Can We Halve Gram Negative Bloodstream Infections?

Martin Kiernan
Visiting Clinical Fellow, Richard Wells Research Centre, University of West London
Conjoint Fellow, University of Newcastle, New South Wales
Clinical Director, GAMA Healthcare

Jon Otter, PhD FRCPath
Imperial College London

Hosted by Jean-Yves Maillard
Cardiff University, Wales

www.webbertraining.com October 20, 2020

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Richard Wells Research Centre

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@emrsa15

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Depends on how the question is looked at

- What is the timescale?
- The eventual answer is yes of course
- But in the shorter time scale (relatively) the answer (sadly) is no

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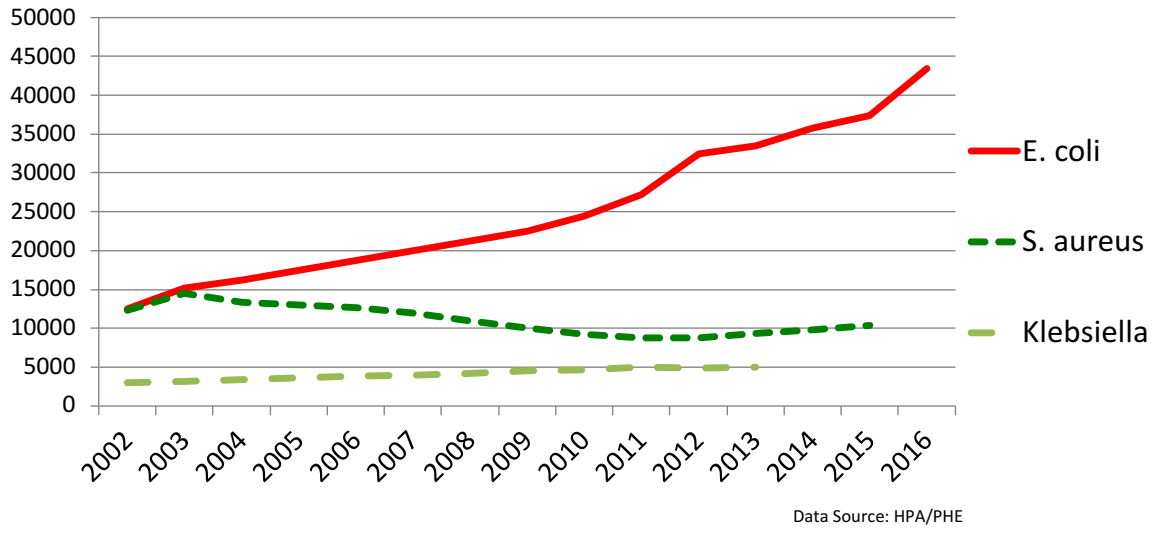
Change in Bloodstream Infections

England 2002-2016



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What's the problem then?

- Cross-infection is not the issue
  - These organisms are the patient's own
- Severely limits potential interventions
  - Screening
  - Isolation
  - Decolonisation
  - IV Line management
  - Hand Hygiene

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England - National Quality Premium 2017

- Original ambition: to reduce healthcare-associated Gram-negative BSI by 50% by 2021
  - 10% across the healthcare economy by 2017/18
- Define HCAI?
  - It's not just hospitals
  - Need to work with the local healthcare economy
- Problem : Unlike MRSA and C. difficile, we do not (at the moment) have the interventions
- We seem to be using the Oterap principle as you will see

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Surveillance

- E. coli bacteraemia is rising - Why?
  - Catheters?
  - Gall Bladders?
  - Uropathogenic strains (ST131)?
  - Food?
  - Antimicrobial resistance?
  - Age?
  - Global warming?

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Analysis of the issues

- Enhanced surveillance (35 Trusts) provided better data
  - Abernethy, J., et al., Epidemiology of Escherichia coli bacteraemia in England: results of an enhanced sentinel surveillance programme. J Hosp Infect, 2017. 95(4): p. 365-375.
- 70% detected on admission
- Catheters 10% at most, mostly in hospitals
  - Small amount of gall bladder
- Most infections occur in elderly females with a GP visit in preceding 2 weeks with a urinary tract infection (UTI)
  - 64% within previous 12 months
  - Often treated with an antibiotic to which the organism was resistant

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Why was CAUTI not reducing?

Meddings, J. Abstract SHEA Spring Meeting, April 2018

- Despite multiple interventions, CAUTI rate unchanged
  - Although documentation was better..
- Qualitative approach identified challenges and grouped successes into intervention domains
  - Used the rich data to construct a comprehensive ICU CAUTI reduction program include at least one strategy from 4 in each of 4 domains
    - Standardisation, communication, alternatives and data feedback
- Basically, professionals like to be given a choice

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Direct observation shows suboptimal practice

Manojlovich, M., S. Saint et al (2016) ICHE 37(01) 117-119

- Direct observation of catheterisations in the Emergency Room
- Findings
  - 59% at least one major breach in asepsis
    - 27% contamination of sterile field
    - 31% contamination of the catheter
    - 38% breach of sterile barrier
  - 71% of those developing bacteriuria had a major breach during the insertion procedure

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Why are they inserted?

- Frequently classed as 'inappropriate, however the reason for insertion was documented in just 13% of notes
  - Gokula, R. R., J. A. Hickner and M. A. Smith (2004). "Inappropriate use of urinary catheters in elderly patients at a midwestern community teaching hospital." Am J Infect Control **32**(4): 196-199.
  - Quantitative studies provide no details of decision-making, staff groups involved and only describe what authors consider to be 'appropriate' – often not defined

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Small Qualitative Study

Kiernan M and Richardson, C. 2012 IPS Conference, Liverpool, UK

- Two predominant reasons for catheter insertion
  - Retention (45%) and output monitoring (30%)
  - None inserted for incontinence
- Who makes the decision?
  - Medical staff described as having made decisions (often 'prompted' by nurses)
  - Nurses frequent instigators of use for retention in non-emergency settings

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Why?

- Nurses motivated by providing relief of symptoms of distress, pain or breathlessness
  - Cause of retention not considered
    - Post-operative retention: intermittent not used
    - Constipation and faecal impaction
    - None could recall education on the causes of retention
  - Alternative methods of output measurement not considered
    - Pad weight
      - Beuscher (2014) J Wound Ostomy Continence Nurs

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Preventability in hospitals?
Boswell, T. et al J Hosp Infect (2019)

- Enhanced surveillance Oct 2017-Jan 2018
- 40 cases, in-depth review of HA-BSI
  - Most common source UTI (14/40), majority associated with catheter use (10)
    - Catheter use was appropriate
  - Concluded that at most, 8 cases (20%) were preventable
    - Poor management of CAUTI
    - Failure to recatheterise (1 case)
    - Potential excess duration (1 case)
    - Two hepato-biliary related cases (inc. blocked stent)

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Can we do better with catheters?

