Prevention of MRSA Bacteraemia in European Hospitals: Secrets of Success?
Dr. Michael Borg, Mater Dei Hospital, Malta
A Webber Training Teleclass

Prevention of MRSA Bacteraemia in European Hospitals: Secrets of Success?

Dr. Michael A. Borg
Head: Dept of Infection Control
Mater Dei Hospital - Malta
Email: michael.a.borg@gov.mt

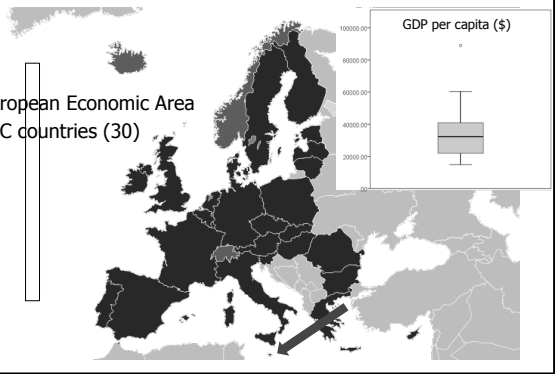
Hosted by Jane Barnett
jane@webbertraining.com

Objectives

- Provide an epidemiological overview of MRSA in Europe
  - Current state of play related to MRSA bloodstream infection prevention
  - Identify success stories
  - Assess characteristics of successful campaigns
- Present new research identifying IPC practices in low prevalence European hospitals.
- Propose a behavioural hypothesis on MRSA prevalence in Europe

The focus of this presentation

European Economic Area
EEC countries (30)



Why *Staphylococcus aureus* bacteraemia?

	Alive	Deceased	Total
BSI - SAU	57	19	76
No BSI	287	30	317
Total	344	49	393

Mortality:
BSI - SAU: 25%; No BSI: 9.5%
Odds ratio: 3.19
p = <0.001

BURDEN of RESISTANCE & DISEASE in EUROPEAN NATIONS

Data collected from Mater Dei Hospital 2007 / 8

Why MRSA bacteraemia?

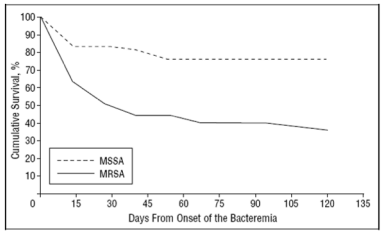


Figure 1. Survival curves for intensive care patients with bacteremia involving methicillin-susceptible *Staphylococcus aureus* (MSSA) (n=38) and methicillin-resistant *S aureus* (MRSA) (n=47) (log-rank test, *P*=.001; Wilcoxon test, *P*<.001).

Blot *et al*: Arch Intern Med. 2002;162:2229-35.

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RESEARCH ARTICLE

Mortality and Hospital Stay Associated with Resistant *Staphylococcus aureus* and *Escherichia coli* Bacteremia: Estimating the Burden of Antibiotic Resistance in Europe

Marlieke E. A. de Kraker, Peter G. Davey, Hajo Grundmann, on behalf of the BURDEN study group

- EU 2007:
  - 27,711 episodes of MRSA BSIs were associated with 5,503 excess deaths and 255,683 excess hospital days
  - The total costs attributable to excess hospital stays for MRSA BSIs were 44.0 million Euros.

