Carbapenem-resistant Enterobacteriaceae (CRE): Coming to a hospital near you?

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- What's the problem?
- A brief overview of CRE microbiology and epidemiology
- Sizing the threat
- Infection prevention and control challenges and strategies
- Your questions

THE END OF ANTIBIOTICS IS NIGH

What's the problem?

"CRE are nightmare bacteria."
Dr Tom Frieden, CDC Director

"If we don't take action, then we may all be back in an almost 19th Century environment where infections kill us as a result of routine operations."
Dame Sally Davies, Chief Medical Officer

"If we fail to act, we are looking at an almost unthinkable scenario where antibiotics no longer work and we are cast back into the dark ages of medicine where treatable infections and injuries will kill once again."
David Cameron, Prime Minister, UK

"The rise of antibiotic-resistant bacteria, however, represents a serious threat to public health and the economy."
Barack Obama, President USA

Rising threat from MDR-GNR

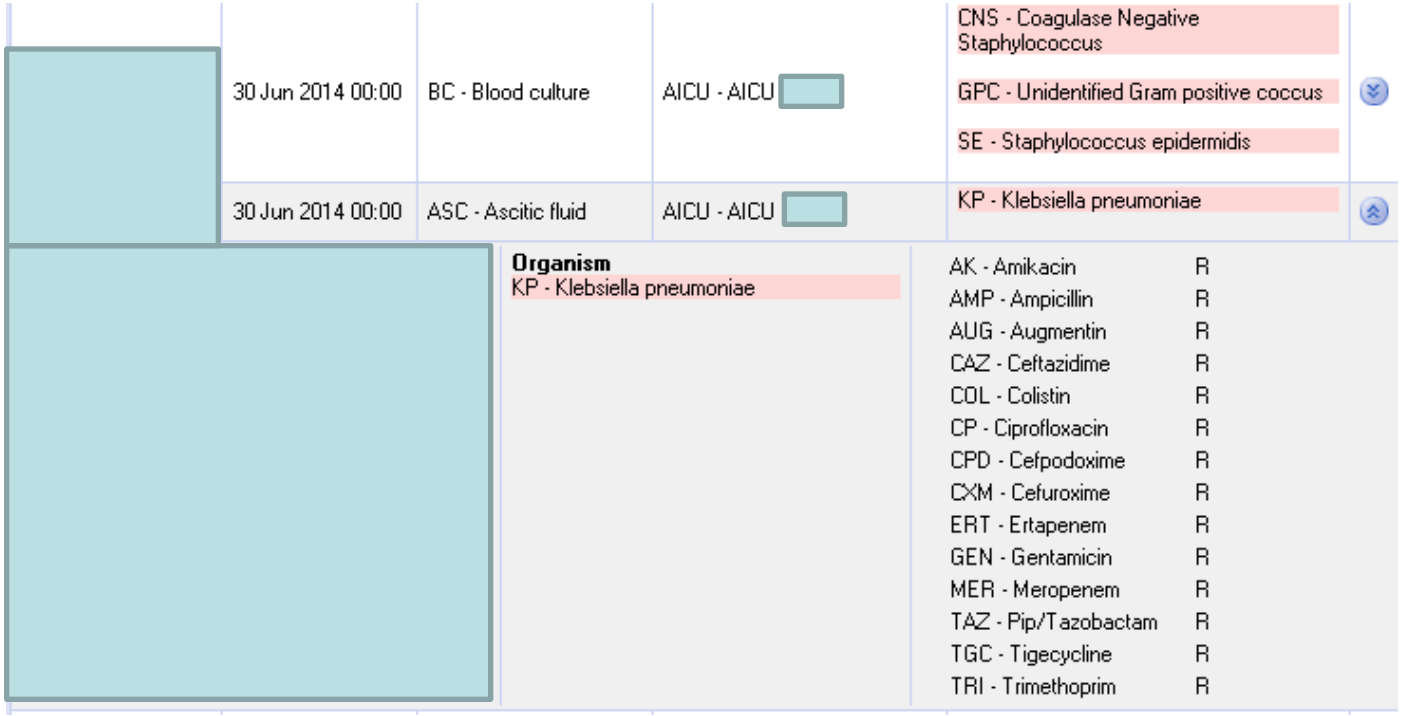
% of all HAI caused by GNRs.

% of ICU HAI caused by GNRs.

Non-fermenters	***Acinetobacter baumannii*** ***Pseudomonas aeruginosa*** ***Stenotrophomonas maltophilia***
Enterobacteriaceae	*Klebsiella pneumoniae* *Escherichia coli* *Enterobacter cloacae*

Hidron et al. *Infect Control Hosp Epidemiol* 2008;29:966-1011.
Peleg & Hooper. *N Engl J Med* 2010;362:1804-1813.

