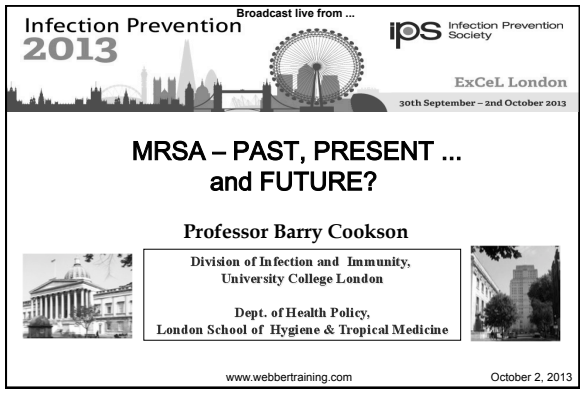
MRSA – Past, Present ... and Future?

Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)



"Gra" "ham" Ayliffe

"Grand" "Homestead"

- Anglo-Saxon or Old Norse origin
- Origins from words meaning:

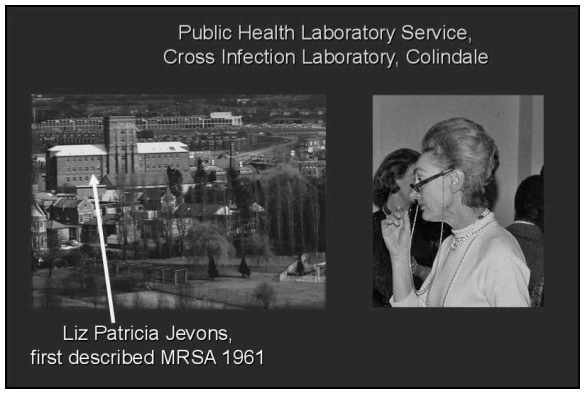
"noble gift"

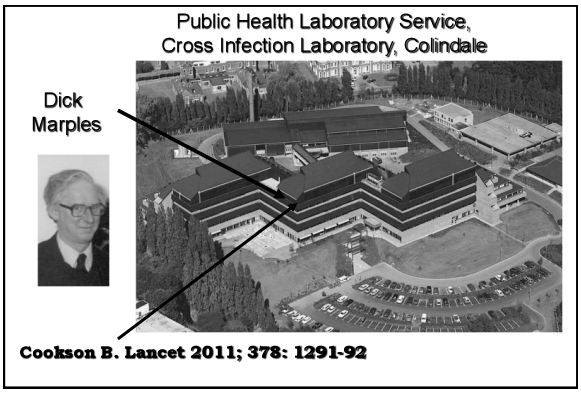
or

"eternal life"

Outline

- The Past - as go through reflect on lessons learnt or not!
- Current Issues
  - What reduced MRSA healthcare associated infections in England?
- The Future
  - Continue to consider what we need to do avoid history repeating itself!
  - Studies still required





A Webber Training Teleclass

www.webbertraining.com

MRSA – Past, Present ... and Future?

Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)

Serendipitous Discovery of MRSA,1960
Same year as use started (pub. 1961)

MRSA in 1960s: "Decade of Discovery"

- Significanceof heterogeneous resistance: a "lab. finding"
- Only relevant to skin? Then bloodstream infections (BSIs) occurred!
- QA distributions need to include these strains as still around (Netherlands missed them in 1990s)
- During decade homogeneous resistance emerged
- Little or no formal surveillance in place (pre EARSNet!)
- Some countries more affected:
  Denmark 34% of *S. aureus* BSIs in 1968

1970s: "The Decade of Complacency"
David Shanson

- MRSA decreased in France, UK, Australia & Denmark
- Several theories why
  - Antimicrobial stewardship: reduction in tetracyline & streptomycin use (isolates were multi-resistant)
  - less "fit" due to these and other resistances (Nielsen et al, 2012 for Danish 1960s MRSA)
  - improved infection prevention and control
- HCWs changed practices because Rosendal head of Staph Lab was very influential in Danish College of Physicians
- CMMs advising DH Scotland 1990s, England 2000s
  Concerns now ref reductions in DH resources

1975-76: Emergence of
Gentamicin Resistant MRSA

- Gentamicin introduced in 1970s another reason for reductions in MRSA?
- 1975: Speller Bristol first gentamicin-resistant isolate
- 1976: Shanson Mile End Hospital first outbreak
  Many interventions and fumigation used after last case discharged
  Strain never seen again in England!