- At last! An RCT! Cross-sectional, stepped-wedge, open-label, randomised controlled trial
  - Fasugba et al Lancet Infectious Diseases (2019) http://dx.doi.org/10.1016/S1473-3099(18)30736-9
- 0.1% Chlorhexidine used to cleanse prior to catheterisation
  - 74% reduction in the incidence of catheter-associated asymptomatic bacteriuria (incident rate ratio 0.26, 95% CI 0.08-0.86, p=0.026), and a 94% decrease in the incidence of catheter-associated UTI (0.06, 95% CI 0.01-0.32, p=0.00080)
  - No reported adverse events
- Short-term catheterisation only

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Evidence Base for Long-term Catheters

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So – Catheters may be an issue

- 'May'
  - if all preventable; only 10% at most
- What about
  - 'Long-term'
  - Unavoidable use in some
  - Forgotten
  - Avoidable
    - Other methods of fluid measurement
    - 'Retention'

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Which came first..

- Bladder colonisation increases with age
  - Studies of elderly non-institutionalised people have shown that up to 50% women and 30% of men have asymptomatic bacteriuria
    - Foxman B. Disease Monthly, 2003 49(2):53-70
  - 38% of elderly patients with hip fractures had bacteriuria present on admission
    - Johannson I. et al, J Clin Nurs. 2002 11(5):651-6
  - Up to 50% of Nursing Home residents also
    - O'Donnell JA and Hoffman MT. Geriatrics. 2002, 57(5):45,49-52. 55-6

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So what about the 'community' cases?

- The majority of cases
  - Originally classed as HCAI by PHE due to contact with GP in previous weeks
- Benchmarking in the community
  - Data from CCG with regard to practice sizes
  - Considerable variation in infection rate/1000 practice population
- I examined one CCG (total pop 111,896) in 2014
  - CCG is a locality with many General Practice surgeries, some large some small
  - Rate/10000 Practice Population
    - Mean rate 6.62 (range 0 – 18.53; SD 5.59)

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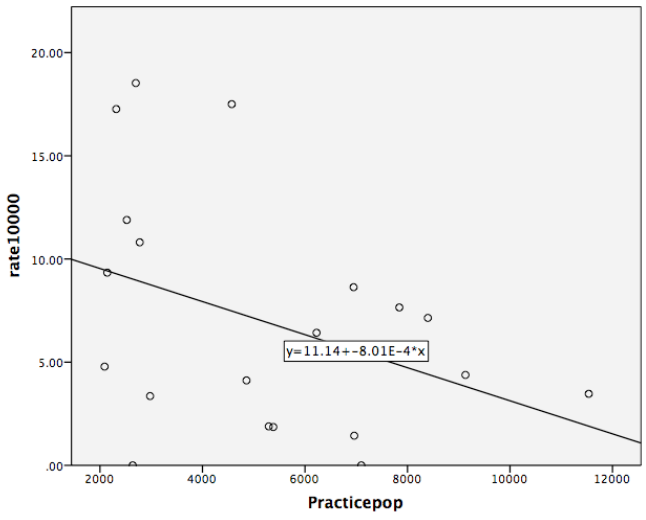
Differences in rate/Practice pop



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E. Coli bacteraemia

- Majority were uncatheterised females with repeated UTI, treated with antibiotics that did not work
  - What causes UTI?
- Can we treat differently?
  - Ibuprofen for symptom relief
    - 66% of women with uncomplicated UTI treated symptomatically recovered without any antibiotics
    - Initial symptomatic treatment a possible approach with those willing to avoid immediate antibiotics and to accept a higher burden of symptoms
      - Gágyor et al. BMJ 2015; 351

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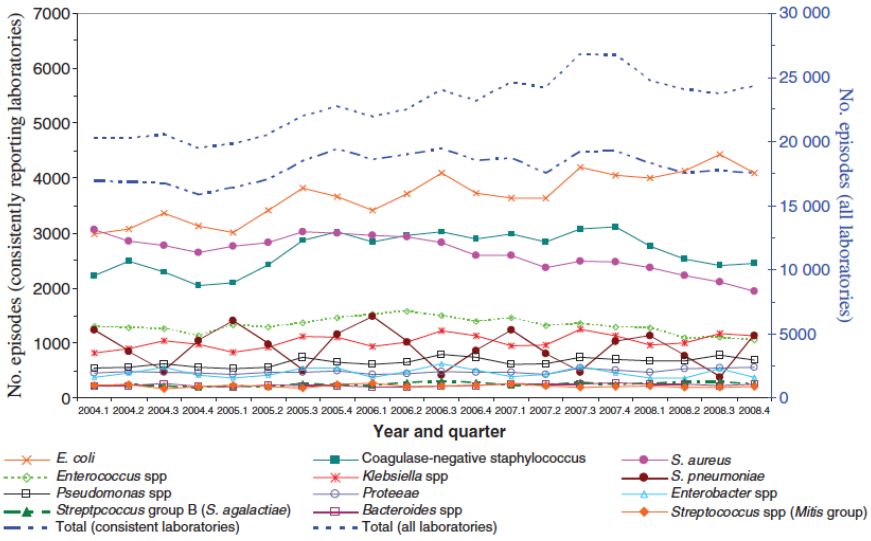
Wilson J. *et al* Clinical Micro Infect, Sept 2010