What's the problem? Resistance

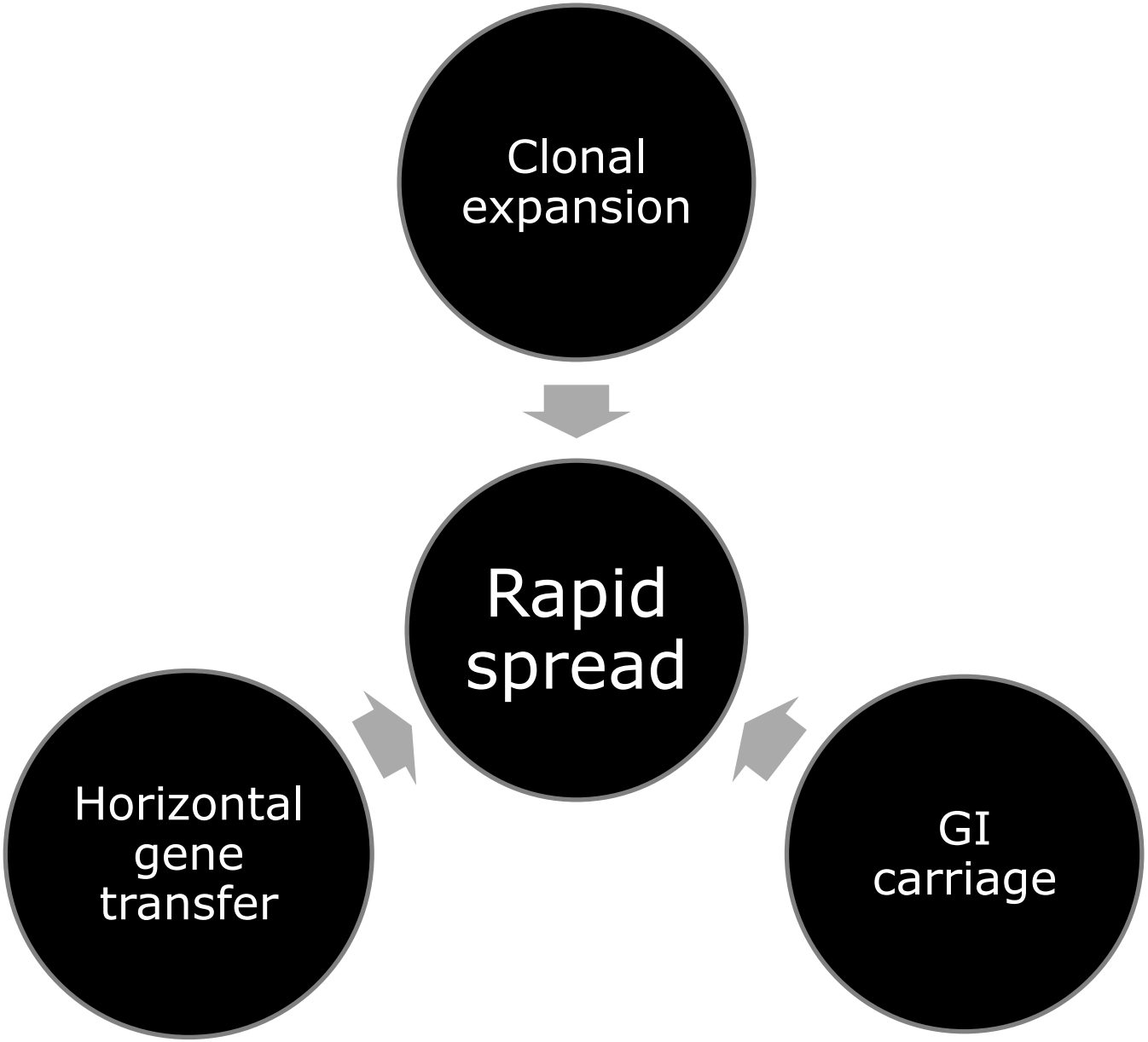


What's the problem? Mortality

	Enterobacteriaceae		Non fermenters
Organism	AmpC / ESBL	CPE	*A. baumannii*
Attributable mortality	Moderate	Massive (>50%)	Minimal

