Key prevention strategies for MRSA bacteraemia: a case study

Dr. Michael A. Borg
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Malta

Mortality following *Staphylococcus aureus* bacteraemia

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

Funded by DG Sanco
Direction Général
Santé & protection
des consommateurs

BURDEN of RESISTANCE & DISEASE in EUROPEAN NATIONS

Mortality:

BSI - SAU: 25%; No BSI: 9.5%

Odds ratio: 3.19

p = 0.0005

Data collected from
Mater Dei Hospital
2007 / 8

MRSA vs MSSA bacteraemia

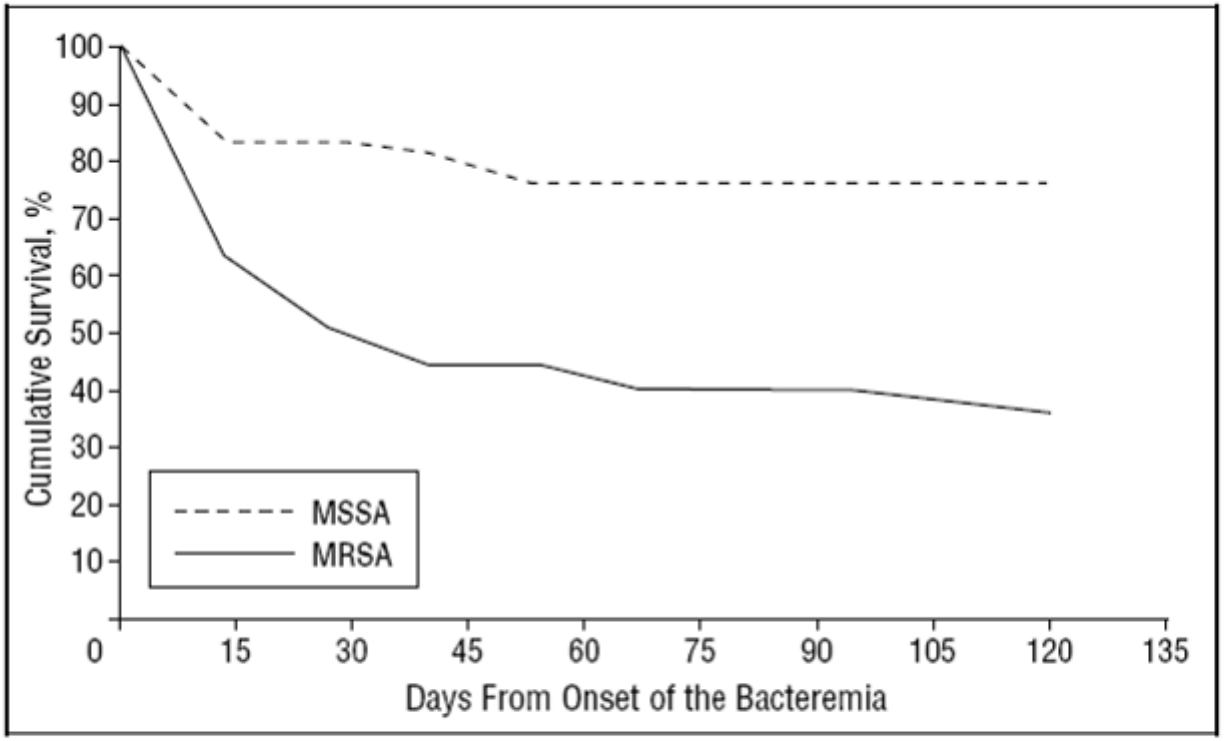

Figure 1. Survival curves for intensive care patients with bacteremia involving methicillin-susceptible *Staphylococcus aureus* (MSSA) (n=38) and methicillin-resistant *S aureus* (MRSA) (n=47) (log-rank test, $P=.001$; Wilcoxon test, $P<.001$).

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

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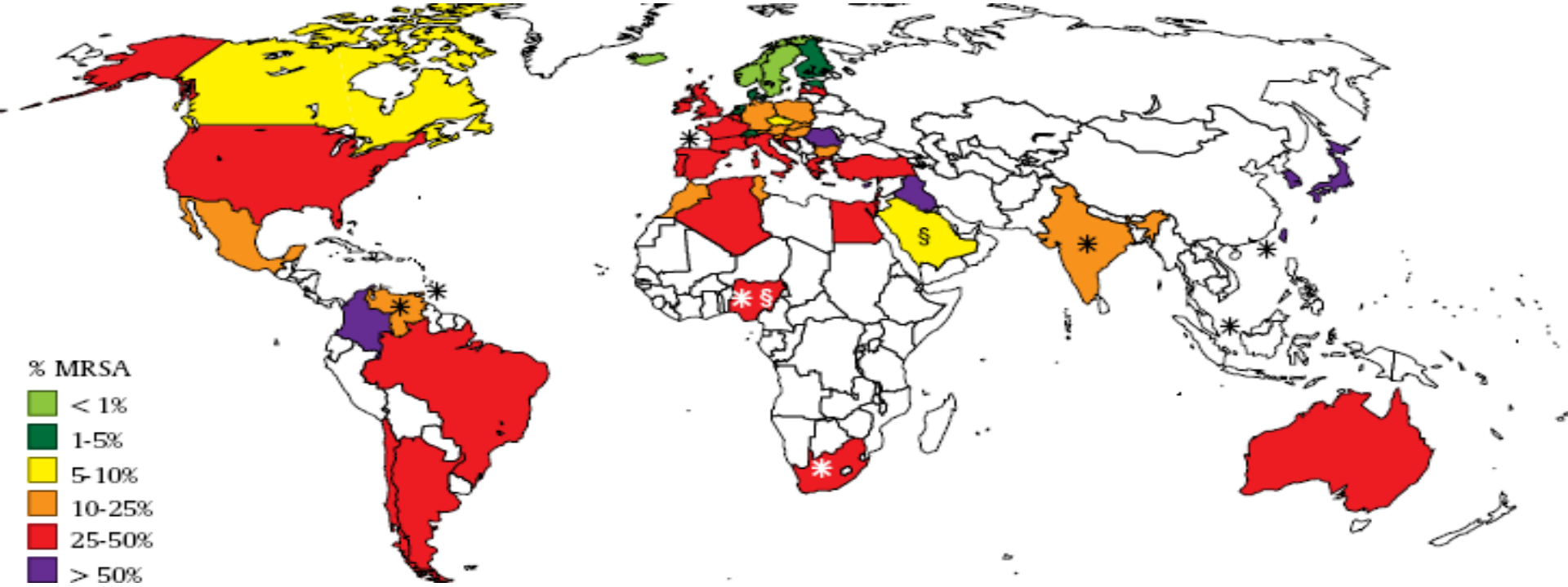
RESEARCH ARTICLE

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.

It's a problem in most of the world



Reported worldwide MRSA prevalence

Grundmann: Lancet 2006

Where do you start?

"If you cannot measure it, you cannot improve it"

Lord Kelvin, 1824-1907

Good surveillance is the key

- Sentinel surveillance
  - System where every single MRSA bacteraemia is promptly notified to infection control personnel
  - Differentiate between healthcare and community associated cases
  - Keep good records
    - as rates (first isolate only)
    - e.g. MRSA bacteraemias per 10,000 bed days or 1000 admissions
  - Try to benchmark yourself with others
    - Keeping in mind that hospital characteristics differ