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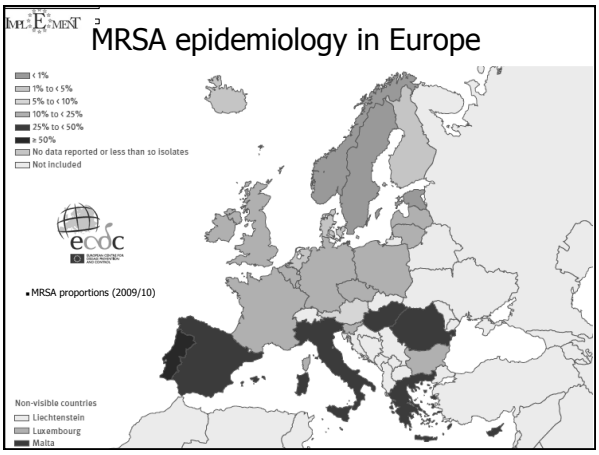
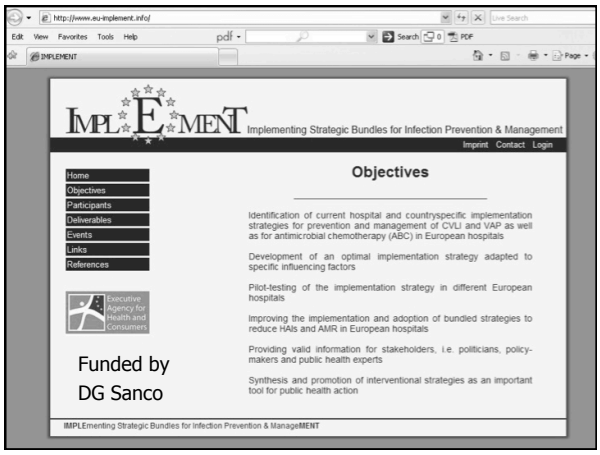




Methodology

- Online survey sent to members of European IC societies
  - March to October 2011
  - Translated to Spanish, French, German, Greek & Italian
- Denominator data collected:
  - Hospital demographic information,
  - MRSA proportions in blood culture isolates during previous year.
- Hospital practices
  - MRSA surveillance and follow up
  - Isolation & screening
  - Hand hygiene
  - Care of venous catheters
  - Antibiotic prescribing

Results

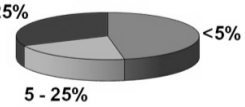
- 223 replies received from secondary / tertiary hospitals:
  - regional or academic institutions with ≥2 specialised services.
- Respondents primarily IPC doctors or nurses

MRSA bacteraemia proportions grouped:

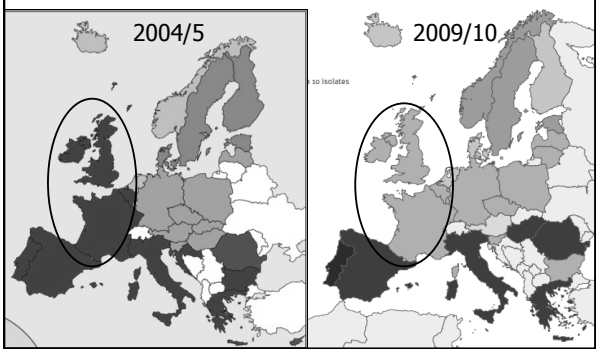
<5%: 105 hospitals

5-25%: 47 hospitals

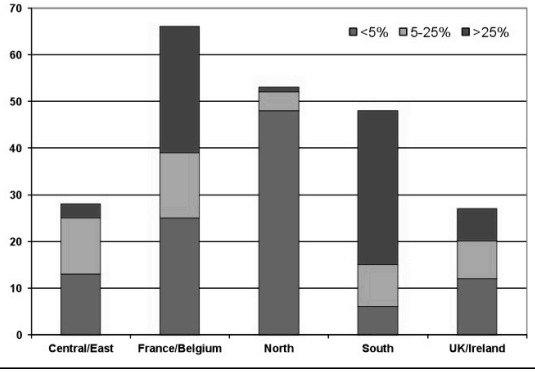
>25%: 71 hospitals



MRSA proportions: 2004/5 vs 2009/10



Hospitals by region



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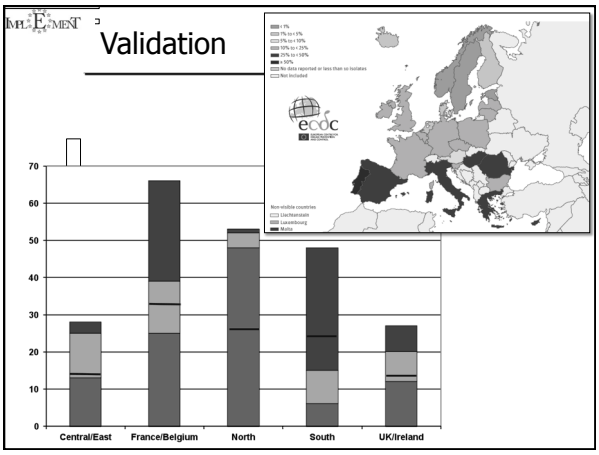