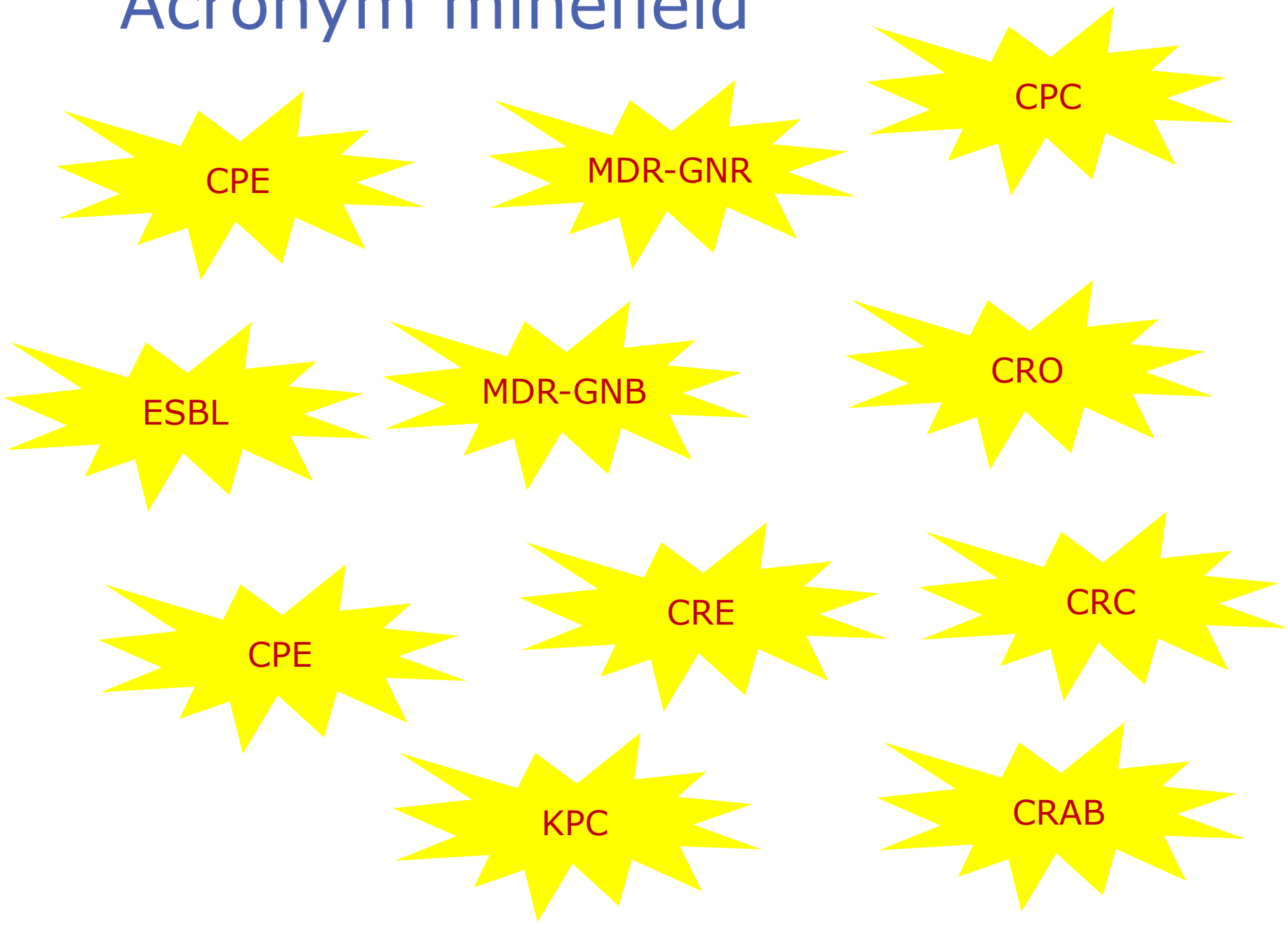
Shorr *et al. Crit Care Med* 2009;37:1463-1469.
Patel *et al. Iinfect Control Hosp Epidemiol* 2008;29:1099-1106.
Falagas *et al*. *Emerg Infect Dis* 2014;20:1170-1175.

What's the problem? Rapid spread




DANGER
MINES

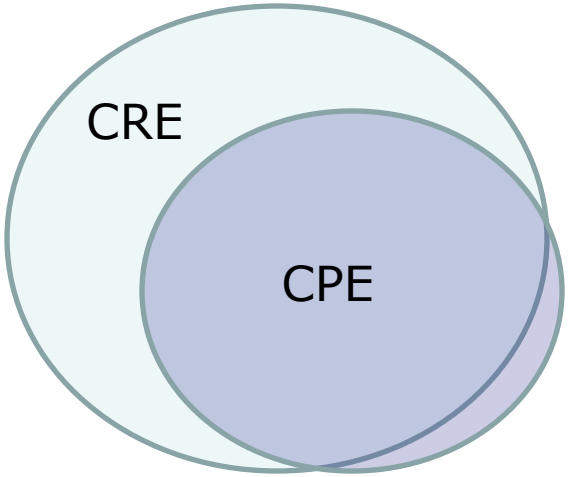
Acronym minefield



What are CRE?

Carbapenem-resistant Enterobacteriaceae (CRE) – Enterobacteriaceae that are resistant to carbapenems by any mechanism.

Carbapenemase-producing Enterobacteriaceae (CPE) – Enterobacteriaceae that are resistant to carbapenems by means of an acquired carbapenemase.