SURVEILLANCE REPORT

Antimicrobial resistance surveillance in Europe

MRSA bacteraemia rates in EU countries

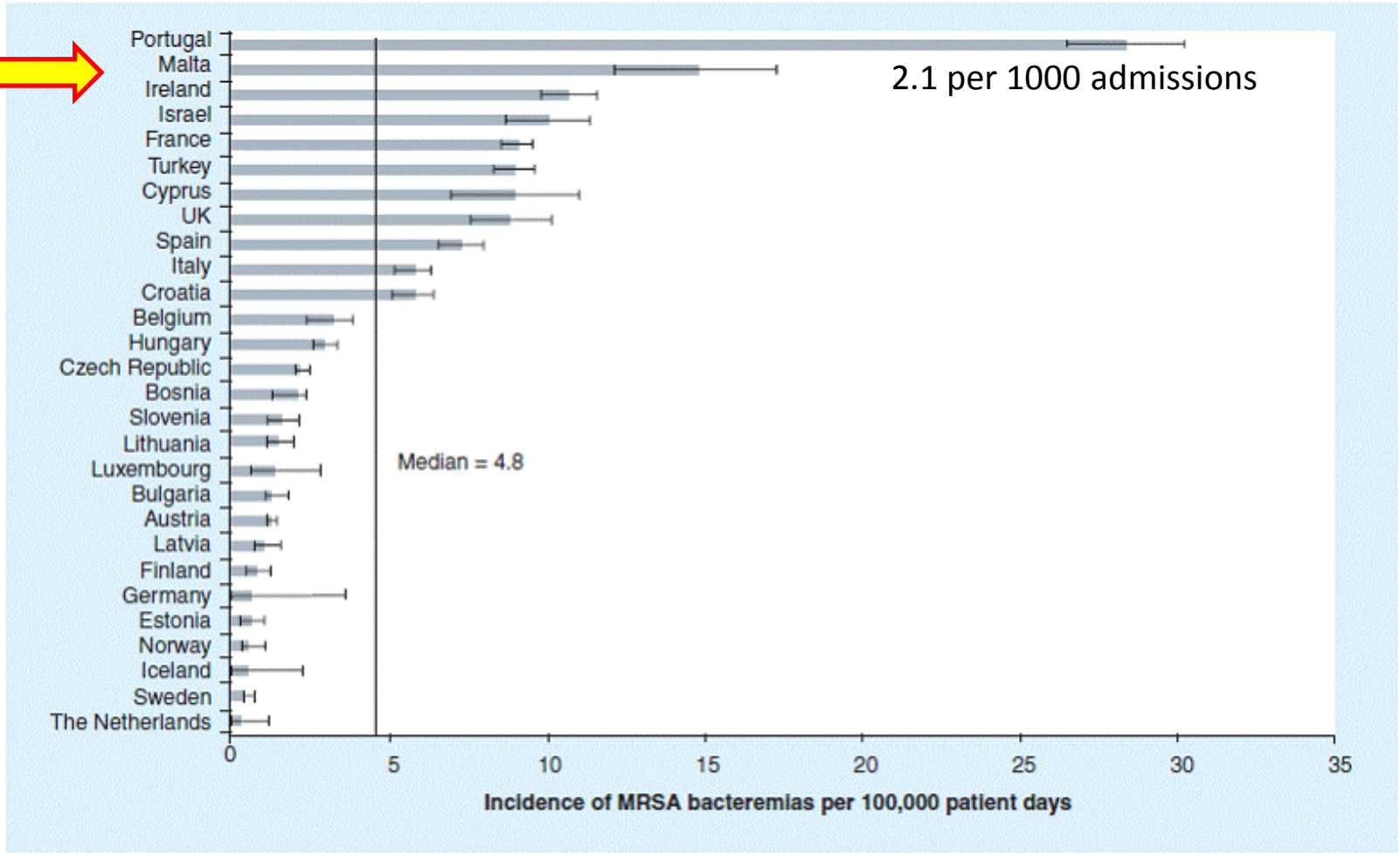
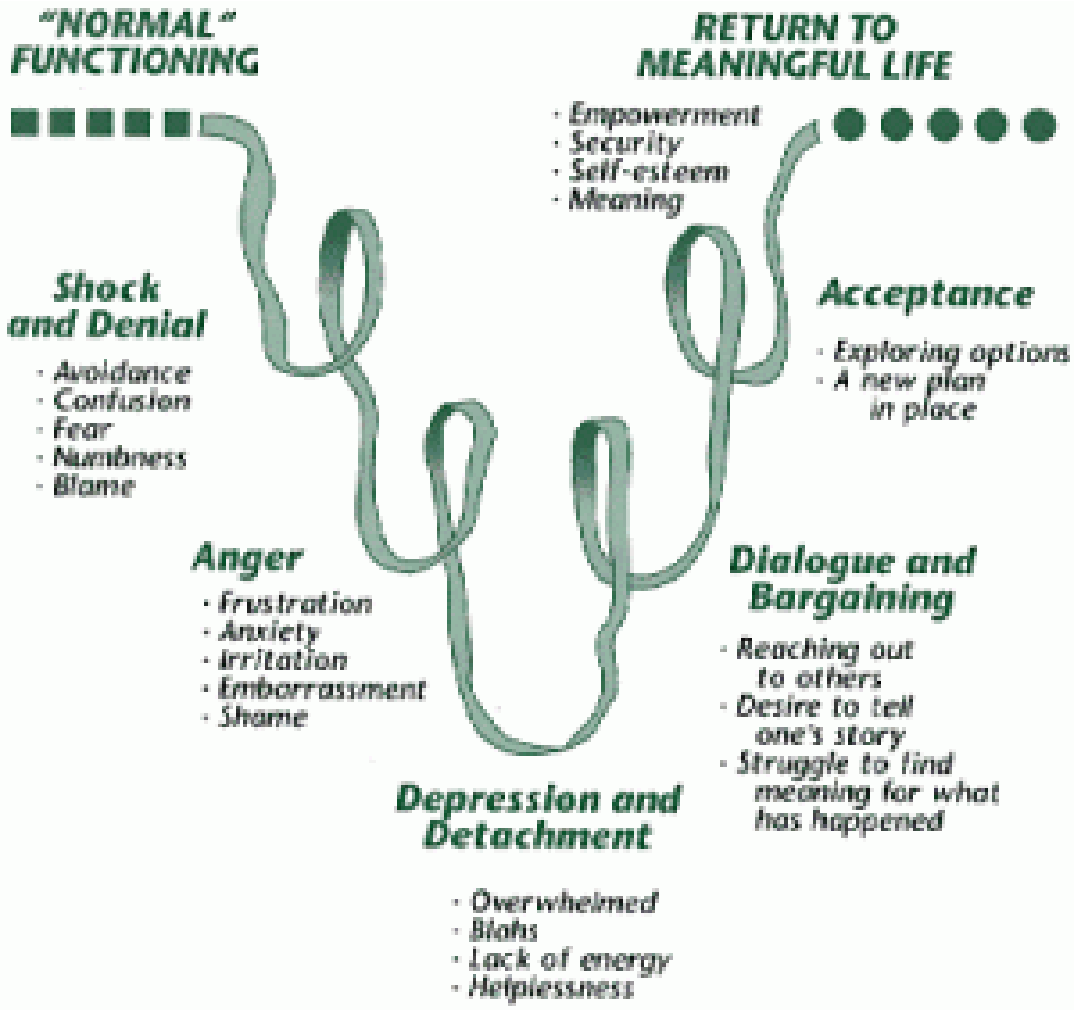


Figure 1. Incidence of MRSA bacteremias per 100,000 patient days in 2008 with 95% confidence intervals. Drawn from data in the 2008 Annual Report of the European Antimicrobial Resistance Surveillance Scheme [37].
MRSA: Methicillin-resistant *Staphylococcus aureus*.

Davey PG et al "Overview of strategies for overcoming the challenge of antimicrobial resistance" Expert Rev. Clin. Pharmacol. 3(5), 667–686 (2010)

Join me on a journey...

5 stages of grief



5 stages of grief

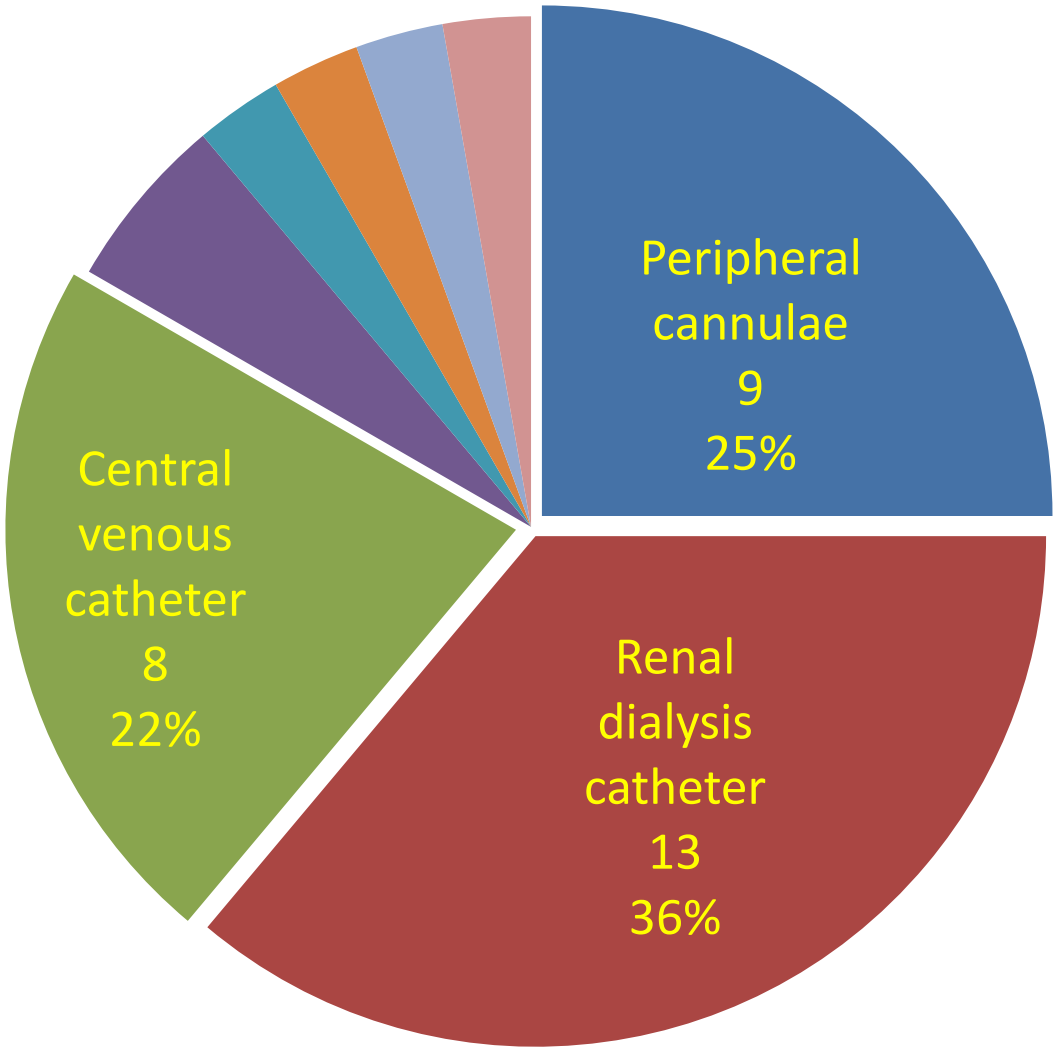
1. Denial:
   - Your figures are wrong! We do not have a problem with MRSA bloodstream infections!!!
2. Anger:
   - Don't you have anything better to do with your time than looking over my shoulder??!!
3. Depression:
   - Do you actually expect this to improve with our massive work load, overcrowding, patient to nurse ratios, etc etc?!
4. Bargaining:
   - But all these patients have so many underlying conditions... diabetes, renal failure, etc etc. They wasn't anything we could do to prevent these infections...