1980s: "The Decade of Re-Emergence"

- New epidemic gentamicin resistant MRSA strains emerged in Australia
- Caused immense problems in the UK
- Spread globally (but many different strains in USA)

1980s Controversies
(see Ayliffe et al's Guidelines 1986, 1990, 1995, 1998)

- MRSA virulence questioned
  - Marples labelled different MRSA types
  - Some at least as virulent as some MSSA (Lacey strain prot A-)
- MRSA displace MSSA so no additional burden
  - Probably UK surveillance data from 1990s most convincing that they are an additional burden
- MRSA can be treated by many drugs and hyper-betalactamase production is the issue
  - Not so even though amoxycillin binds to PBP2' (PBP2a)
  - Luckier in UK that more susceptible than some others e.g. parts of USA, Gulf States and Australia

MRSA – Past, Present ... and Future?

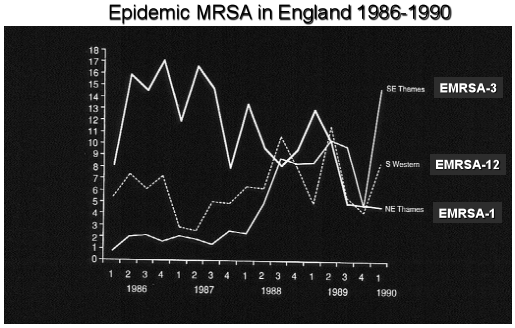
Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)

EMRSA Sites Predilection (Marples et al studies)

- Six month survey 1987-88
  EMRSA-1: infections in men,
  Other EMRSAs (2-14): infections in women
- Analysis of multiple-site referrals in 1995
  - EMRSA-15: vaginas, pressure sores, urines,
  - EMRSA-16: sputum
    (also with Cox *et al* "Kettering outbreak")
    throat colonisation
  - EMRSA-3: leg ulcers
  - OMRSA: skin lesions and leg ulcers

Epidemic MRSA in England 1986-1990



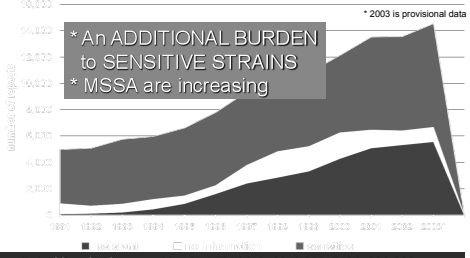
Mackintosh et al J Hosp Infect 1991; 18: 279-292

1990s : "The Decade of Dawning Realisation"

- ICTs differed in views still on MRSA importance!
- "MRSA and MSSA are both important: MRSA is a distraction and other HAI AMR organisms also important"
- ICNA debate where audience's opinions changed to pro MRSA control
- Politicians ignored warnings and the increases in MRSA
- IC shown to be effective but not enthusiastically adopted
- Emergence of mupirocin resistance: threats of other disinfectant resistance: no surveillance!

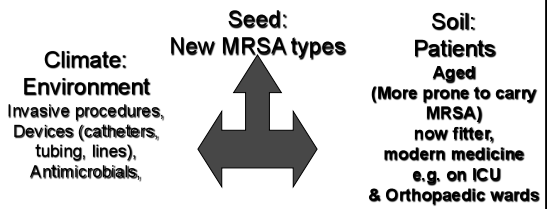
MRSA Bacteraemias in England & Wales: 1991 – 2003

14-fold increase
Doubled in Last Six Years



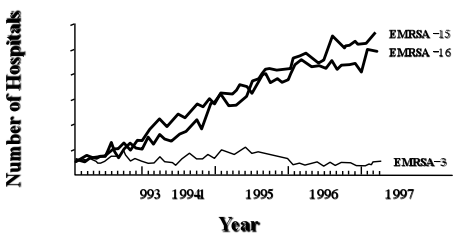
Cookson B. Is it time to stop searching for MRSA? *Br Med J* 1997; 31: 664-666.
Also See Cookson, B. Meticillin-resistant *Staphylococcus aureus*. *Lancet Infect Dis* 2005, 5: 654-655

Changes in MRSA Pathogenesis in 1990s



Healthcare delivery
(Bed occupancy >85%, More inter ward transfers, staff shortages, shorter lengths of stay losing alert organism surveillance)

Hospitals affected each month by EMRSA-3, EMRSA-15, or EMRSA-16



CPHL-Laboratory of HCAI

A Webber Training Teleclass
www.webbertraining.com

MRSA – Past, Present ... and Future?