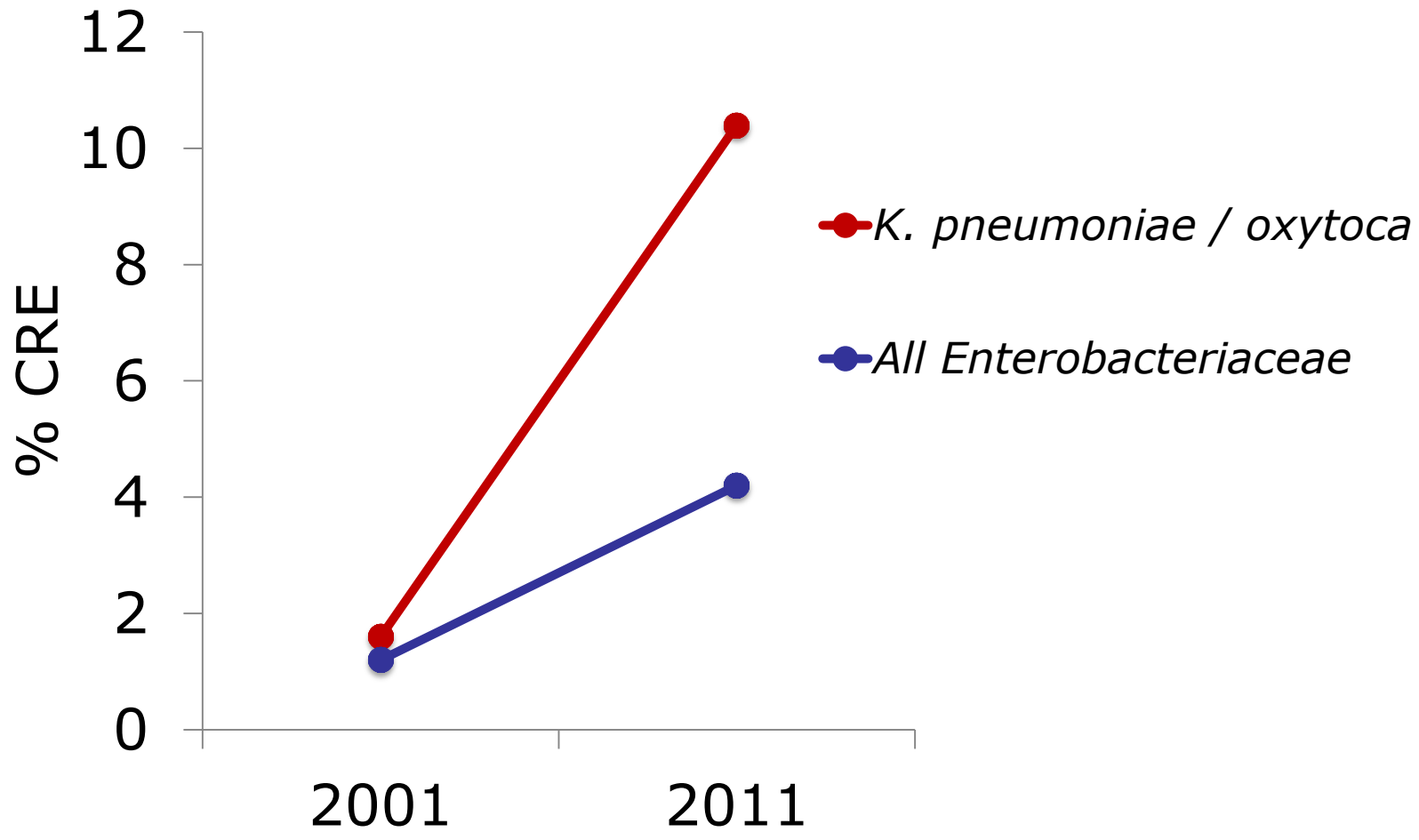


Understanding the enemy

Pathogen	CRE[1]	MRSA	VRE	*C. difficile*
Resistance	+++	+	+	+/-
Resistance genes	Multiple	Single	Single	n/a
Species	Multiple	Single	Single	Single
HA vs CA	HA & CA	HA	HA	HA
At-risk pts	All	Unwell	Unwell	Old
Decolonisation	No	Yes	No	No
Virulence	+++	++	+/-	+
Environment	+/-	+	++	+++