What changed?

- A new hospital chief executive
  - Infection control reported directly to him
  - Gave us the power to implement which was previously lacking
- Increased collaboration with hospitals in the UK having similar characteristics as ourselves


Root cause analysis
Effective root cause analysis to minimise recurrence of infections
Undertaking RCA when a patient has a confirmed HCAI is essential to ensure that a trust reduces similar risks to safe patient care in the future.
RCA should be carried out in all cases of MRSA bacteraemia and may be considered for certain cases of C. difficile, for example severe cases, death, and for clusters or increasing numbers.
RCA can show if there were risk factors that could have contributed to the problem occurring. It can also help identification of emerging trends, and in focusing on areas requiring improvement.
NHS
DH Department of Health

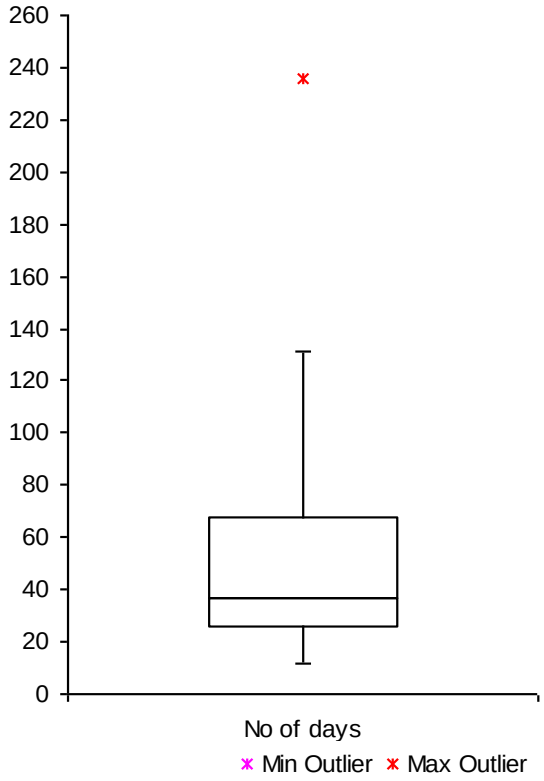
Root cause analysis
MRSA bacteraemias 2010



Renal dialysis

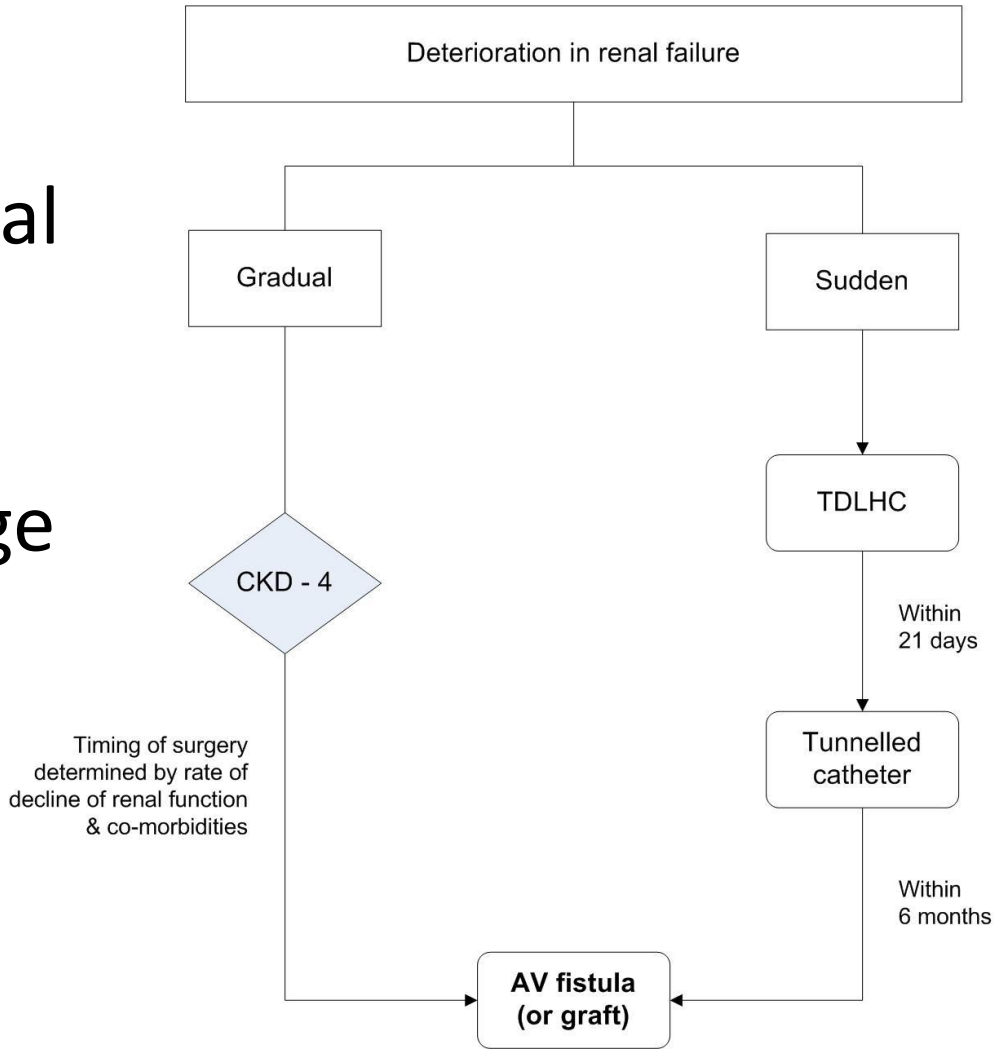
Numerous factors contributed to a long time lag before A-V fistula surgery

- Patients invariably kept on non-tunneled vascular catheters
  - Often for many weeks until surgery
- Less than optimal aseptic technique in line access
- Very high MRSA prevalence in community



Renal dialysis

- Attempt to get renal physicians to identify patients going into end stage renal failure and refer for surgery before they reach dialysis stage



Renal dialysis

- All new renal dialysis patients must have a tunnelled access line inserted within three weeks of referral for dialysis
- Initial logistical bottleneck solved by getting Medical Imaging to provide this services.
- Patients on tunnelled line referred for A-V fistula surgery within 6 months

Renal dialysis

- MRSA screening of all renal patients on a monthly basis
- Improved line access techniques by dialysis nurses
  - Ownership issues encountered
- ICN dedicated a half session a day to the project
  - daily visits to unit to review procedures