Prof. Barry Cookson

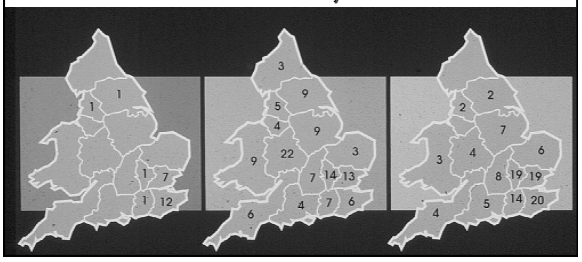
Broadcast live from IPS 2013 (www.ips.uk.net)

EMRSA Incidents in 1995

Supra-Regional

EMRSA- 3 **EMRSA-15** **EMRSA-16**

All are distinct clones by MLST/SCCmec



European Epidemic MRSA

J Clin Microbiol 2003;41:1574-85 & 2007;45:1830-7

Five International EU EMRSA clones :

A - "Iberian clone":.
Belgium EC-1: Finland E7, 10: France A, B, C:
N. German I: Spain E1 : Sweden: Portugal

B - Belgium EC-3: Finland E1

C - UK E3: South German II: Slovenia: Finland : Belgium

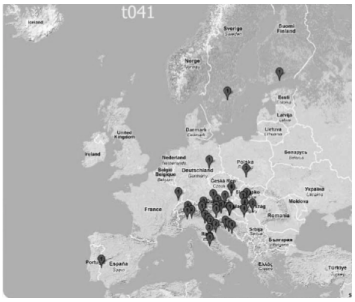
D - UK E16: Sweden II (via Cyprus): Denmark: Finland E5: Belgium, German, Belgium, USA, Spain

E - UK EMRSA –15: Germany: Belgium

nature

Biologists deploy database to quash drug-resistant bacteria

http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=18860



EU Seqnet
spa database

Increased inter country patient movement: will need agreed SOPs for communication!

Whole genome sequencing and the prevention and control of meticillin-resistant *Staphylococcus aureus* infection

Humphreys and Coleman, J Hosp Infect, 2013;85:86

MRSA Colindale Update – 1995
142 England and Wales ICTs

Important Difficulties in MRSA Control

Difficulties in eradicating colonisation	64%
Compliance with handwashing Due in part to:	61%
Rapid turnover of staff	30%
Lack of MRSA experience	37%
Agency staff	31%
Inter-ward transfers	59%
Poor staff/patient ratios	58%
Extensive patient colonisation	51%
Not implement initial screening	39%
Not implementing other IC procedures	50%
Differences in health care workers opinions on importance of MRSA control	48%
Unable to discharge patients to nursing homes	41%
Lack of skilled staff	39%
Financial constraints	39%
Nursing/elderly home admissions	37%
Differences in Manager's opinions on importance of MRSA	37%
Frequent introductions of MRSA	35%
Laboratory overload	34%
Staff spread MRSA	27%
(Mupirocin resistance)	13%

Shown at CMO Annual Conference: no interest
PHLS Business Plan: HAI not included!

Sunday Times 1995

- Cookson "The ways in which we deliver healthcare today are almost designed to spread multi-resistant organsims around the hospital" The perfect storm!
- Fortunately the NHS CE and CMO agreed with me!
- Swedish ICD on seeing the data from England "even the best armies in the world can be overwhelmed"

MRSA – Past, Present ... and Future?