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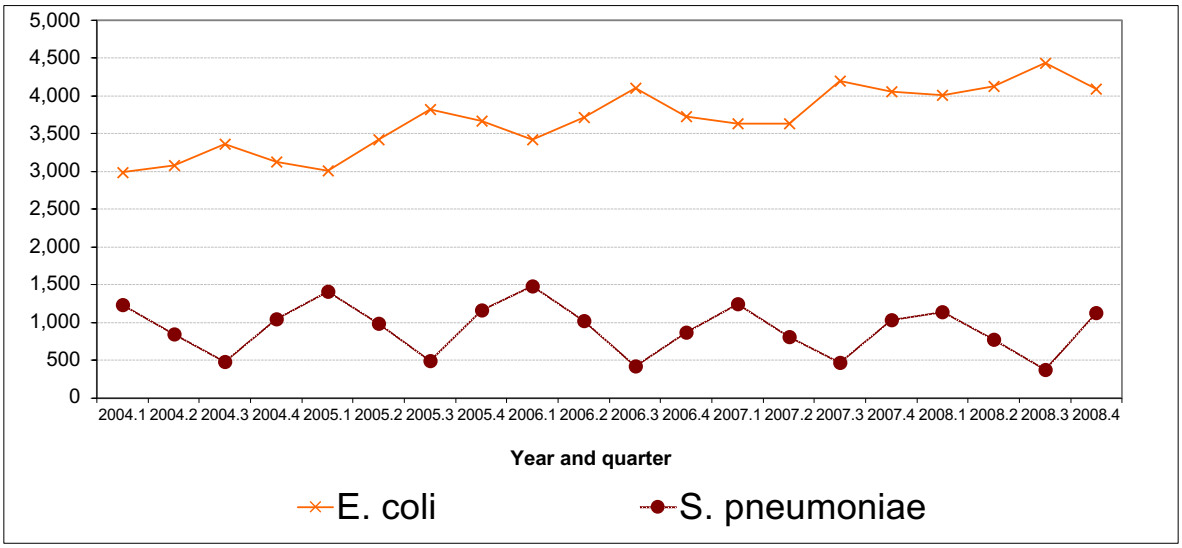
Seasonal trends in cause of bacteraemia 2004-2008



Wilson *et al* Clinical Micro Infect, Sept 2010

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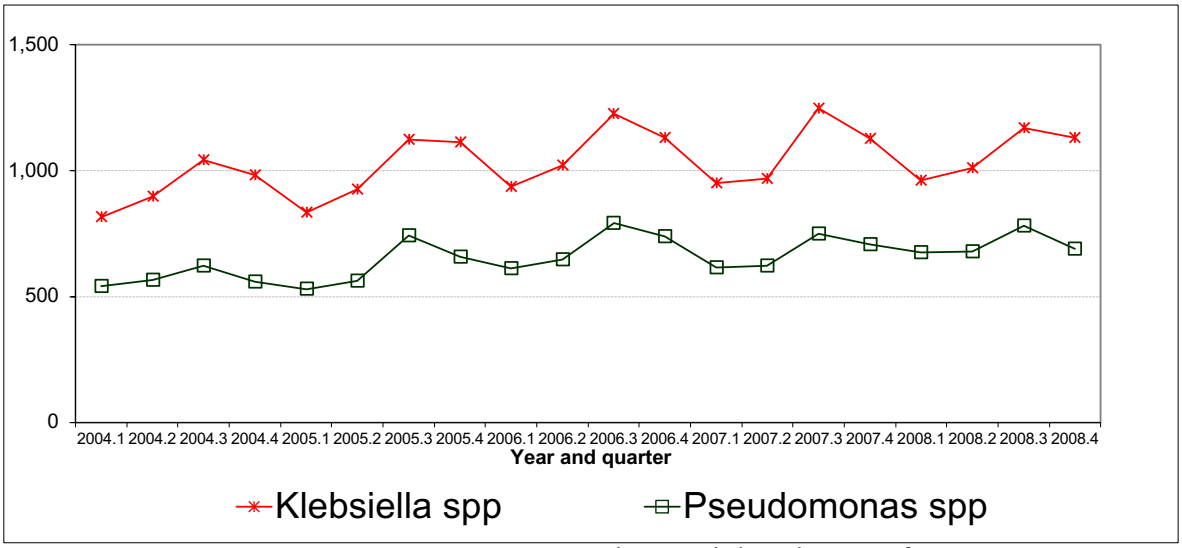
Seasonal trends in cause of bacteraemia: 2004-2008



Wilson *et al* Clinical Micro Infect, Sept 2010

25

Seasonal peaks in Gram-negatives

- Incidence of E. coli from clinical specimens (including blood) in a Baltimore hospital increased by 12% during the summer
  - Perencevich E et al. ICHE 2008; 29: 1124–1131.
- Estimated 7% increase in monthly BSI incidence for every 10°F increase in average monthly temperature
  - Al-Hasan M, et al. Clin Microbiol Infect 2009; 15

26

Seasonal peaks in Gram-negatives

- Increases in the mean monthly rates of infection caused by P. aeruginosa, E. cloacae, E. coli, and A. baumannii
  - Perencevich EN et al. ICHE 2008;29(12):1124-31
- Higher temperatures associated with higher infection rates, independent of seasonality
  - For each 10°F increase, observed a 17% increase in the monthly rates of infection caused by P. aeruginosa ($P<0.01$) and A. baumanii ($P<0.05$)
  - Hottest month also the wettest
- Importantly there was no change in Gram-positives, reducing the risk of practice variable confounding

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Seasonality and UTI?

Falagas et al Eur J Clin Microbiol Infect Dis 2009; 28: 709–712

- Retrospective evaluation of potential for UTIs being associated with meteorological factors
  - Reviewed weekly house call visits by GPs for UTIs and average weekly temperature and humidity recorded in the same area 3 days earlier
- Significant correlation between visits for UTIs and average higher weekly temperature and decreased relative humidity

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Seasonality of E. coli bacteremia

Freeman et al, Clin Mic Inf 2009 15(10) 951-3

- Seasonal changes
  - human behaviour?
  - effect of temperature on the ability of E. coli to survive in the environment?
- Behavioural changes
  - Travel
  - Dietary or food preparation practices
  - Recreational water exposure
  - Sexual activity
  - Water consumption

Evidence for a link between poor hydration and UTI?

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- High prevalence of UTI in clean room workers noticed (technology industry)
  - Su et al, J. Women's Health 2006
- Protective clothing takes 10 mins to remove/replace
- Tendency to minimise restrict fluid intake to avoid leaving area
- Education/hydration promotion intervention
- Urination 3 x or more during shift associated with lower risk of UTI ($p < 0.07$)
- Paired before/after data in 366 workers
  - Increased fluid intake 3x or more (28% to 51%)
  - Reduced in prevalence of UTI (9.8% to 1.6%; $p < 0.001$)

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Can increasing intake help?