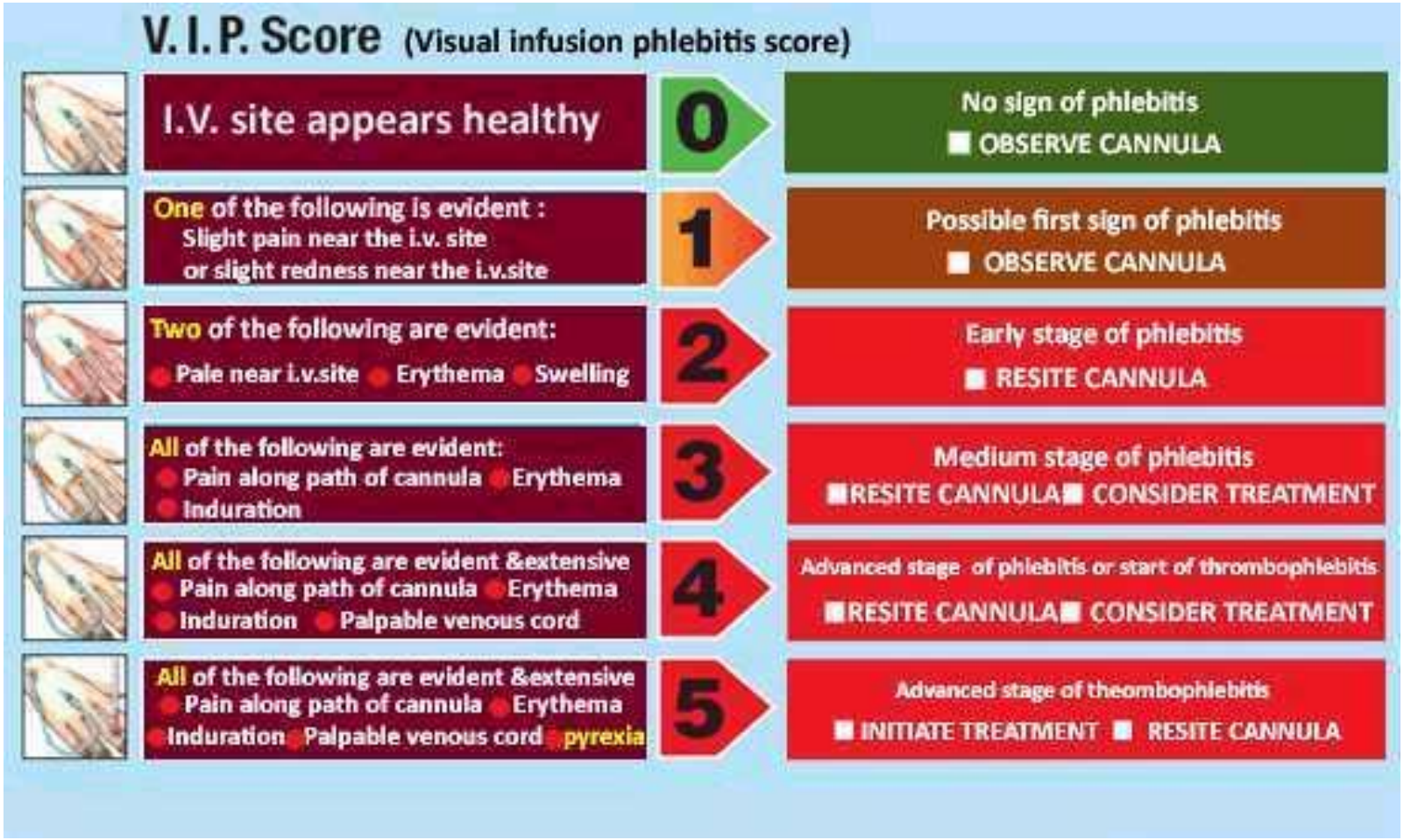
Peripheral venous cannulae

- Inadequate hand hygiene and skin decontamination before insertion by junior doctors
- No record keeping
  - No dating of PVC
  - Kept for prolonged periods
- No structured programme for PVC inspection
- PVC dressings were non-transparent
  - Early signs of inflammation missed and then developed into local sepsis and bacteraemia

Peripheral venous cannulae

- Induction training of all new junior doctors
- Hands on assessment using training arms
- Policy requirement to document insertion and put date on PVC dressing
- Change of dressing to transparent
- Introduction of Visual Infusion Phlebitis (VIP) score system

VIP score & management tool



Peripheral venous cannulae

- Strict limit of 3 day duration for all PVC unless a written risk assessment was written by the doctor.

Rickard *et al. BMC Medicine* 2010, **8**:53
http://www.biomedcentral.com/1741-7015/8/53

BMC Medicine

RESEARCH ARTICLE Open Access

Routine resite of peripheral intravenous devices every 3 days did not reduce complications compared with clinically indicated resite: a randomised controlled trial

Claire M Rickard[1*], Damhnat McCann[2], Jane Munnings[3], Matthew R McGrail[4]

Peripheral venous cannulae

- Audits, audits, audits, audits.
  - Done by another ICN who dedicated 4 half days per week to the project
- Audit findings sent to head of ward
- Six monthly meetings held with nurses in charge of wards in the presence of the Director of Nursing.
  - Well performing units congratulated and also publically commended
  - Low performing units were provided support if necessary but improvement demanded.

Central venous catheters

- Lack of policy in insertion
- Various shortcuts in proper attire, skin disinfection and draping
- Lines kept far too long (>14 days)
- Sub-optimal hub disinfection when accessing lines
- Major problems when patients transferred from ICU to general wards with central lines.

Central venous catheters

- Identification of a champion in intensive care
  - Lead intensivist
- Visit to a collaborating hospital in the UK
- Emphasis on
  - skin preparation (2% chlorhexidine in 70% alcohol)
  - Full patient drape
- Pack procured containing all required items
- Training of intensivists in insertion
- Introduction of an insertion checklist

CENTRAL VENOUS CATHETER INSERTION & REMOVAL FORM

Tick all that apply. This form should be kept with the patient and filed in the patient's records when the line has been removed

Patient ID _____

Patient name: _____

or affix addressograph

Date: / /

Time: :

Location: ITU ❑ Operating theatre ❑ A&E ❑ Radiology ❑

Reason: Inotropes ❑ Multi-use ❑ TPN ❑ Dialysis ❑ Other ❑

Insertion: Elective ❑ Emergency ❑ **U/S guidance:** Yes ❑ No ❑

No of lumens: *(insert number)* **Impregnated:** Yes ❑ No ❑

MRSA status:

Neg ❑ Pos* ❑ Not available ❑

*If MRSA positive, was Infection Control contacted beforehand?
Yes ❑ No ❑

Site of insertion evaluated before procedure with preference to subclavian

Site: Subclavian ❑ Jugular ❑ Femoral* ❑ **Side:** R ❑ L ❑

*If femoral: state why jugular or subclavian could not be used: _____

Femoral lines should be avoided as much as possible and inserted only if no other option

Comments:

Hand hygiene performed for the necessary duration

Method: Alcohol rub x 30 secs ❑ Washing (soap) x 1 min ❑

Skin at insertion site scrubbed vigorously with disinfectant for 30 seconds

Disinfectant: 2% chlorhexidine in 70% alcohol ❑ 0.5% chlorhexidine in 70% alcohol ❑

Inserted by:

Name _____

Maximal barrier applied for both patient and operator/s

Operator/s: Sterile gloves ❑ Gown ❑ Mask ❑ Cap ❑ All ❑

Signature _____

Patient: Sterile drape (Large) ❑

CXR done: Yes ❑ No ❑ **Correct position confirmed by doctor:** Yes ❑ No ❑

Assisting nurse:

Ease of insertion: Easy ❑ Moderate ❑ Difficult ❑

Name _____

Problems / Complications:

Signature _____

Both doctor and nurse to sign form

Central venous catheters

- Easy on documentation
  - Tick sheet
- Filled by doctor
  - signed by both doctor and nurse assistant
- Nurses were not required to oversee doctor's performance or stop an insertion
- Informal feedback from link nurses identified non-compliant staff
  - Referred to champion
- User consultation at all stages
  - Focus groups to understand bottlenecks
  - Policy tweaking during two seminars held in roll-out phase

Central venous catheters

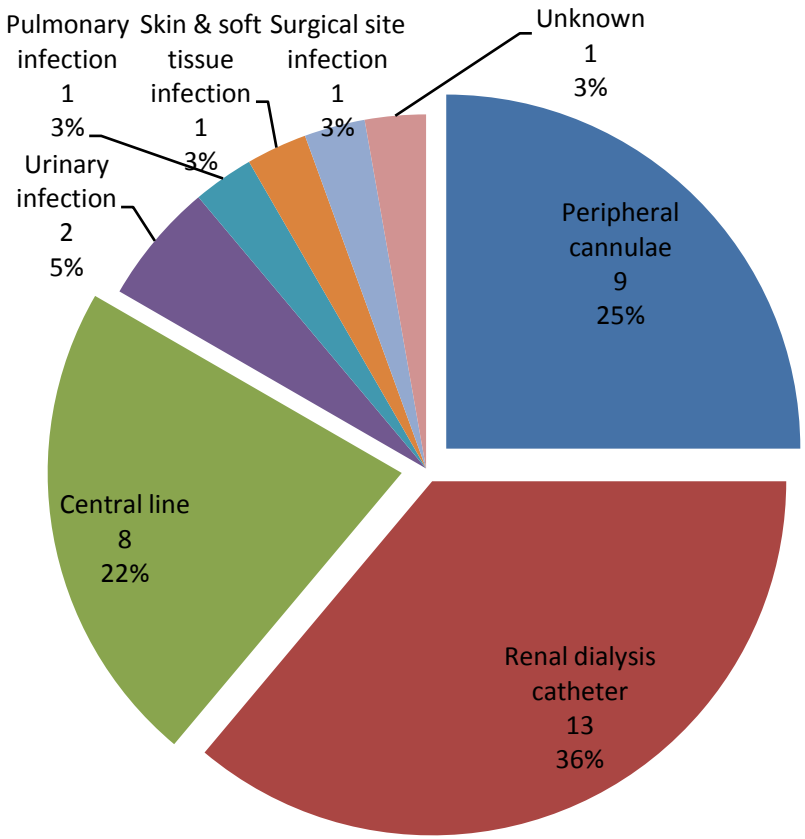
- Line maintanance checklist introduced
- Hub scrub with 2% chlorhexidine alcohol x 15 seconds emphasised
- Daily review of central line necessity by intensivists
- Review of line necessity before transfer to ward
  - If essential, ICN informed
  - Went to ward daily to ensure correct access practices