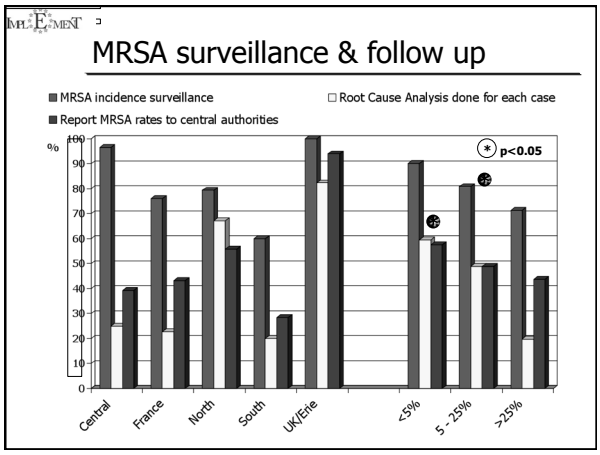

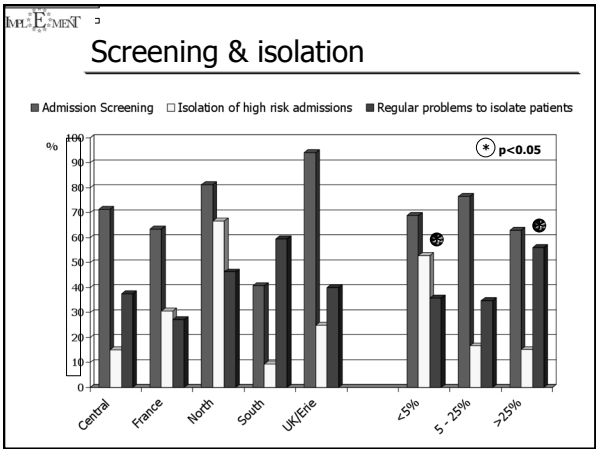

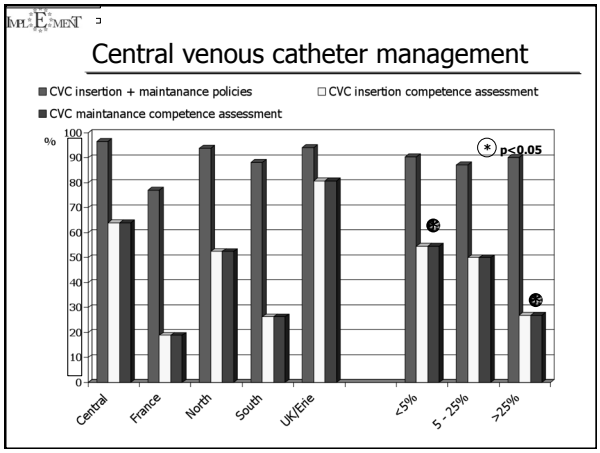

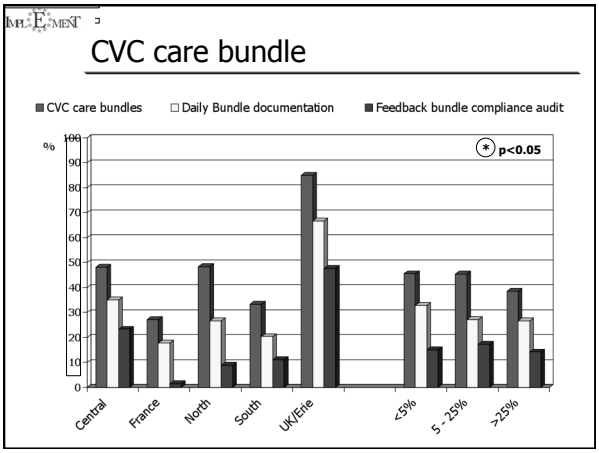

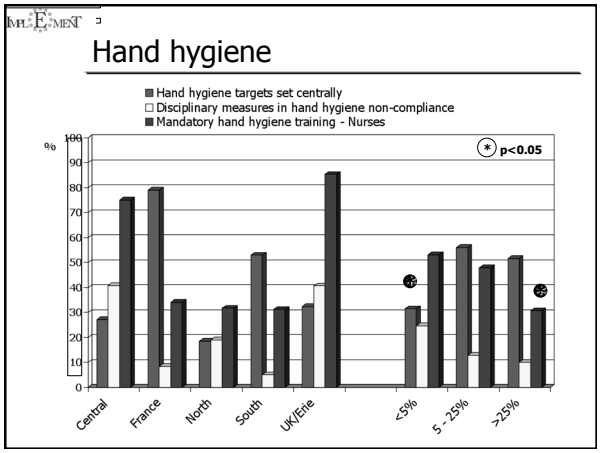

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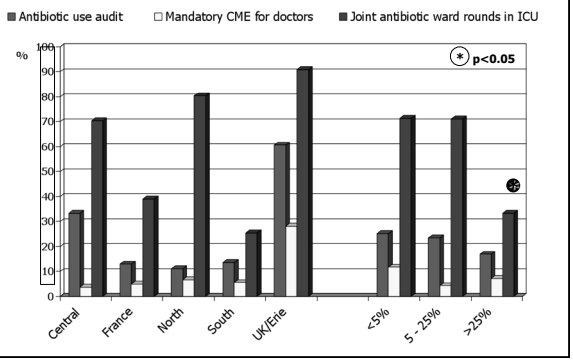
Antibiotic prescribing



Practices correlated with MRSA control

- Routine daily surveillance
  - Root cause analysis
- Isolation of high risk admissions
  - Availability of isolation facilities
- Competency verification of staff in IV device management
- Mandatory hand hygiene training
  - Accountability for poor performance
- Joint collaboration between microbiologists & clinicians in antibiotic prescribing

Conclusions

- Northern European hospitals show a strong emphasis on search and destroy
  - Screening & presumptive isolation of high risk admissions

Journal of Hospital Infection (2004) 56, 321-325

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SHORT REPORT

Low prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) at hospital admission in the Netherlands: the value of search and destroy and restrictive antibiotic use

H.F.L. Wertheim[a,*], M.C. Vos[a], H.A.M. Boelens[a], A. Voss[b], C.M.J.E. Vandenbroucke-Grauls[c], M.H.M. Meester[c], J.A.J.W. Kluytmans[d], P.H.J. van Keulen[d], H.A. Verbrugh[a]

Journal of Hospital Infection (2004) 56, 321-325

- "The low prevalence in the Netherlands can largely be explained by our national search and destroy policy, in combination with restrictive antibiotic use."
- MRSA patients are strictly isolated at hospital admission until screening cultures for MRSA prove negative ('search').
- In case of MRSA carriage, individuals are kept in isolation and treated to eradicate MRSA ('destroy').

Table I Risk factors for MRSA carriage in the Netherlands, according to the national guidelines of the Working Group Infection Prevention (WIP-guideline 35a; available at: www.wip.nl)

1 All patients transferred from a foreign hospital or nursing home, who had been admitted there for at least 24 h
or
had undergone surgery there
or
have a drain or catheter in place at the time of transfer
or
are intubated
or
have open wounds or infections such as abscesses or furuncles
2 All patients that are known to be positive for MRSA
3 Contacts of an MRSA carrier

Conclusions

- Northern European hospitals show a strong emphasis on search and destroy
  - Screening & presumptive isolation of high risk admissions
- Focus of French hospitals mainly focused on AHR based hand hygiene initiatives
  - Improvement more moderate & over >10 years (Jarlier et al)

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ORIGINAL INVESTIGATION

Curbing Methicillin-Resistant *Staphylococcus aureus* in 38 French Hospitals Through a 15-Year Institutional Control Program