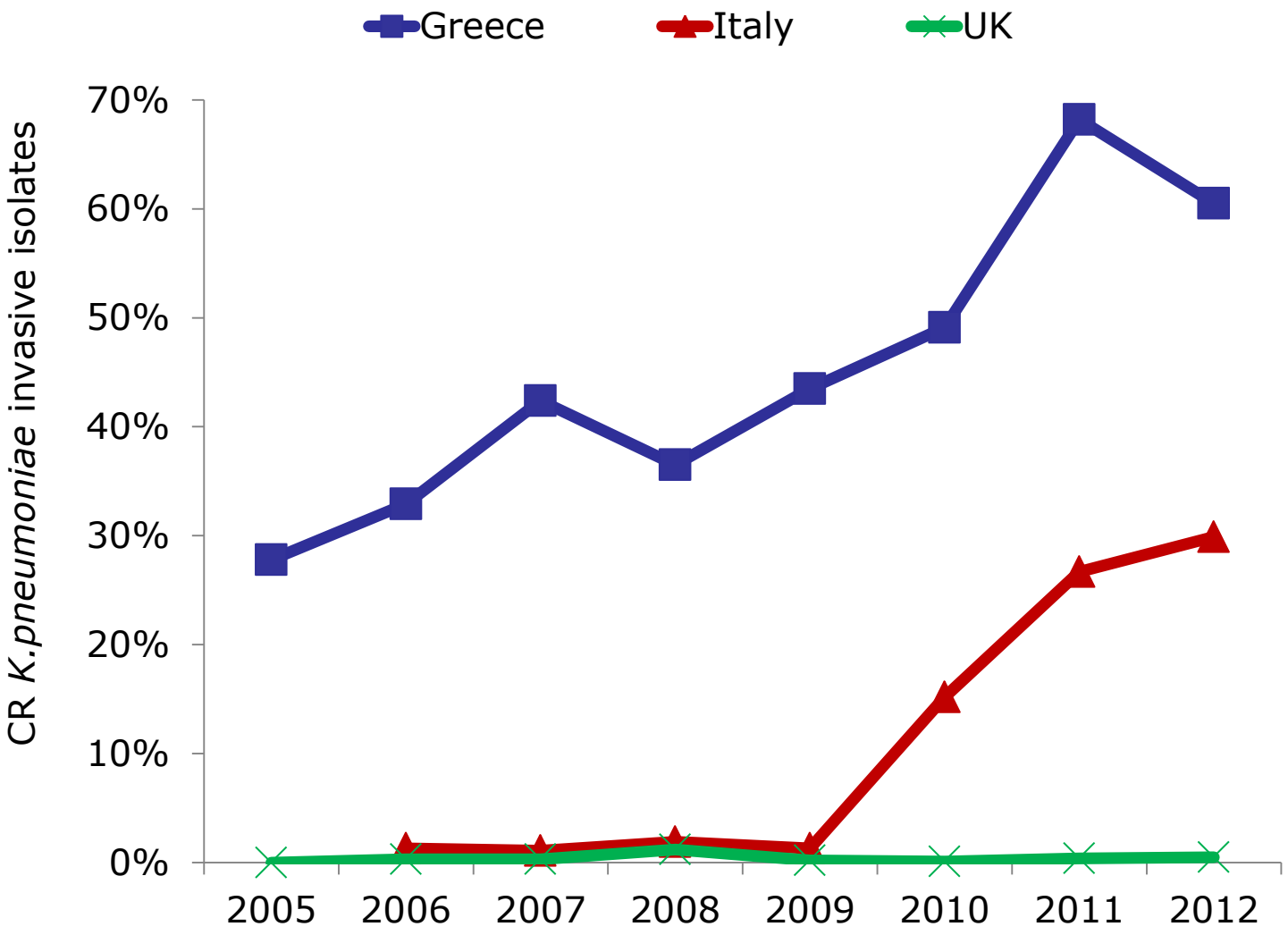
1. Carbapenem-resistant Enterobacteriaceae.

CRE in the USA



NHSN / NNIS data; *MMWR* 2013;62:165-170.

Invasive CRKP trends



ECDC EARS-Net

Colistin resistance in Italy

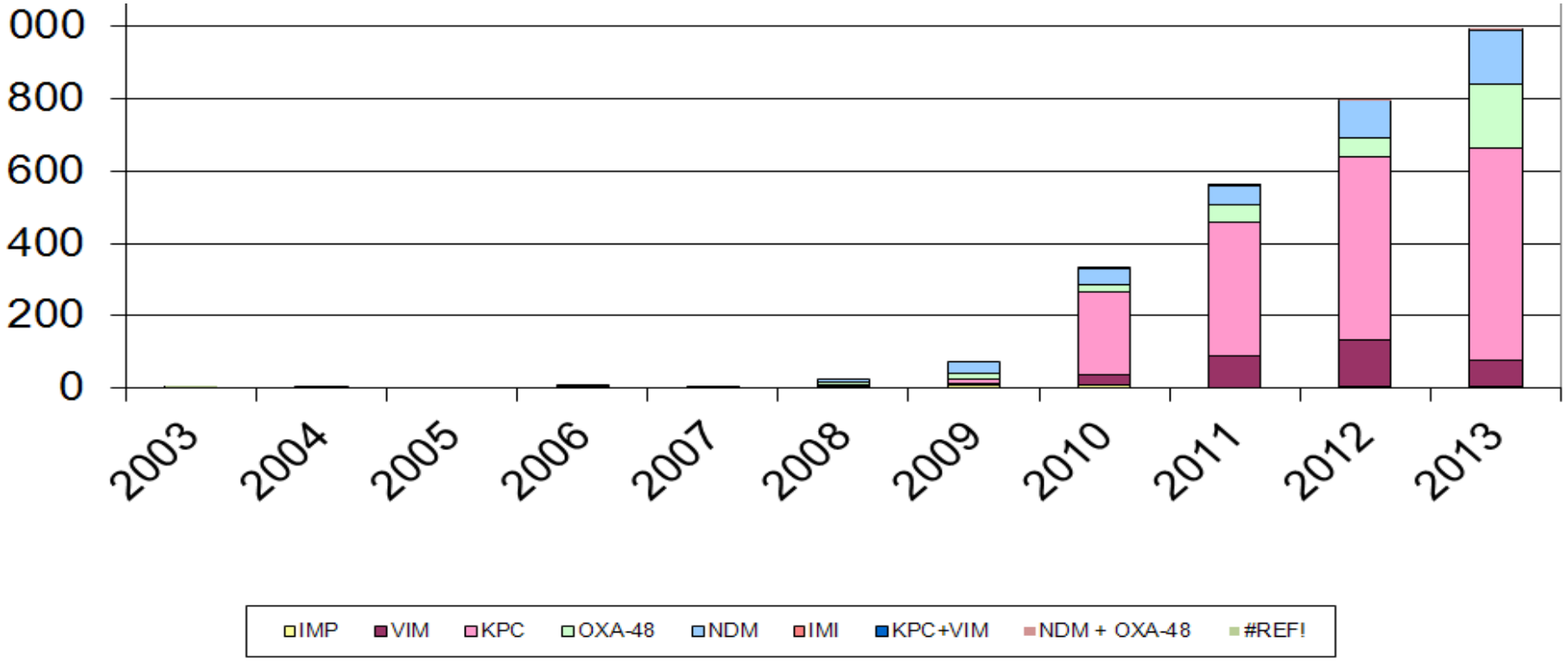
Survey of 191 CRE from 21 labs across Italy.