CENTRAL VENOUS CATHETER MAINTANANCE FORM

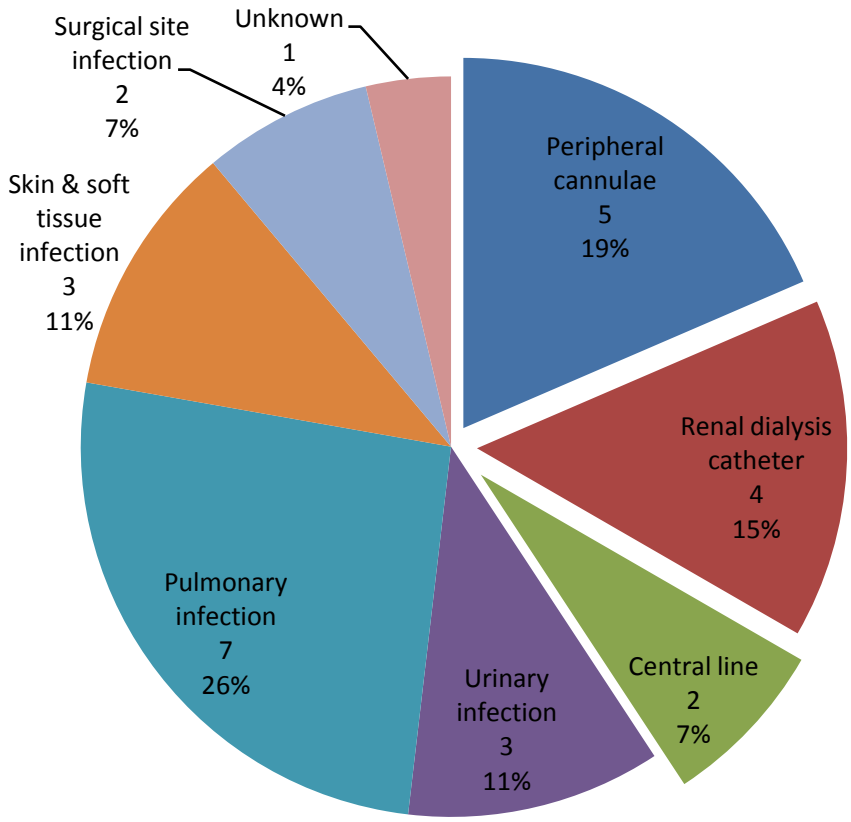
	DATE	1		2		3		4		5		6		7	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Daily assessment	Catheter site inspected														
	Redness, pus, oedema present?														
	Daily review of CVC necessity performed with consultant														
	Weekly MRSA nasal screen done														
CVC Access	Hub scrub with 2% alcoholic chlorhexidine x 15 secs														
	Administration sets/tubings replaced (every 96 hrs) *														
	All lines are labelled with date														
	All unused lumens flushed with 0.9% saline														
Dressing	Dressing type (T: transparent A: Absorbent)														
	Dressing intact, dry & clean														
	Catheter site cleaned with 2% chlorhexidine in 70% alcohol														
	Date marked on dressing														
	Nurse initials														