- 163 premenopausal women (mean age = 37) with recurrent cystitis who drank <1.5L/day
  - Hooton et al JAMA Intern Med. 2018;178(11):1509-1515
- RCT of drinking additional 1.5L water vs no change
- 47% reduction in episodes of cystitis; 47% reduction in antimicrobial treatment ($p<0.001$)
- Increased time to next episode (84 to 143 days)
- Reduced urine osmolarity, Increases in voiding (8 vs. 6, so additional 2 times per day) and mean urine volume
- Poor fluid intake or low urine output are host-mediated predisposing factors
  - Beetz R Eur J Clin Nutr 57 (Suppl 2):S52–S58, 2003

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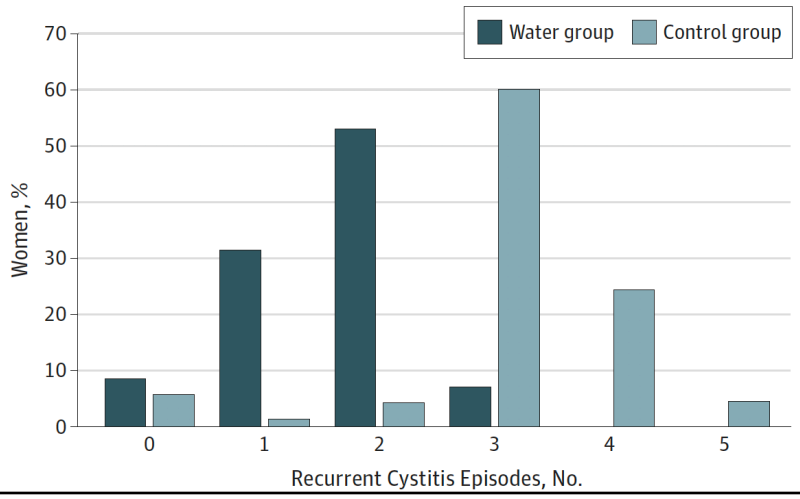
Pictures say more than words

Figure 2. Recurrent Cystitis Episodes by Study Group



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Hydration, UTI and incontinence

- Study in 1492 teachers (53% responded; 16% reported UTI in a year)
  - half made a conscious effort to drink less while working to avoid using the toilet
  - those who drank less had a 2.21-fold higher risk of UTI
  - 1 in 20 had >3 UTIs per year
  - 30% reported urge incontinence
    - Nygaard I, Linder M. Thirst at work - An occupational hazard? Int Urogynecol J Pelvic Floor Dysfunction 1997;8:340.
- Other studies have shown the same in nurses
  - Bendtsen AL. et al., Infrequent voiders syndrome (nurses bladder) Scand J Urol Nephrot 199; 25:201-204

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What is hydration in hospital like?

- Survey of patients in University College Hospital, London
  - Omar, F. (2019). "Preventing Escherichia coli bacteraemia through optimized hospital hydration: an inpatient survey on drinks consumption on care of elderly wards." J Hosp Infect 103(2): 170-171.
- 70% rated hydration as 'very important' for health
- 11% (3/27) met the minimum recommended fluid intake of 1500 mL/day (about eight small cups); 67% drank half the recommended fluid intake or less
  - 59% reported that water jugs changed once a day or less
  - Barriers included lack of thirst (18.5%), inability to reach jug or drink due to physical impairment (22.5%), and polystyrene cups (described as hard to grasp, liable to spill)
- Two patients in single rooms reported jug changes of once and less than once a day; had the lowest total fluid consumption of one to three cups/day (0.3-0.6 L)

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Primary Care
Safety netting and self-care

- Evidence based safety netting advice includes return to the GP practice at 48 hours if symptoms are not resolving, and if fevers or chills, costovertebral tenderness and drowsiness
- Self care measures include adequate hydration (6-8 cups per day), wiping front to back, post intercourse micturition and vaginal oestrogen/D-mannose for the prevention of recurrent infections
- Use of a TARGET UTI Leaflet that provides advice
  - Treat Antibiotics Responsibly, Guidance, Education, Tools
- Is this being done?

35

Management of uncomplicated uti

- Review of 269 E. coli bloodstream infections in 2017-2018 found that 57% (152/269) were community onset: Review by two trainee GPs
  - Wiley, E. et al (2019). "Preventing Escherichia coli bacteraemia through improved community urinary tract infection (UTI) management: use of the TARGET Uncomplicated UTI audit tool in primary care." J Hosp Infect 103(2): 172-173.
- Antibiotic agent was given according to PHE guidelines in 97% of patients, and for the advised duration in 83%
- Safety netting advice was given in 62.5%, Self-care advice in 35%
- Guidance on the natural history of UTI in 15%
- Information on antibiotic resistance and use 2.5%
- No patients were offered the TARGET UTI leaflet at baseline

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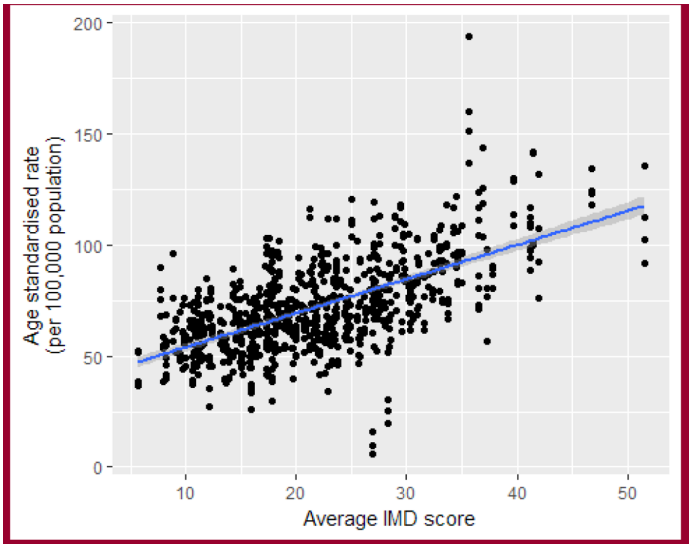
E. coli BSI vs. Deprivation index

Source: Public Health England



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So, how have things been going?