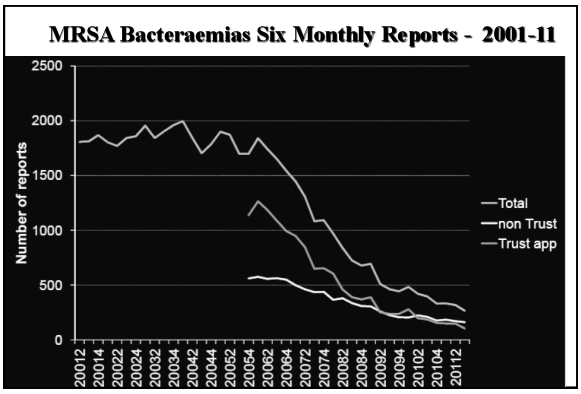
Prof. Barry Cookson

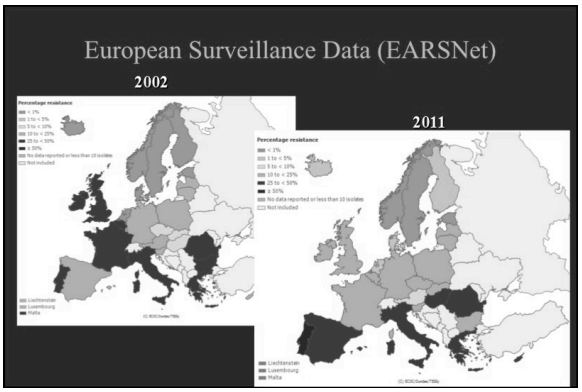
Broadcast live from IPS 2013 (www.ips.uk.net)

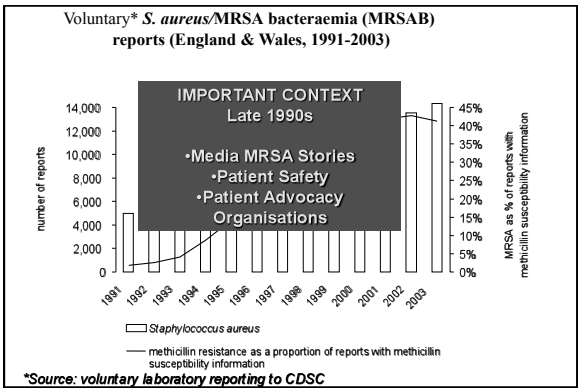
2000s: "The Decade of Reactivity"

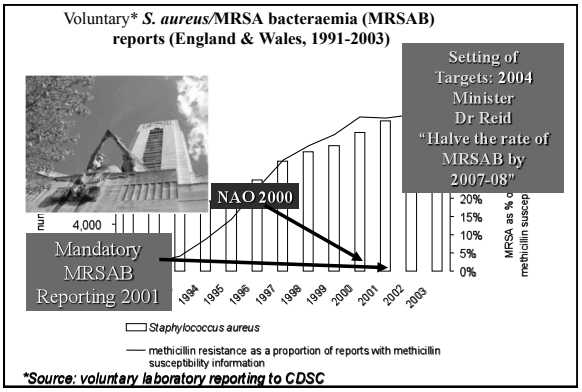
What interventions were important in reducing England's MRSA Bacteraemia ?

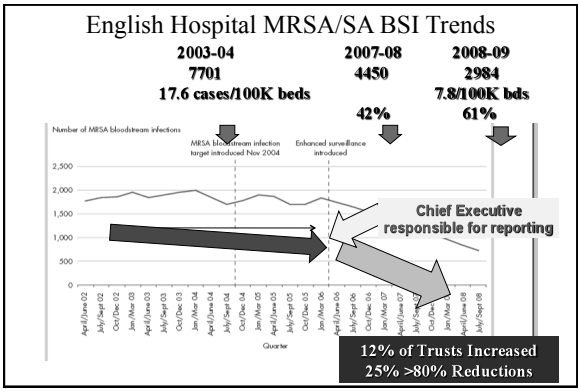
(Note orthopaedic MRSA SSIs and MRSA HAI Prevalence also decreased)











A Webber Training Teleclass

www.webbertraining.com

MRSA – Past, Present ... and Future?

Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)

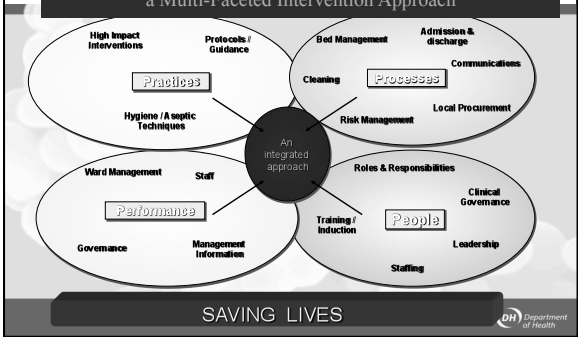
Possible TRIGGERS?