Identified causes of MRSA bacteraemia: 2011 vs 2012

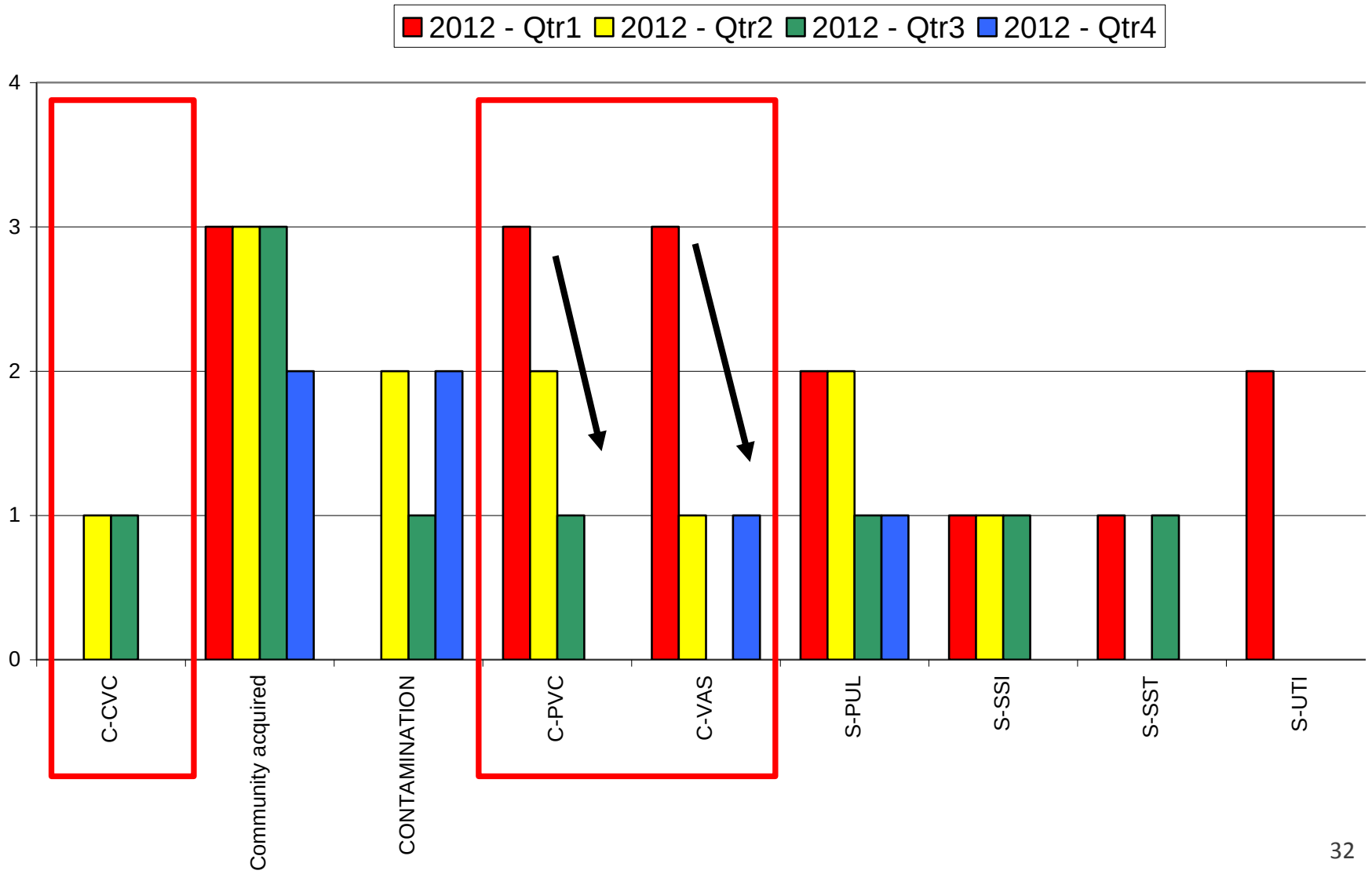
2011



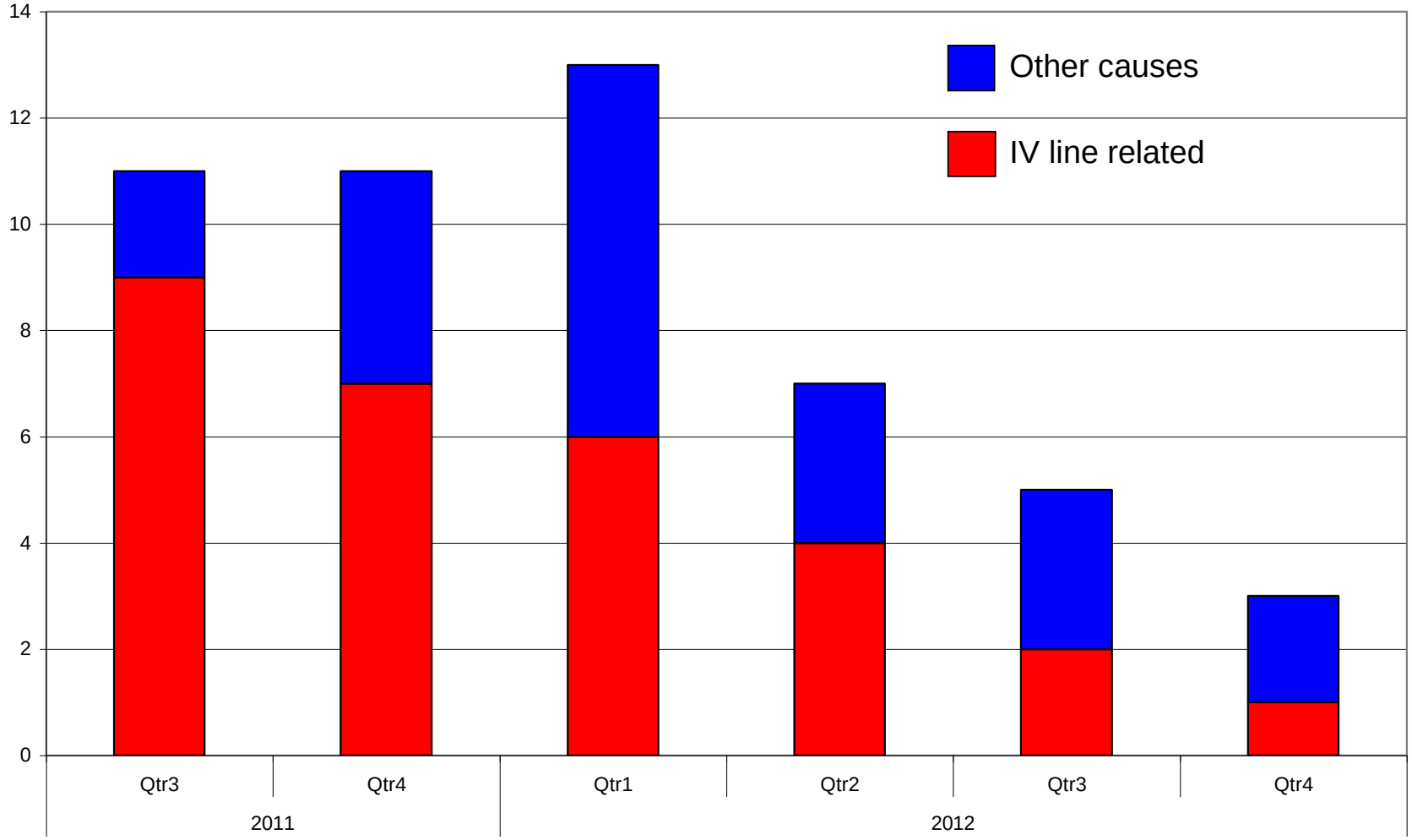
2012



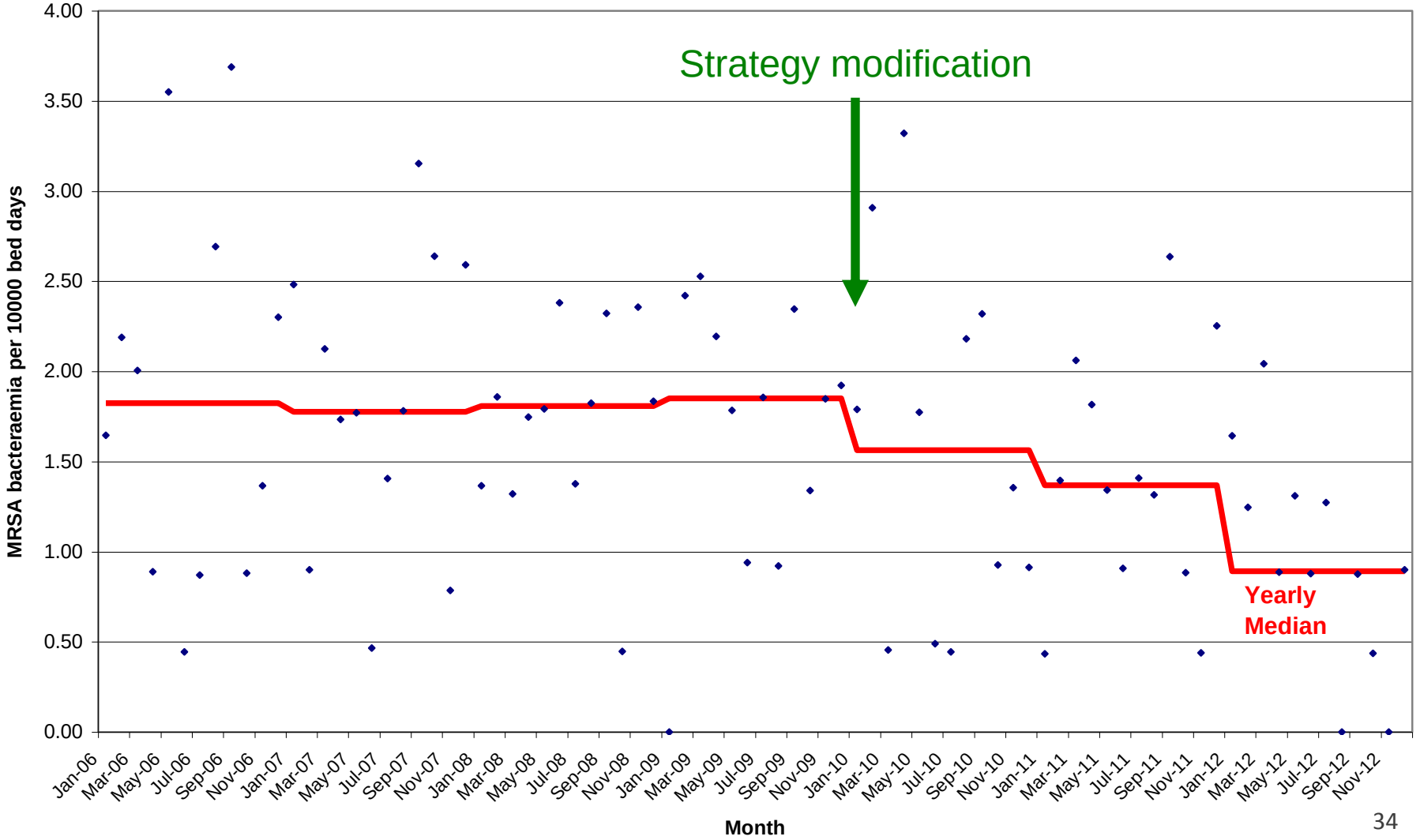
MRSA bacteraemia cases



MRSA bacteraemia cases



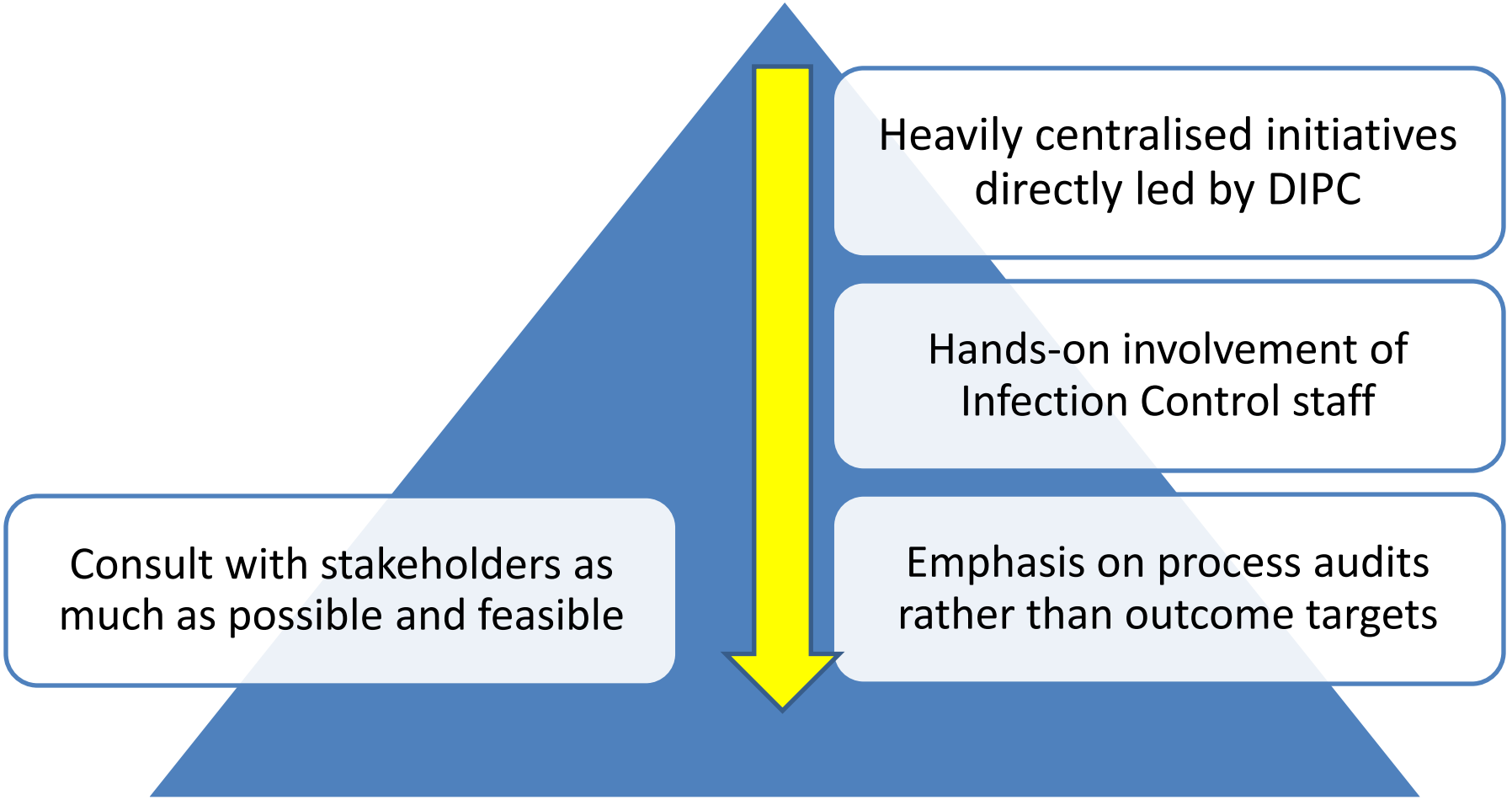
Mater Dei hospital - Malta
MRSA bacteraemia per 10,000 BD



What worked

- Learnt from successful experiences elsewhere
- Understood that our cultural values will never be those of a US, UK or Scandinavian hospital.
- Choose interventions that are compatible with our national (and organisational) culture.
  - or adapt implementation methods so that they synchronise with - rather than go against - our local values.

Our approach



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.