Vincent Jarlier, MD, PhD; David Trystram, MD; Christian Brun-Buisson, MD, PhD; Sandra Fournier, MD; Anne Carbonne, MD; Laurence Marty, MD; Antoine Andremont, MD, PhD; Guillaume Arlet, MD, PhD; Annie Buu-Hoi, MD; Jean Carlet, MD, PhD; Dominique Decré, PharmD, PhD; Serge Gottot, MD, PhD; Laurent Gutmann, MD, PhD; Marie-Laure Joly-Guillou, MD, PhD; Patrick Legrand, MD; Marie-Hélène Nicolas-Chanoine, MD, PhD; Claude-James Soussy, MD, PhD; Michel Wolf, MD, PhD; Jean-Christophe Lucet, MD, PhD; Michelle Aggoune; Gilles Bräcker, MD, PhD; Bernard Régnier, MD, PhD; for the Collégiale de Bactériologie-Virologie-Hygiène des Hôpitaux Universitaires de l'Île de France

Arch Intern Med. 2010; 170:552-559

France

Phase 1 (1993-2000)
- Guidelines
- Hand washing
- Isolation in single-bed rooms
- Barrier precautions for MRSA patients
  - disposable gloves worn before and discarded after patient contact,
  - Hand hygiene
  - disposable aprons worn for extensive contacts,
  - equipment (eg, stethoscope) dedicated to the patient.

Phase 2 (2001 -)
- Alcohol-based hand-rub (ABHR)
  - **Used to benchmark hospital performance in infection control**

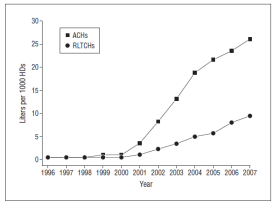

Figure 1. Changes in the use of alcohol-based hand-rub solutions (in liters per 1000 HDs) from 1993 to 2007. ACHs indicates acute care hospitals; RLTCHs, rehabilitation and long-term care hospitals; and HDs, hospital days.

France – MRSA reduction

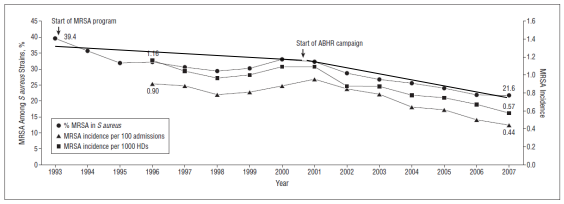

Figure 2. Change in methicillin-resistant *Staphylococcus aureus* (MRSA) rates from 1993 to 2007. Data are given as proportion (percentage) of MRSA in *S aureus*, MRSA incidence per 1000 hospital days, and MRSA rate per 100 admissions.

France - MRSA reduction by specialty

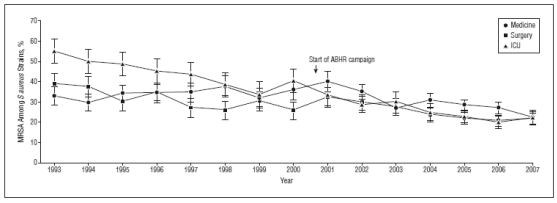

Figure 3. Change in the proportion (percentage) of MRSA strains in ICUs, surgery units, and medicine units from 1993 to 2007. ABHR indicates alcohol-based hand rub; ICUs intensive care units; and MRSA, methicillin-resistant *Staphylococcus aureus*. Error bars represent 95% confidence intervals.

- Major improvements were evident in Intensive Care
- Less reduction in general wards esp medicine

Conclusions

- Northern European hospitals show a strong emphasis on search and destroy
  - Screening & presumptive isolation of high risk admissions
- Focus of French hospitals mainly focused on AHR based hand hygiene initiatives
  - Improvement more moderate & over >10 years (Jarlier et al)
- UK / Irish responding hospitals reported the presence of a wide range of interventions
  - Rapid & significant MRSA improvement (Wilson et al)