43%

Colistin resistant *K. pneumoniae*.
Range = 10-80% for the 21 labs.

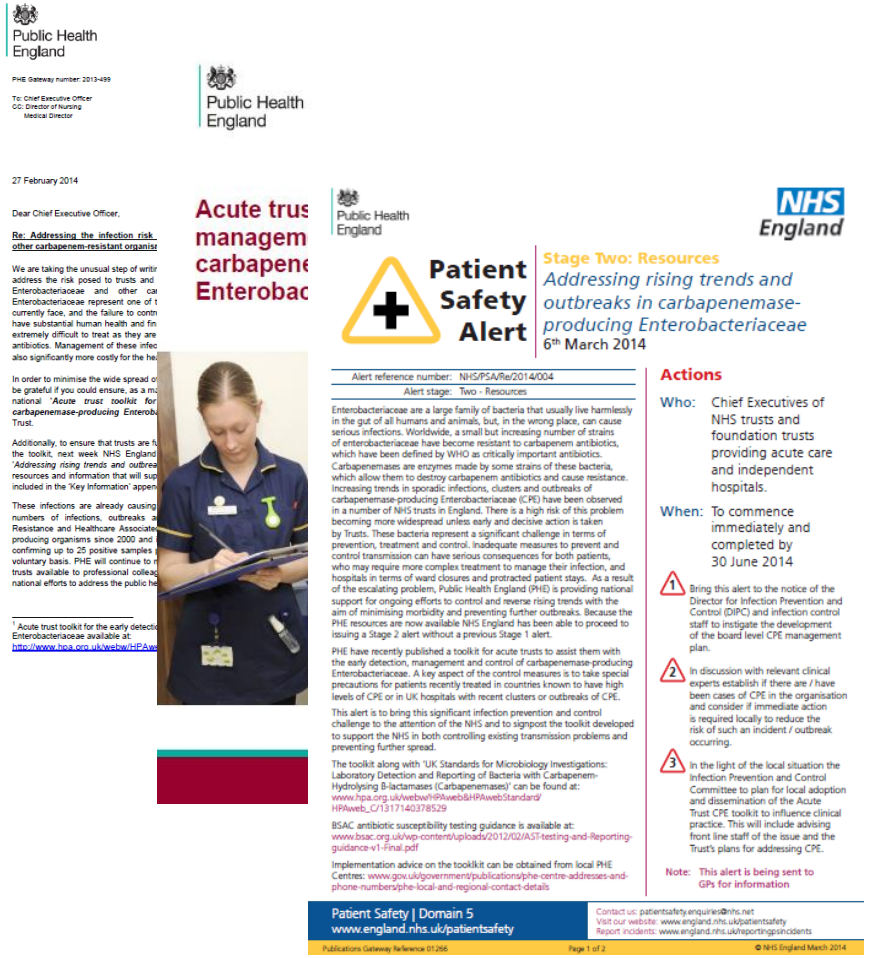
Monaco *et al.* 2014; *Euro Surveill* 2014;19:pii=20939.

Emergence of CRE in the UK



PHE ARMRL, 24/01/14
Courtosy of Dr Neil Woodford

CRE in the UK and US


Public Health England

PHE Gateway number: 2013-499

To: Chief Executive Officer
CC: Director of Nursing
Medical Director

27 February 2014

Dear Chief Executive Officer,

Re: Addressing the infection risk
other carbapenem-resistant organis

We are taking the unusual step of writi
address the risk posed to trusts and
Enterobacteriaceae and other ca
Enterobacteriaceae represent one of t
currently face, and the failure to contr
have substantial human health and fin
extremely difficult to treat as they are
antibiotics. Management of these infec
also significantly more costly for the he

In order to minimise the wide spread o
be grateful if you could ensure, as a m
national *'Acute trust toolkit for*
carbapenemase-producing Enteroba
Trust.