Some take-home messages

- Massive hard work by many stakeholders
  - Both with and outside the IC department
- Infection control is a team effort
  - But we needed to drive it forward ourselves
- There's no "I" in "team"
  - but it's the first letter in "Improvement“
- It’s not rocket science!!
  - Infection control is primarily a behavioral science
- Culture eats strategy for breakfast
- Keep "copy and paste" for your desktop IT applications - not your infection control programmes.

Thank you


Conference theme:
Understanding behaviour,
Implementing change
FOURTEENTH CONGRESS
OF THE INTERNATIONAL
FEDERATION OF
INFECTION CONTROL
12-15 March 2014, Malta
www.ific2014.com


Washing your hands
stops MRSA.

Table 1. Ranking given by doctors and nurses working in the study hospital within the identified country of the perceived importance of obstacles to HH

	Cyprus	Egypt	Jordan	Lebanon	Malta	Morocco	Tunisia	Turkey	Overall	*P* value
Insufficient sinks	1	1	3	5	5	1	1	5	1	
Insufficient AHR	2	2	1	6	2	2	2	6	2	.004
Staff unaware of importance	8	8	5	4	4	3	4	3	3	< .001
Not a priority for management	3	3	9	8	3	4	3	9	4	.016
Skin complaints from products used	4	9	2	7	1	9	9	2	5	NS
Staff too busy or unable to cope	6	5	6	9	6	5	6	1	6	NS
Poor role models	5	7	8	1	7	7	5	7	7	NS
Gloves used instead of HH	7	4	4	3	8	6	7	8	8	NS
Need for promptness is more important than HH	9	6	7	2	9	8	8	4	9	NS

NS, not significant.

Health care worker perceptions of hand hygiene practices and obstacles in a developing region

Michael A. Borg,[a] Mohamed Benbachir,[b] Barry D. Cookson,[c] Saida Ben Redjeb,[d] Ziad Elnasser,[e] Ossama Rasslan,[f] Deniz Gür,[g] Ziad Daoud,[h] and Despo Pieridou Bagatzouni[i]

Msida, Malta; Casablanca, Morocco; London, United Kingdom; Tunis, Tunisia; Irbid, Jordan; Cairo, Egypt; Ankara, Turkey; Beirut, Lebanon; and Nicosia, Cyprus

Table 2. Ranking on both an overall and a country basis by doctors and nurses of the perceived importance of various HH improvement strategies

Strategy	Cyprus	Egypt	Jordan	Lebanon	Malta	Morocco	Tunisia	Turkey	Overall	*P* value
Better and more available soap and towels	1	1	1	1	1	1	1	4	1	
Accessible AHR	2	2	2	2	2	2	2	3	2	< .001
Feedback on infection rates	3	5	5	3	6	4	3	2	3	< .001
Posters and leaflets	5	3	4	4	4	3	4	6	4	.487
Increased staff and decreased work load	4	8	7	5	3	8	6	1	5	< .001
Lectures on HH	6	4	3	8	8	5	8	7	6	.9422
Compliance audits and feedback	7	7	8	6	5	7	7	5	7	.008
Reminders from colleagues	8	6	6	7	7	6	5	8	8	.002

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journal homepage: www.ajicjournal.org

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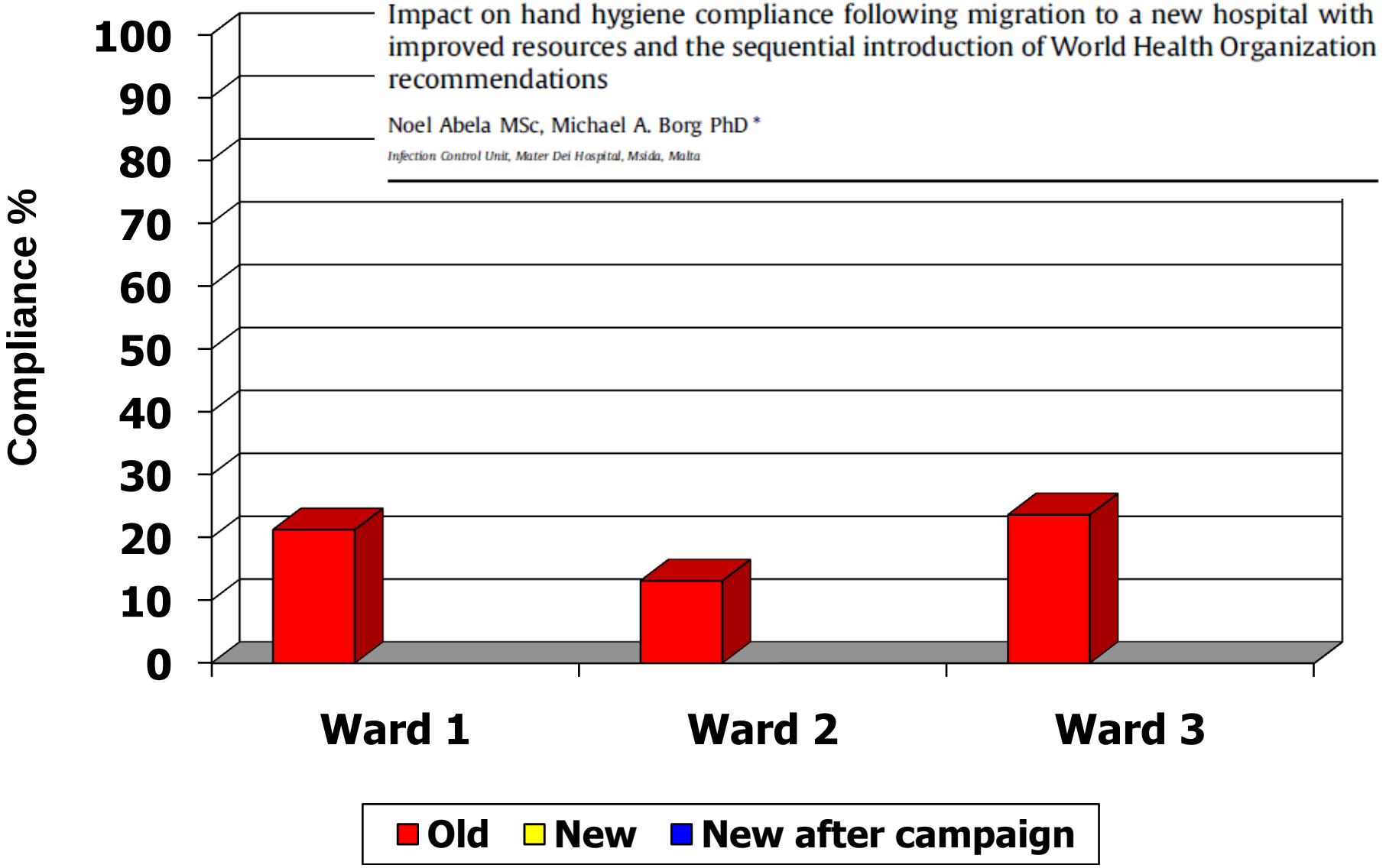
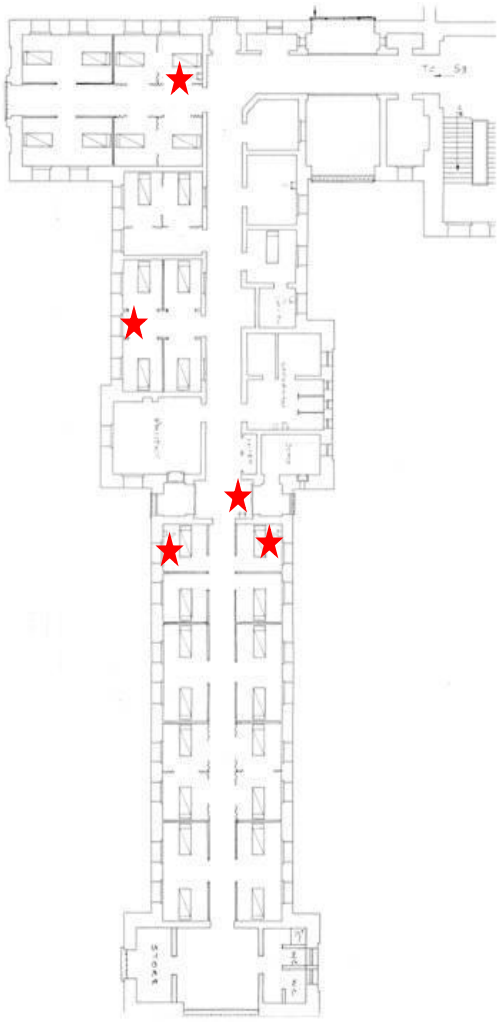
Noel Abela MSc, Michael A. Borg PhD *

Infection Control Unit, Mater Dei Hospital, Msida, Malta



Ward sink density

Old Hospital



New Hospital


How to handrub?
How to handwash?

How to handrub?

With alcohol-based product

1a Apply a palmful of the product in a cupped hand and cover all surfaces.

Remove all hand jewellery and keep your nails short and clean.

2 Rub palm to palm.

3 Right palm over left dorsum with interlaced fingers and vice versa.

4 Palm to palm with fingers interlaced.

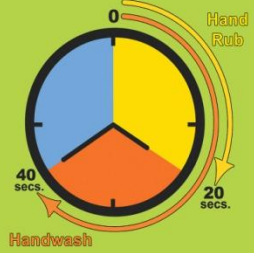
5 Backs of fingers to opposing palms with fingers interlocked.