UK: a political initiative

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NHS

Board to Ward

how to embed a culture of HCAI prevention in acute trusts

DH Department of Health

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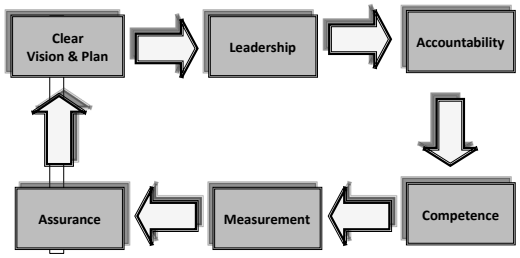
UK approach



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People

Going Further Faster II: Applying the learning to reduce HCAI and improve cleanliness

- **'Board to ward' culture:**
  - everyone in the organisation understands their role and is accountable for it
- **Director of Infection Prevention and Control (DIPC)**
  - role right: ensure that the DIPC has the skills, responsibility and delegated authority to maximise impact.
- **Provide comprehensive knowledge and skills assessment**
  - Staff competencies assessment
- **Rigorous personal objectives and individual appraisals**

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Processes

Going Further Faster II: Applying the learning to reduce HCAI and improve cleanliness

- **Create and implement an infection prevention action & delivery plan**
  - Objectives - Specific, Measurable, Achievable, Realistic and Time bound.
- **Use High Impact Interventions**
  - Emphasis on care bundles to increase the reliability of clinical processes.
- **Care pathways for patients with *C. difficile***
- **MRSA screening**
  - Consistently applied
- **Target environmental cleaning**

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Practices

Going Further Faster II: Applying the learning to reduce HCAI and improve cleanliness

- **Improved knowledge and skills to perform key clinical procedures:**
  - Including aseptic technique, taking blood cultures and inserting lines.
- **Prudent antimicrobial prescribing**
  - Robust prescribing policies including endorsement protocols.
- **Root cause analysis**
  - RCAs undertaken for every MRSA bacteraemia, with feedback to staff and prompt action on findings.
- **Improved isolation implementation**
- **Set expectations for compliance with key policies:**
  - Hand hygiene, dress codes, environmental cleanliness and antimicrobial prescribing)
  - Consequences of non-cooperation and/or poor practice clearly understood and acted upon.

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Performance

Going Further Faster II: Applying the learning to reduce HCAI and improve cleanliness

- **Routine reports on compliance:**
  - HCAI Key Performance Indicators (KPIs), use of HII bundles and levels of cleanliness regularly discussed at board level
- **Link HCAI performance to clinical indicators:**
  - Impact of HCAI on mortality rates and outcome measures emphasised with senior management and clinicians.
- **Communicate and present performance information in ways that change behaviour**
  - Reporting tools used to give insights into the effectiveness of interventions on HCAI reduction and cleanliness.
- **Directly reinforce individual accountability:**
  - Staff performance on HCAI and cleanliness tied into appraisals, performance objectives and reward & disciplinary processes.

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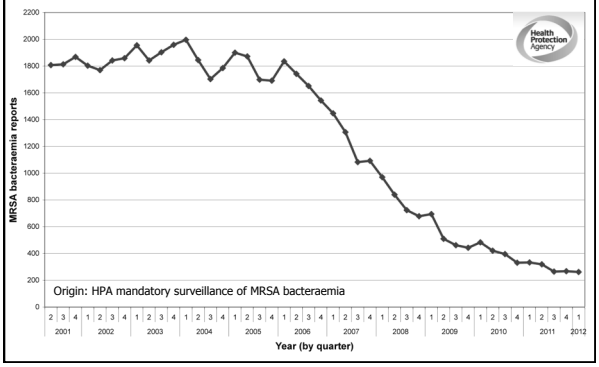
MRSA bacteraemia incidence (England)



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- Focus of French hospitals mainly focused on AHR based hand hygiene initiatives
  - Improvement more moderate & over >10 years (Jarlier et al)
- UK / Irish responding hospitals reported the presence of a wide range of interventions
  - Rapid & significant MRSA improvement (Wilson et al)
- Southern European hospitals have the policies but seem to face difficulties to translate them into effective practices
  - Infrastructural challenges,
  - Systems not conducive to achieve consistent performance, ownership and accountability

Why?