- Not well as regards the data
- Rate of increase has possibly slowed but there is no decline

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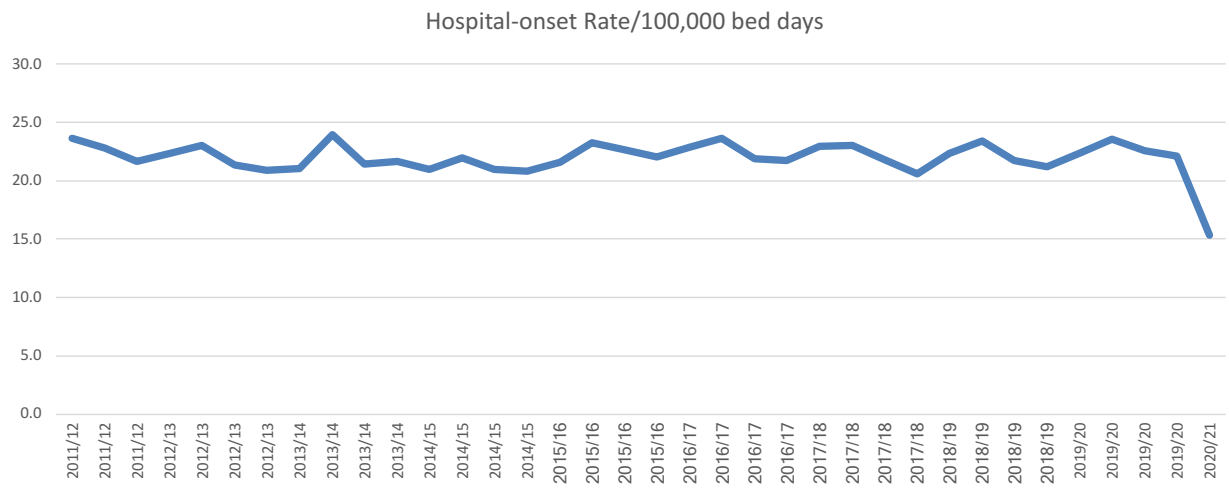
E. Coli BSI 2011 - 2021



Source: PHE Fingertips

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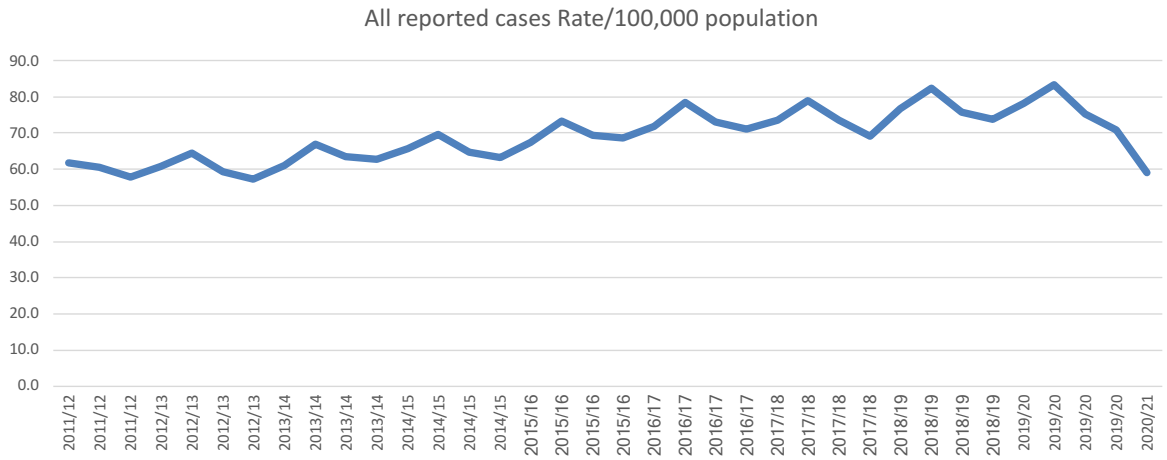
E. Coli BSI 2011 - 2021



Source: PHE Fingertips

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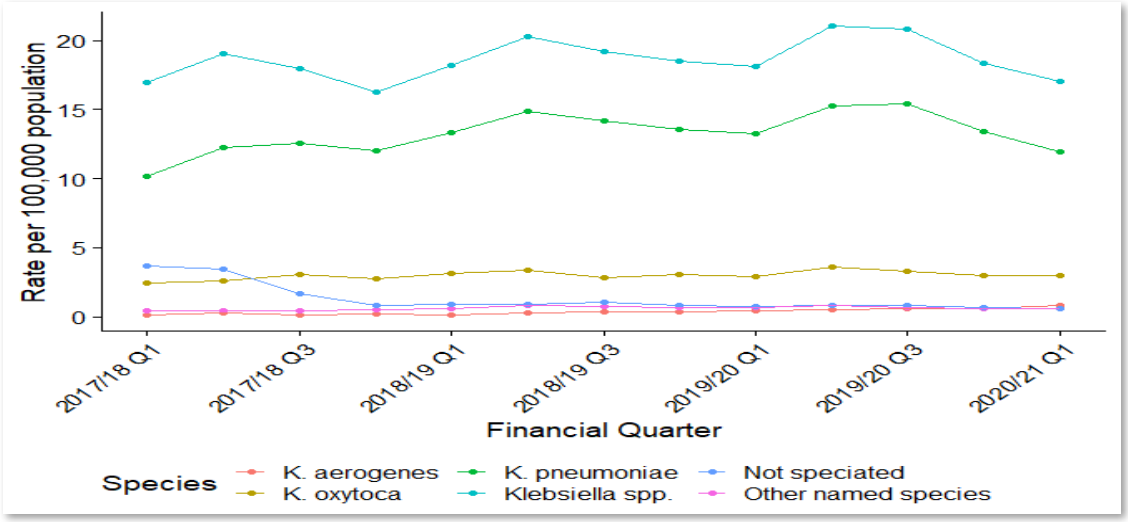
Quarterly rates of all reported *Klebsiella* spp. bacteraemia by species: April to June 2017 April to June 2020



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Source: PHE Epidemiological Commentary 2020

Quarterly rates of hospital-onset *Klebsiella* spp. bacteraemia: April to June 2017 to April to June 2020

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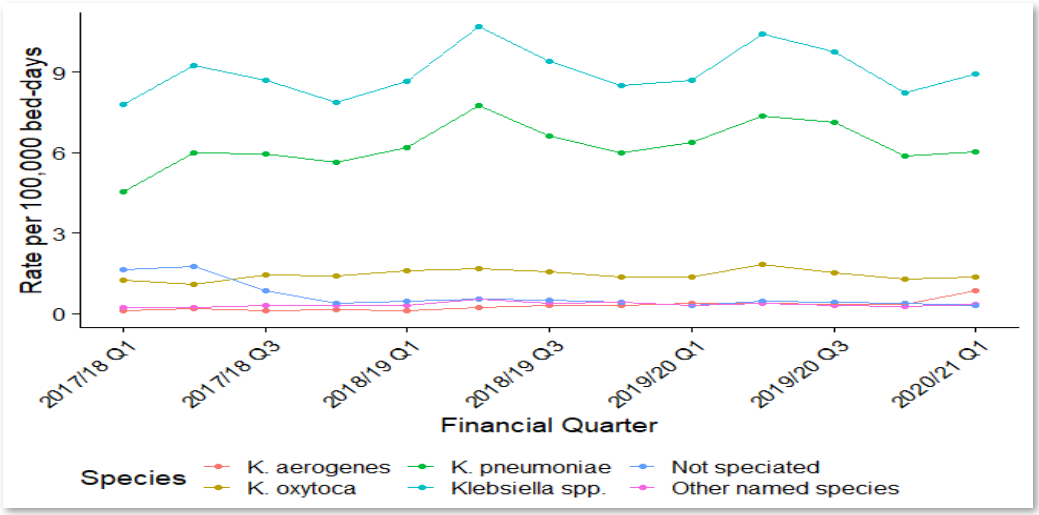