Additionally, to ensure that trusts are f
the toolkit, next week NHS England
'Addressing rising trends and outbrea
resources and information that will sup
included in the 'Key Information' appen

These infections are already causing
numbers of infections, outbreaks a
Resistance and Healthcare Associate
producing organisms since 2000 and
confirming up to 25 positive samples
voluntary basis. PHE will continue to r
trusts available to professional colleag
national efforts to address the public he

[1] Acute trust toolkit for the early detecti
Enterobacteriaceae available at:
http://www.hpa.org.uk/webw/HPAw

Public Health England

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Public Health England

NHS England

Patient Safety Alert

Stage Two: Resources

Addressing rising trends and outbreaks in carbapenemase-producing Enterobacteriaceae

6th March 2014

Alert reference number: NHS/PSA/Re/2014/004
Alert stage: Two - Resources

Enterobacteriaceae are a large family of bacteria that usually live harmlessly in the gut of all humans and animals, but, in the wrong place, can cause serious infections. Worldwide, a small but increasing number of strains of enterobacteriaceae have become resistant to carbapenem antibiotics, which have been defined by WHO as critically important antibiotics. Carbapenemases are enzymes made by some strains of these bacteria, which allow them to destroy carbapenem antibiotics and cause resistance. Increasing trends in sporadic infections, clusters and outbreaks of carbapenemase-producing Enterobacteriaceae (CPE) have been observed in a number of NHS trusts in England. There is a high risk of this problem becoming more widespread unless early and decisive action is taken by Trusts. These bacteria represent a significant challenge in terms of prevention, treatment and control. Inadequate measures to prevent and control transmission can have serious consequences for both patients, who may require more complex treatment to manage their infection, and hospitals in terms of ward closures and protracted patient stays. As a result of the escalating problem, Public Health England (PHE) is providing national support for ongoing efforts to control and reverse rising trends with the aim of minimising morbidity and preventing further outbreaks. Because the PHE resources are now available NHS England has been able to proceed to issuing a Stage 2 alert without a previous Stage 1 alert.

PHE have recently published a toolkit for acute trusts to assist them with the early detection, management and control of carbapenemase-producing Enterobacteriaceae. A key aspect of the control measures is to take special precautions for patients recently treated in countries known to have high levels of CPE or in UK hospitals with recent clusters or outbreaks of CPE.

This alert is to bring this significant infection prevention and control challenge to the attention of the NHS and to signpost the toolkit developed to support the NHS in both controlling existing transmission problems and preventing further spread.

The toolkit along with 'UK Standards for Microbiology Investigations: Laboratory Detection and Reporting of Bacteria with Carbapenem-Hydrolysing ß-lactamases (Carbapenemases)' can be found at: www.hpa.org.uk/webw/HPAweb&HPAweb/Standard/HPAweb_C/1317140378529

BSAC antibiotic susceptibility testing guidance is available at: www.bsac.org.uk/wp-content/uploads/2012/02/AST-testing-and-Reporting-guidance-v1-Final.pdf

Implementation advice on the tooklkit can be obtained from local PHE Centres: www.gov.uk/government/publications/phe-centre-addresses-and-phone-numbers/phe-local-and-regional-contact-details

Actions

Who: Chief Executives of NHS trusts and foundation trusts providing acute care and independent hospitals.