- No association with:
  - GDP per capita
  - Healthcare expenditure
  - Healthcare characteristics

Eur J Clin Microbiol Infect Dis
DOI 10.1007/s10096-009-0871-9

BRIEF REPORT

Are healthcare economics a factor behind European MRSA rates?

M. A. Borg

Journal of Hospital Infection 81 (2012) 251–256
Available online at www.sciencedirect.com
Journal of Hospital Infection
journal homepage: www.elsevierhealth.com/journals/jhin

Understanding the epidemiology of MRSA in Europe: do we need to think outside the box?

M.A. Borg [a,*], L. Camilleri [b], B. Waisfisz [c]

Aim: To investigate the possible impact of national cultural dimensions on the epidemiology of MRSA in Europe.
Methods: Median proportions of MRSA bacteraemia were sourced for countries participating in the EARS-Net surveillance network in 2010, and correlated with the national cultural dimension scores of Hofstede *et al.*
Conclusion: Implementation of ICAS programmes often requires behavioural change. Cultural dimensions appear to be key factors affecting perceptions and values among healthcare workers, which in turn are critical for compliance and uptake. Customizing ICAS initiatives to reflect the local cultural background may improve their chances of success.

Individual correlation and multiple regression analysis between national Hofstede cultural dimension scores and 2010 meticillin-resistant *Staphylococcus aureus* (MRSA) proportions reported by countries participating in EARS-Net

Cultural dimension	Correlation coefficient	*P*
Univariate analysis		
PDI	0.515	0.007
UAI	0.603	0.001
MAS	0.461	0.018
IND	−0.314	0.119
LTO	−0.237	0.243
IVR	−0.078	0.703
Multiple regression		
Constant	−1.551	
UAI	0.365	0.002
MAS	0.214	0.05
LTO	−0.281	0.05
Adjusted R^2	0.475	
F ratio	8.53	
P	0.001	

PDI, power distance; UAI, uncertainty avoidance; IND, individualism; MAS, masculinity; LTO, long-term vs short-term orientation; IVR, indulgence vs restraint.

Cultural dependency theory

- Infection prevention & control is ultimately dependent on correct behavioural practices
- Identified cultural dimensions have been linked with key behavioural traits:
  - risk tolerance, lack of ownership and discretionary practices
- It stands to reason that national cultural traits that influence behaviour will also have an impact on IPC performance

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Journal of Hospital Infection 86 (2014) 161–168

Available online at www.sciencedirect.com

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journal homepage: www.elsevierhealth.com/journals/jhin

Lowbury Lecture 2013

Cultural determinants of infection control behaviour: understanding drivers and implementing effective change

M.A. Borg*

Mater Dei Hospital and University of Malta, Msida, Malta

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Take home messages

- Infection control works!
- There is no one universal model
  - Different European countries have achieved MRSA bacteraemia reduction with different approaches
- Having the policies in place makes no difference; putting them into practice does
- Need to guarantee correct & consistent performance & encompass initiatives that are genuinely effective
  - Behaviour change is the goal

Coming Soon

April 17 **CHLORHEXIDINE PATIENT BATHING AS A MEANS TO PREVENT HEALTHCARE ASSOCIATED INFECTIONS**
Prof. Mark E. Rupp, University of Nebraska

April 24 *(Free Teleclass)*
ARE WE TOO CLEAN FOR OUR OWN GOOD? THE HYGIENE HYPOTHESIS AND ITS IMPLICATIONS FOR HYGIENE, LIFESTYLE, AND PUBLIC HEALTH
Dr. Sally Bloomfield, London School of Hygiene and Tropical Medicine

May 5 *(Free ... WHO Teleclass – Europe)*
WORLD HAND HYGIENE DAY **... CLEAN YOUR HANDS – STOP THE SPREAD OF DRUG-RESISTANT GERMS**
Prof. Didier Pittet, World Health Organization

May 8 **VENTILATOR-ASSOCIATED EVENTS: A PATIENT SAFETY OPPORTUNITY**
Dr. Michael Klompas, Harvard Medical School

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