Source: PHE Epidemiological Commentary 2020

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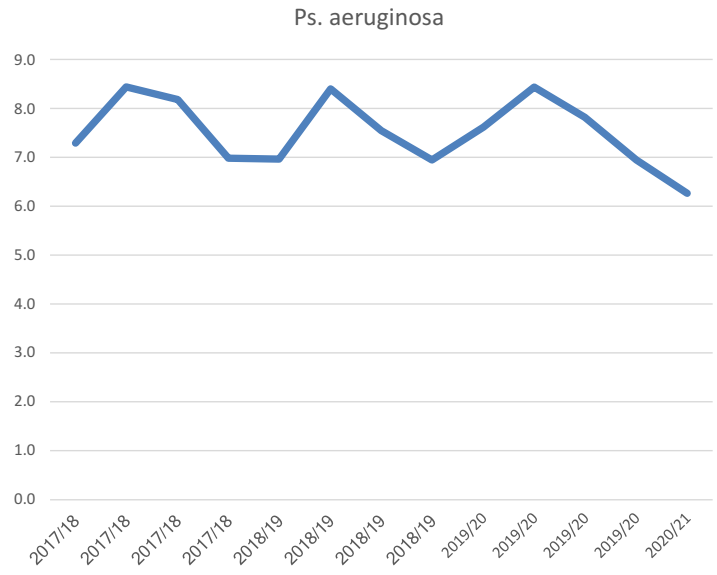
All cases Ps. Aeruginosa/100,000 population



Source: PHE Fingertips

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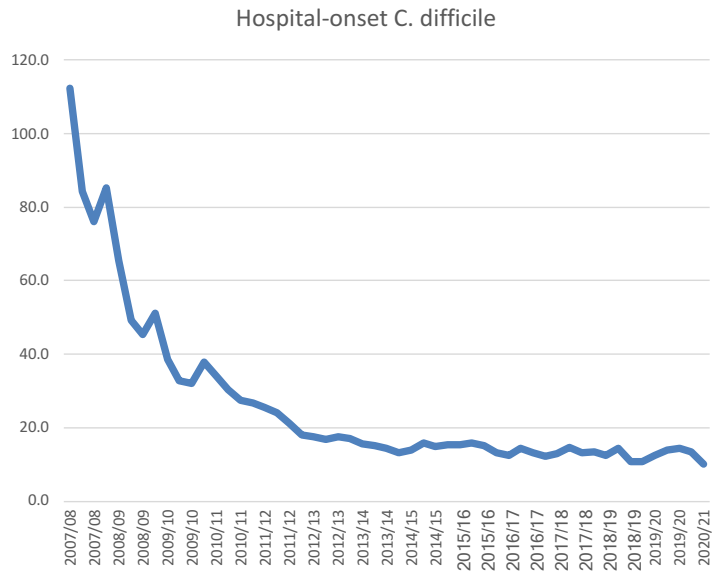
C. difficile rates 2007-2021

Yes, we can reduce infections!



Source: PHE Fingertips

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APPLYING the Pareto Principle

Wilson, J. Journal of infection prevention (2018) 19(5) 208-10

- Pareto's 80/20 principle states that 80% of effects come from 20% of causes
- Focus on hospitals is the Pareto principle in reverse.. Hence oterap
  - Better data on the aetiology of gram-negative bloodstream infections
  - Implementing strategies that reduce the risk of UTI in people aged over 75 years, in particular through supporting hydration
  - Improving strategies for accurately diagnosing and treating UTI in those over 75 years, especially those with dementia, where signs of dehydration are easily confused with those of infection
  - More resources for social care allocated to areas of greatest need

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Can we halve Gram-negative BSI?

Jon Otter, PhD FRCPath
Imperial College London

✉ j.otter@imperial.ac.uk
@jonotter
Blog: www.ReflectionsIPC.com

Imperial College London

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Background and epi

Drivers of GNBSI

Learning from G+ success?

How to tackle GNBSI

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Background and epi

Drivers of GNBSI

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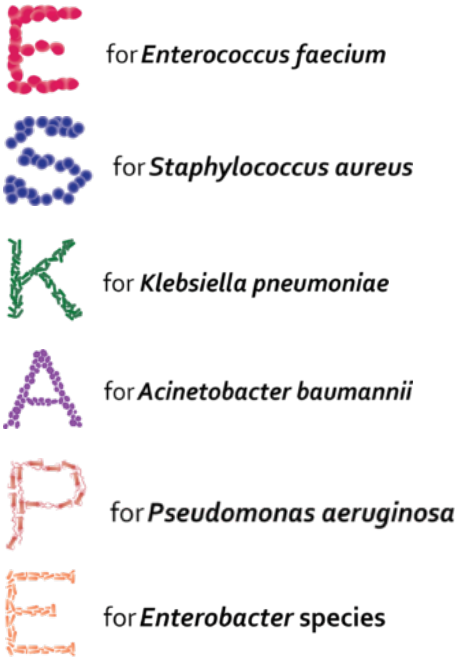

https://emerypharma.com/blog/eskape-pathogens-explained/

Point prevalence

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Around 0.5 (2016 UK PPS) to 1% (2012 European PPS) of hospital inpatients will have a BSI at any one time.