April 2001	**Mandatory Acute Hospital MRSA bacteraemia surveillance**
July 2003	Director Infection Prevention and Control (DIPHIC) reports to Chief Executive
July 2004	**Target for reduction of MRSA bacteraemia: 2003-04 halved by 07-08**
Sept 2004	clean***your***hands national campaign
June 2005	Saving Lives published: Seven Bundles followed
Oct 2005	**Enhanced MRSA bacteraemia surveillance: CE Responsible**

Trigger Factors?

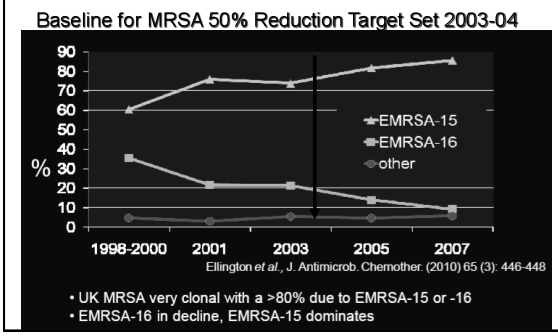
Oct 2006	Code of Practice to prevent HCAI published as part of the Health Act : The STICK
2006 - 08	Improvement Teams: varied why went in and what done: The CARROT Used Healthcare Commission and other approaches
May 2007	Healthcare Commission inspection programme: against Code

NO Prospective studies to unravel individual effects: "Sold" as a Multi-Faceted Intervention Approach



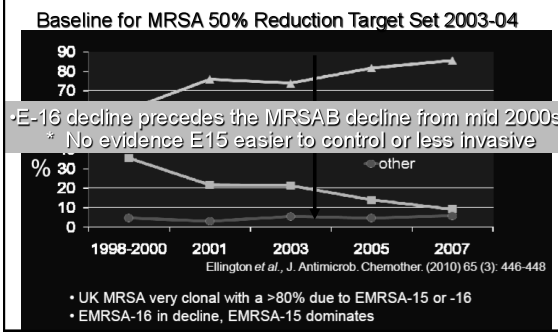
Other Factors?

Decline of EMRSA-16 in 2000s



- UK MRSA very clonal with a >80% due to EMRSA-15 or -16
- EMRSA-16 in decline, EMRSA-15 dominates

Decline of EMRSA-16 in 2000s



- E-16 decline precedes the MRSAB decline from mid 2000s
- * No evidence E15 easier to control or less invasive
- UK MRSA very clonal with a >80% due to EMRSA-15 or -16
- EMRSA-16 in decline, EMRSA-15 dominates

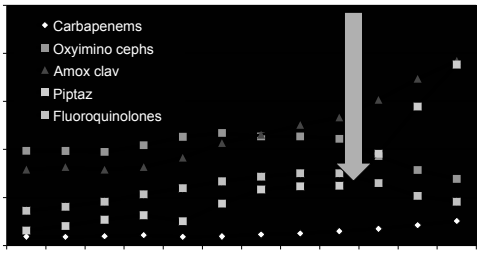
MRSA – Past, Present ... and Future?

Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)

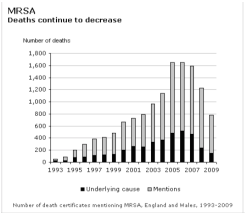
CMO report : UK Hospital antibiotic sales (kg) IMS data

(Tacconelli et al, J Antimicrob Chemother, 2008;61;26–38)



Are the MRSA Bacteraemia data to be believed? Were the hospitals "gaming"?

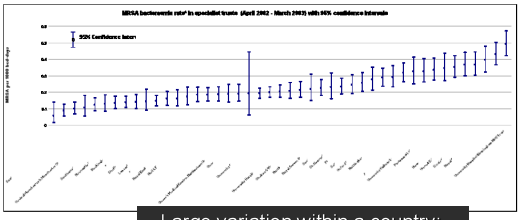
- CE made responsible for locking the data down
- External independent inspection checks
- No significant reductions in blood cultures taken
- Death reporting (ONS) data also decreased



Studies of MRSA bacteraemia (MRSAB) Reductions

MRSA bacteraemia (MRSAB) rate in specialist Trusts

(April 2002 - March 2003)



