation technique (SALT)
- Search & Destroy

John Spicer, J Hosp Infect 1984;5:45-49 (Suppl. A)

Scutari Strategy



John Spicer, J Hosp Infect 1984;5:45-49 (Suppl. A)





- Selective with regard to infection vs colonization
- Aseptic techniques in patient care
- "smooth" limited number of isolation = limited stress for HCW and patients
- Saving money, time and staff

John Spicer, J Hosp Infect 1984;5:45-49 (Suppl. A)

Think bronchial suction !











Seen the high prevalence of MRSA in countries who use SALT and the missing logic of only isolating infected patients,

I conclude ...

SALT harms (your patient's) health





• MRSA patients



Strict isolation & screening of patients with risk of MRSA carriage on admission

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A patient transferred from a hospital or nursing home where MRSA is present, or from a foreign hospital who:

- has been operated on
- has drains or catheters
- is intubated
- has been admitted more than 24 hrs
- has open wounds
- has possible sources of infection, like abscesses

Search & destroy strategy

Strict isolation

- in single isolation room (!)
- nose-face mask, gown, gloves (and caps)
- MRSA screening (x 2)
 - nares and throat (one swab), plus
 perineum, or wounds, urine (if catheter present)
- List of contacts
- Interventions postponed if possible

Isolation and MRSA



- Setting: outbreak in ICU
- 16 of 331 admissions became MRSA positive
- None of 144 HCWs after contact with colonized patients became positive
 patients = source
- Rate of transmission:

contact isolation 0.009 per dayno isolation 0.14 per day (RR 15.6)

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

Diagnosis, surveillance and control of MRSA



Routine use of (%)	Africa	East- Europe	West- Europe	South America	USA
Private room	33%				
Glove					
use	62.2%)			
Gown use	44.4%	I	Richet e ICHE 20	et al 03;24:334-34	1
Hand hygiene	53.3%)			
Isolation sign	43.0%)			

When is S&D justified ?







- 1. Yes, hospital-wide
- 2. Yes, on certain wards/specialties
- 3. Only when causing clinical infections
- 4. No, doesn't work
- 5. No, let MRSA go and concentrate efforts on other pathogens (VRE, ..)

Winning the battle but losing the war

- 1000-bed teaching hospital
- Screening high-risk patients, isolation, closure of wards and screening during outbreaks, epidemiology

Eradication policy

- about 1 MRSA patient/mo
- largest outbreak 11 patients, despite intro of EMRSA-16
- increasing workload HCWs
- interference clinical service

 \rightarrow costs policy versus "costs" endemicity

Farrington et al. Q J Med 1998;91:539-548



Winning the battle and the war

 Main problem increasing amount of positive patients admitted to the hospital



Implement policy in the whole region instead of a single centre !

... a "typical" Friday afternoon





everyone (who could be of help) is gone you have an urgent appointment at home (in-laws visit)

... Professor Dr. B.I.G. Boss calls



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MRSA spreads through your modern ICU





MRSA outbreak control





What to do when out of control

- Cohort patients and HCWs
- No discharge (unless in isloation)
- Follow up possible former contacts (expatients)
- Screen all HCWs in the unit (not only those with "known" contact with index patient
- Screen out-of-unit consultants
- Admission stop ?

What is next?



Isolation and cohorting

- Index case(s) possible negative
- Cohort patients <u>and</u> HCWs (if necessary close beds)



Be consequent !





 Transmission will continue as long as a permanent carrier among patients or HCWs is still in the outbreak unit

No control \rightarrow admission stop



typical administrator or clinician (dislikes IC measures)



typical infection control guy

Achieve the impossible





What to do



Implement or re-enforce existing pitals are strategy
Decolonize and follow problem measurements with epidemic strains the problem intervence on the problem of the probl mprove infection control outside hospital

Furthermore ...



- Fast & reliable diagnostic
 - RT-PCR
 - IDI-MRSA
- Diagnostic guidelines
 - NVMM
- Infection Control guidelines
 - Implementation
 - Behavior of HCWs







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ICU-acquired MRSA infections (Geneva MICU 2003-04)



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Masuet et al – ICAAC 2004: #D57