	All types of infection	Pneumonia or other lower respiratory tract infection	Surgical site infection	Urinary tract infection	Bloodstream infection	Gastrointestinal infection
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
HAIs and microorganisms						
HAIs, total	1,531 (100)	394 (25.7)	290 (18.9)	264 (17.2)	200 (13.1)	119 (7.8)
HAIs with microorganisms	905 (59.1)	191 (48.5)	172 (59.3)	187 (70.8)	188 (94.0)	48 (40.3)
Microorganisms, total	1,165 (100)	249 (100)	247 (100)	210 (100)	228 (100)	65 (100)
Major groups of microorganisms						
Gram-positive cocci	410 (35.2)	46 (18.5)	134 (54.3)	39 (18.6)	95 (41.7)	21 (32.3)
Enterobacteriaceae	404 (34.7)	80 (32.1)	58 (23.5)	134 (63.8)	79 (34.7)	18 (27.7)
Gram-negative bacteria, non-*Enterobacteriaceae*	226 (19.4)	91 (36.5)	36 (14.6)	29 (13.8)	30 (13.2)	7 (10.8)
Fungi	69 (5.9)	23 (9.2)	5 (2.0)	7 (3.3)	17 (7.5)	4 (6.2)
Top 15 microorganisms (accounting for (92.4% of total number microorganisms)						
Escherichia coli	177 (15.2)	24 (9.6)	29 (11.7)	78 (37.1)	29 (12.7)	10 (15.4)
Staphylococcus aureus	141 (12.1)	26 (10.4)	53 (21.5)	2 (1.0)	26 (11.4)	5 (7.7)
Pseudomonas aeruginosa	131 (11.2)	44 (17.7)	24 (9.7)	21 (10.0)	17 (7.5)	6 (9.2)
Enterococcus spp.	114 (9.8)	4 (1.6)	33 (13.4)	32 (15.2)	21 (9.2)	11 (16.9)
Coagulase-negative staphylococci	97 (8.3)	3 (1.2)	33 (13.4)	3 (1.4)	38 (16.7)	1 (1.5)
Klebsiella spp.	94 (8.1)	22 (8.8)	7 (2.8)	30 (14.3)	25 (11.0)	3 (4.6)

Zarb et al. Eurosurvellance 2012. European Point Prevalence Survey of HCAI.

Rising threat from AMR-GNR

50

% of all HAI caused by GNRs.

% of ICU HAI caused by GNRs.

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

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

Gram-negative BSIs are getting more common

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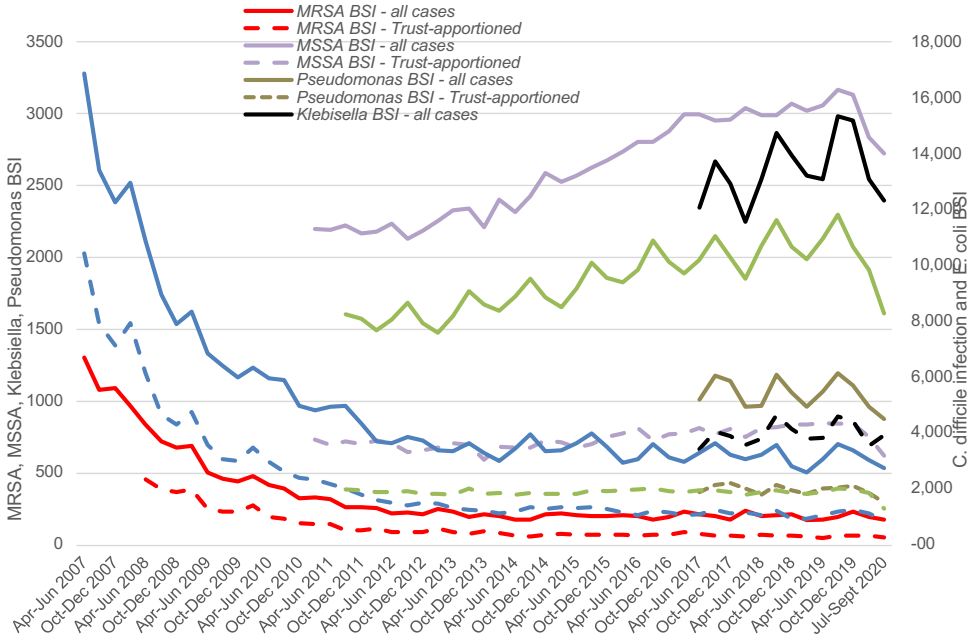

Data: Public Health England.

Gram-negative BSIs are getting harder to treat

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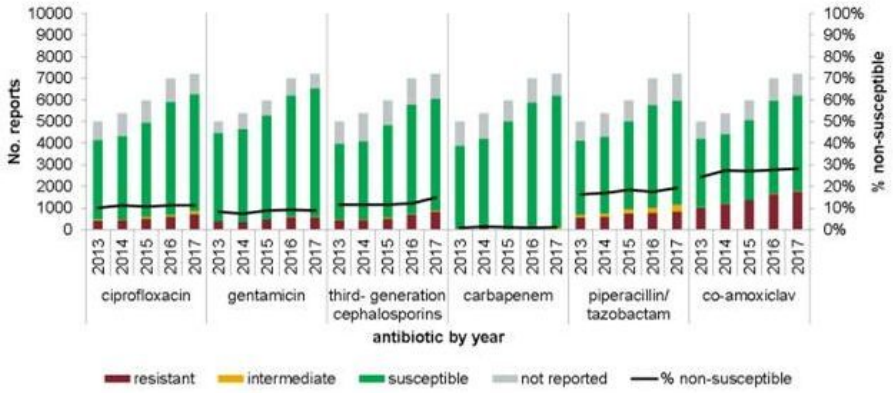

Data: ESPAUR 2018.

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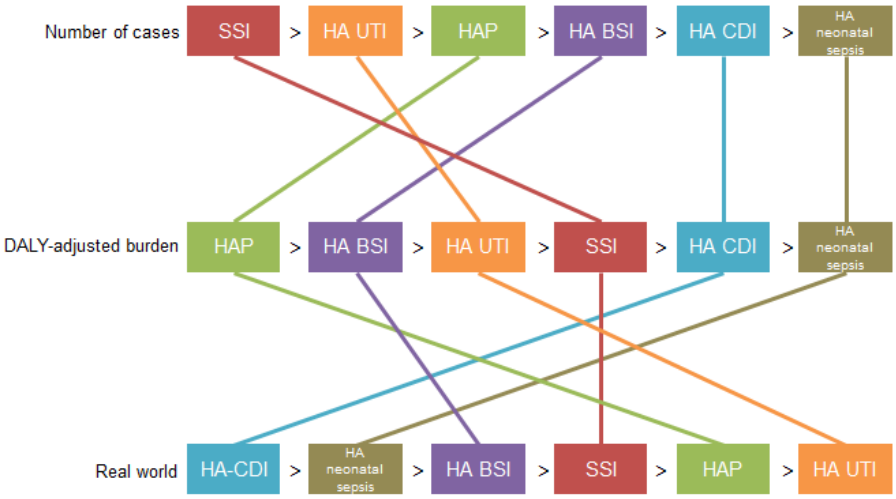
BSIs are expensive



Cassini *et al*. *Plos Med* 2016.