Large variation within a country: opportunities from learning within the same healthcare system

Healthcare Commission Analysis of Healthcare Associated Infection 2006

Lower Rates of MRSAB if:

- better scores for availability of hand hygiene materials on wards sampled
- Better able to comply with patient isolation guidance as more single rooms

Mears A *et al*, *J Hosp Infection*, 2009; 71: 307-313

Healthcare Commission Analysis

Lower MRSAs and *C. difficile* infection rates:

- Better bed management parameters
- Inclusion of infection control in appraisal and personal development plans

Higher rates:

- Protected time for infection control training for all healthcare workers
- May be an example of "reactive practice"

Very Early in the implementation of Saving Lives and pre Improvement Team visits

MRSA – Past, Present ... and Future?

Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)

The World's First
National Hand Hygiene Improvement Campaign
Preceding the WHO Global Patient Challenge

- **4 year campaign: Dec 2004 to June 2005**
- **Rolled out to all 187 acute NHS hospitals**

Conclusions NOSEC Study
Stone et al, BMJ 2012;344:e3005

- Trebling of usage of soap and alcoholic hand rub (AHR)
- Strong independent associations with ~halving of MRSA bacteraemia and *C difficile* infections
  - Higher procurement of soap and AHR
  - Health Act
  - DOH improvement visits
- Relative contributions unclear
- Other national interventions or hospital variations were not significant
- National infection control interventions, including a hand hygiene campaign, in **context of a high profile political drive**, can successfully reduce these infections.

NAO Report 2008
Improvement Comments

- Leadership from CEs, Good Performance Management
- Increase in ICT resourcing & isolation capacities (HTA MRSA Review shown to be vital)
- Threat of CQC fines/shaming
- Stoke Mandeville/Maidstone Reports a wake-up call
- Quoted DH report:
  Staff/Patient ratios/Bed Occupancy no longer related to higher MRSABs
  NOTE: It showed that they WERE significant when I was complaining about these!

The Future

Five decades of MRSA: controversy and uncertainty continues.
Cookson, Lancet 2011; 378: 1291-92.

"It is vital that policy makers and governments realise that they must continue to spend money to save money."

"MRSA and other hospital infection pathogens will continue to pose threats to patient safety in the foreseeable future.

One thing is certain: the response to these challenges will determine the next decade of research and reaction to MRSA."

- "Prediction is very difficult, especially about the future"
  Niels Bohr *Danish physicist (1885 - 1962)*

- "The future will be exactly like the past only far more expensive"
  Jim Bishop, *Author,* 1959

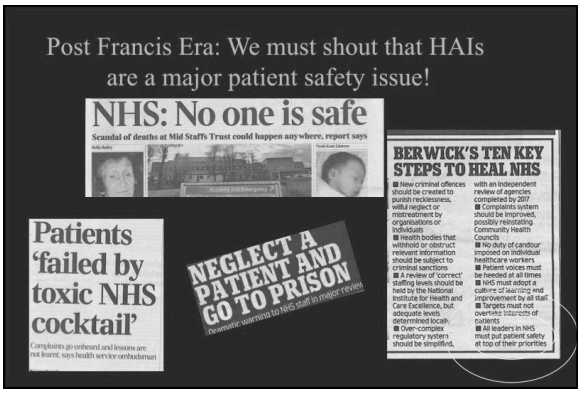
MRSA – Past, Present ... and Future?

Prof. Barry Cookson

Broadcast live from IPS 2013 (www.ips.uk.net)

Issues Still to Be Addressed!

- Need for better (CONSORT/ORION compliant) studies on isolation, disinfectant "suppression," type and methods of screening (i.e what exactly was done when!)
- Context of studies needs to be considered e.g. country and type of unit e.g. case-mix of the ICUs, CA-MRSA, LA-MRSA are considerable threats
- Consider local applicability of interventions?
- Monitor what you can e.g. periodic discharge screening
- MRSA is lower now: consider all MDROs and have an economic strategy e.g. look DH NOW study (Cost/QALYs)
- Ensure a wide engagement in policy making e.g. informed and unbiased patient advocates



Thank your for your attention!

Thanks to Teleclass Education

Patron Sponsors

For information on Patron Sponsorship, contact Paul Harrison (Paul.Harrison@fitwise.co.uk)

A Webber Training Teleclass
www.webbertraining.com