6 Rotational rubbing of left thumb clasped in right palm and vice versa.

7 Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.

8 ...once dry, your hands are safe.

Duration of procedure:



Alcohol rub is preferable *unless*

- hands are dirty,
- soiled with body fluids *or*
- after possible contact with faeces.

Infection Control Unit
Mater Dei Hospital

How to handwash?

With soap and water

0 Wet hands with water.

1 Apply enough soap to cover all hand surfaces.

8 Rinse hands with water.

9 Dry thoroughly with a single use towel.

10 Turn off tap using elbow.

11 ...and your hands are safe.

Stop Rub Go
Hand Hygiene Campaign Malta

For further information phone (2545) 4540

2008

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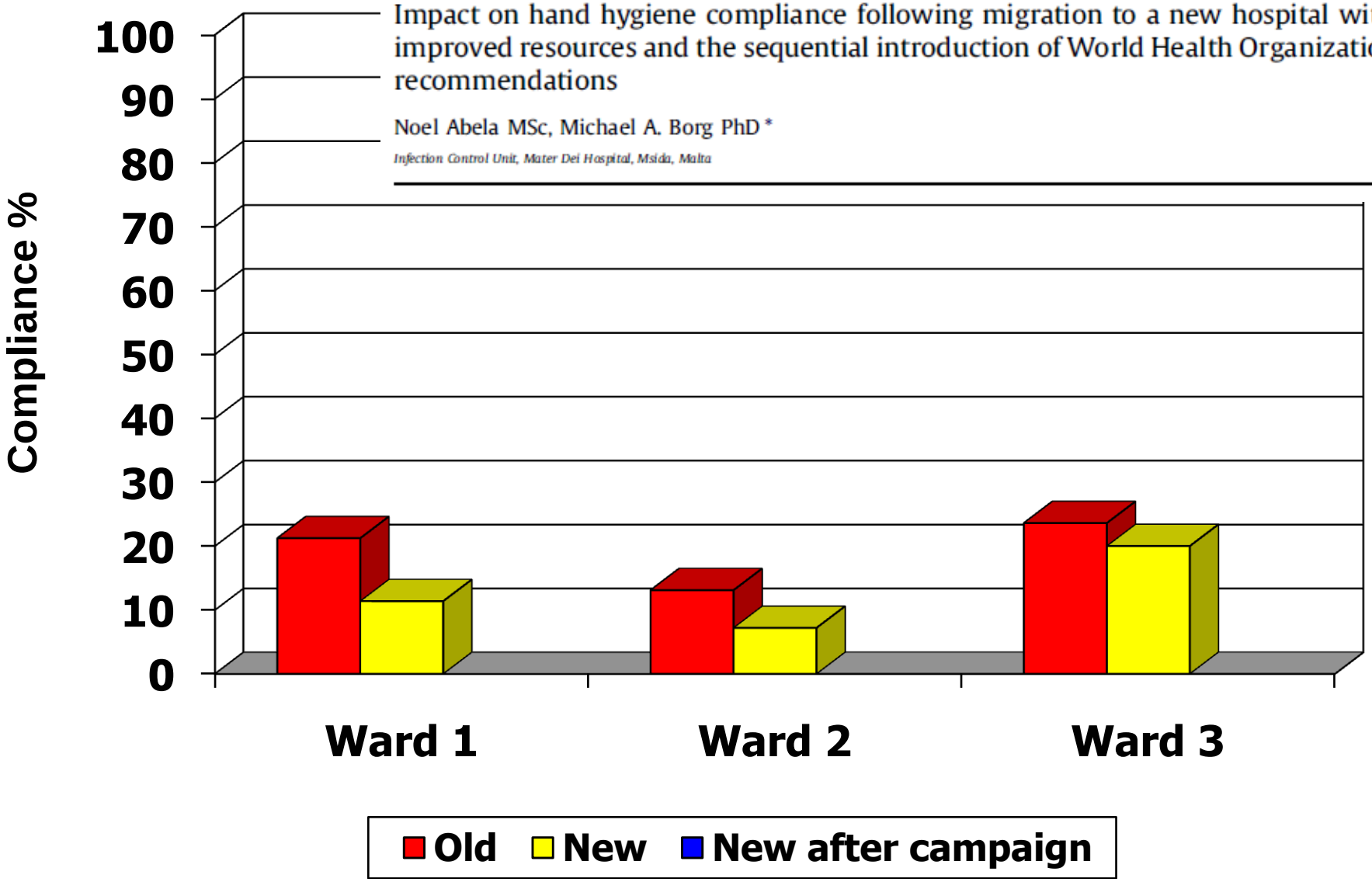


Anki
din
hija
mħabba
lejn
il-pazjent...
Naqqas l-infezzjonijiet ġewwa l-isptar
Ipprattika l-iġjene ta' l-idejn regolarment
Stop Rub Go
Hand Hygiene Campaign
Mater Dei Hospital Malta, tel:2545 4540

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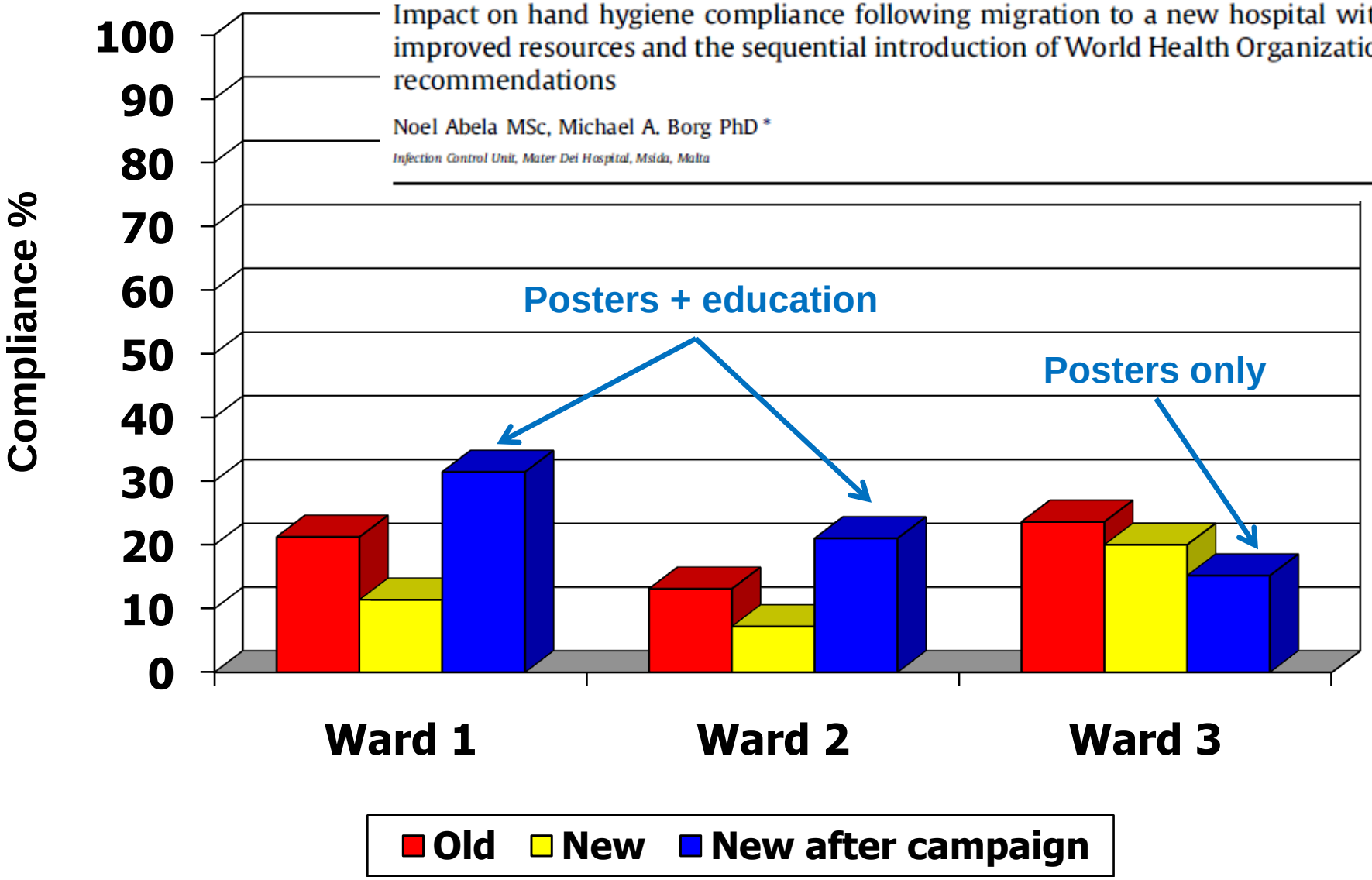

Strategy

- Recruited a member of staff with specific auditing job description
- Results fed back to staff
  - League tables published in hospital newsletter with names of wards and their respective compliance
- ICNs targeted low performing wards and increased training and support
- Nurses in charge of wards invited to a six-monthly review with Director of Infection Control and Director of Nurses to explain results
- Best performing wards recognised through an award at annual infection control conference

Hand hygiene compliance