When: To commence immediately and completed by 30 June 2014

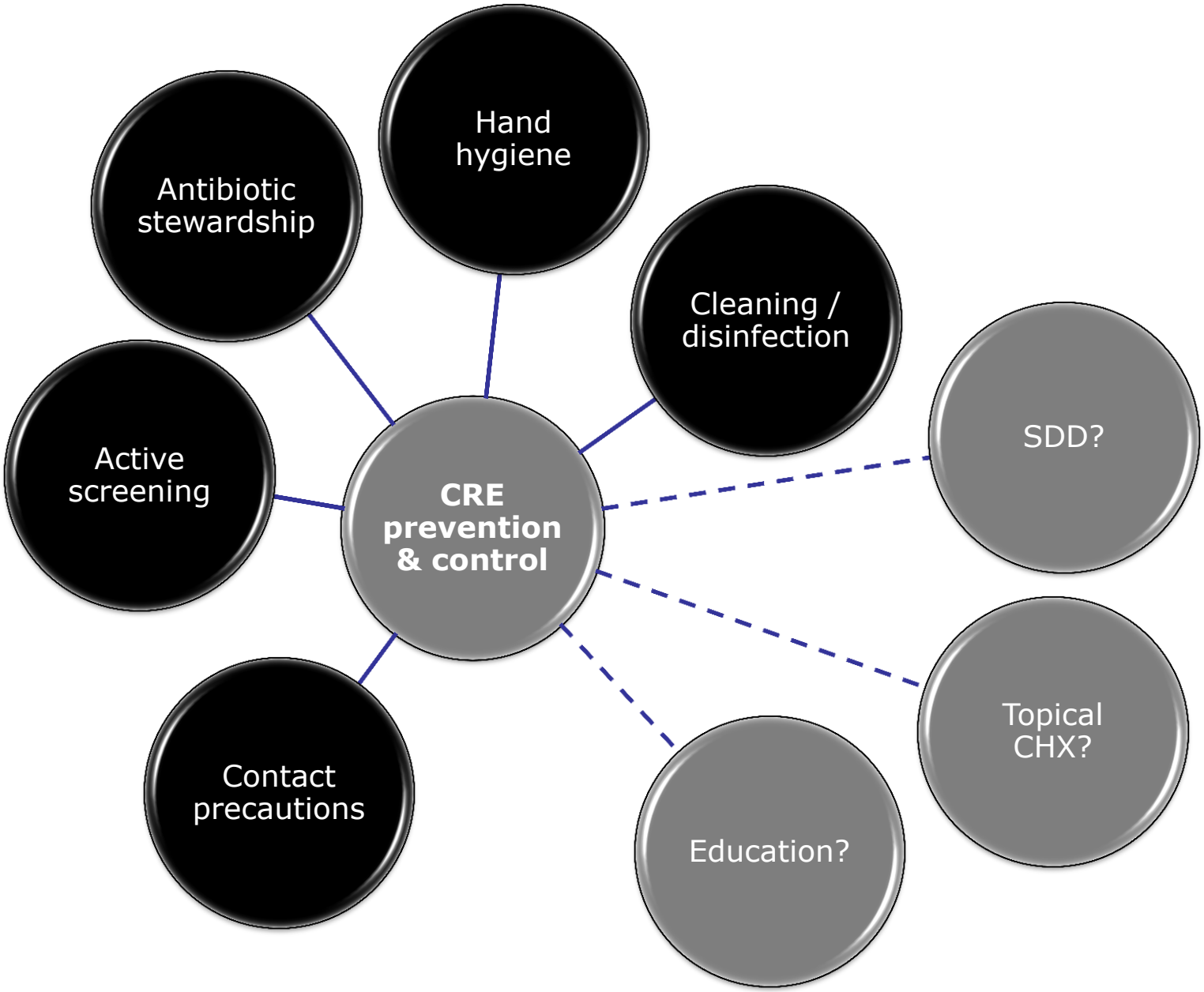
1. Bring this alert to the notice of the Director for Infection Prevention and Control (DIPC) and infection control staff to instigate the development of the board level CPE management plan.
2. In discussion with relevant clinical experts establish if there are / have been cases of CPE in the organisation and consider if immediate action is required locally to reduce the risk of such an incident / outbreak occurring.
3. In the light of the local situation the Infection Prevention and Control Committee to plan for local adoption and dissemination of the Acute Trust CPE toolkit to influence clinical practice. This will include advising front line staff of the issue and the Trust's plans for addressing CPE.

Note: This alert is being sent to GPs for information

Patient Safety | Domain 5
www.england.nhs.uk/patientsafety

Contact us: patientsafety.enquiries@nhs.net
Visit our website: www.england.nhs.uk/patientsafety
Report incidents: www.england.nhs.uk/reportingpsincidents

Publications Gateway Reference 01266 Page 1 of 2 © NHS England March 2014



Tacconelli *et al. Clin Microbiol Infect* 2014;20 Suppl 1:1-55

Who do I screen?

PHE CPE Toolkit screening triggers:

a) an inpatient in a hospital abroad, or

b) an inpatient in a UK hospital which has problems with spread of CPE (if known), or

c) a 'previously' positive case.

Also consider screening admissions to high-risk units such as ICU, and patients who live overseas.

How do I screen?

- Rectal swab is the best sample
  - Insert no more than 2cm into rectum
  - Twist gently and withdraw
  - Want to see faeces on swab.
- Patient education as to why this is needed in order to overcome taboos
- Avoid rectal swabs in children and those with low platelets.
- Alternate specimen is faeces but have to wait for the patient to ‘go’

You have positive case: now what?

'Contact precautions'

Single room+glove/gown
Consider staff cohort

Contact tracing

Trigger for screening contacts or whole unit?

Flagging

Patient notes flagged
Receiving unit informed

Education

Staff
Patient / visitor

Cleaning / disinfection

Use bleach or H_2O_2 vapor at discharge

Decolonization?

'Selective decontamination' / chlorhexidine bathing?

The challenge of endoscopes

- Cluster of 39 cases of NDM-producing CRE linked to contaminated duodenoscopes.[1]
- No failures in endoscope reprocessing identified, yet outbreak strain cultured from reprocessed endoscope.
- Prompted calls for more sterilization rather than high-level disinfection of endoscopes.[2]

Meticulously cleaning duodenoscopes prior to high-level disinfection should reduce the risk of transmitting infection, but may not entirely eliminate it. (FDA Feb 23 2015).

1. Epstein *et al. JAMA* 2014;312:1447-1455.
2. Rutala & Weber. *JAMA* 2014;312:1405-1406.

Conclusions

- This is a new an evolving problem
- Recognition of patient carriers is vital
- Appropriate management of identified carriers is crucial
- Information may change in time if we see more cases
- Important to try and stay up to date and carry on with safe infection prevention precautions…