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Enterobacteriaceae vs. non-fermenters

Share	Differ
Gram stain reaction	Risk factors & at-risk population
Concerning AMR	Potential for epidemic spread
	Infection profile & mortality
	Prevalence
	Colonisation site & duration
	Transmission routes
	Resistance profile & mechanisms

What's the problem? Poor clinical outcome

55

	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.

The emerging threat of AMR GNR!

56

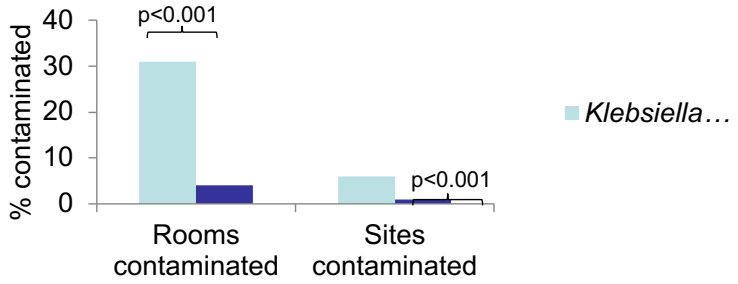
Pathogen	GNR	MRSA	VRE	*C. difficile*
Resistance	+++	+	+	+/-
Resistance genes	Multiple	Single	Single	n/a
Species	Multiple	Single	Single	Single
HA vs CA	HA & CA	HA	HA	HA
At-risk pts	All	Unwell	Unwell	Old
Virulence	+++	++	+/-	+
Environment	+/-	+	++	+++

Transmissibility / fitness

57

- *Klebsiella* species **3.7x** more transmissible than *E. coli* in the ICU.[1]
- *K. pneumoniae* seems to be more environmental than *E. coli*.[2,3]

Surface contamination on five standardized sites surrounding patients infected or colonized with ESBL-producing *Klebsiella* spp. (n=48) or ESBL-producing *E. coli* (n=46).[2]



1. Gurieva *et al. Clin Infect Dis* 2018;66:489-93. 2. Guet-Revillet *et al. Am J Infect Control* 2012;40:845-8.
3. Gbaguidi-Haore. *Am J Infect Cont* 2013;41:664-5.

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Background and epi

Drivers of GNBSI

Learning from G+ success?

How to tackle GNBSI

Drivers of Gram-negative BSI

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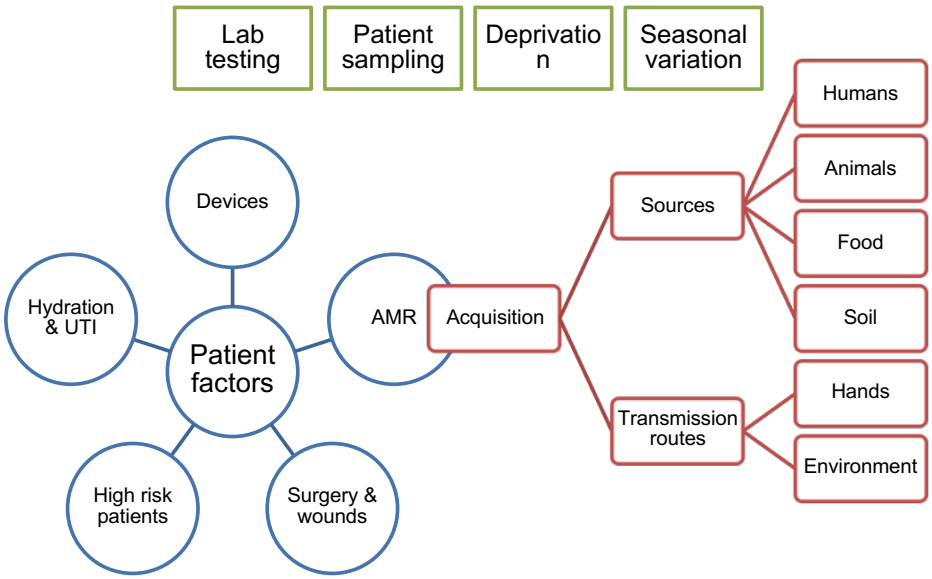
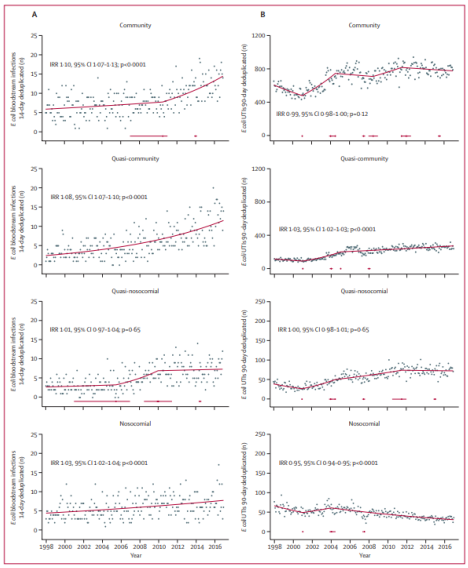


Trends in classification of *E. coli* BSIs

60

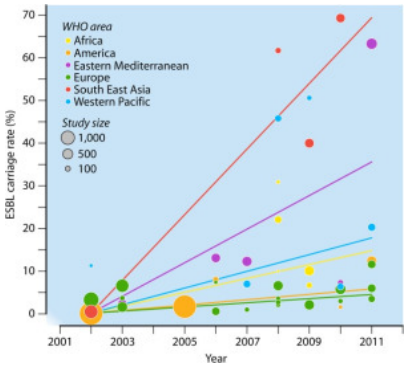
Classification and trends of *E. coli* BSIs in Oxfordshire, England.



Vihta et al. Lancet Infectious Dis 2018.

Social and material deprivation

61



The global prevalence of ESBL in the community, from Woerther et al.

- We performed a risk factor analysis, which included both individual-level variables (such as overseas travel, antibiotic exposure, and age) and were also able to include community-level variables (such as markers of household overcrowding, deprivation, immigration, and ethnicity).
- We found that risk factors for ESBL were travel to Asia (OR 4.4, CI 2.5-7.6), or Africa (OR 2.4, CI 1.2-4.8) in the 12 months prior to admission, two or more courses of antibiotics in the 6 months prior to admission (OR 2.0, CI 1.3-3.0), and residence in a district with a higher than average prevalence of overcrowded households (OR 1.5, CI 1.05-2.2).

Otter et al. Clinical Microbiol Infect 2019.

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Background and epi

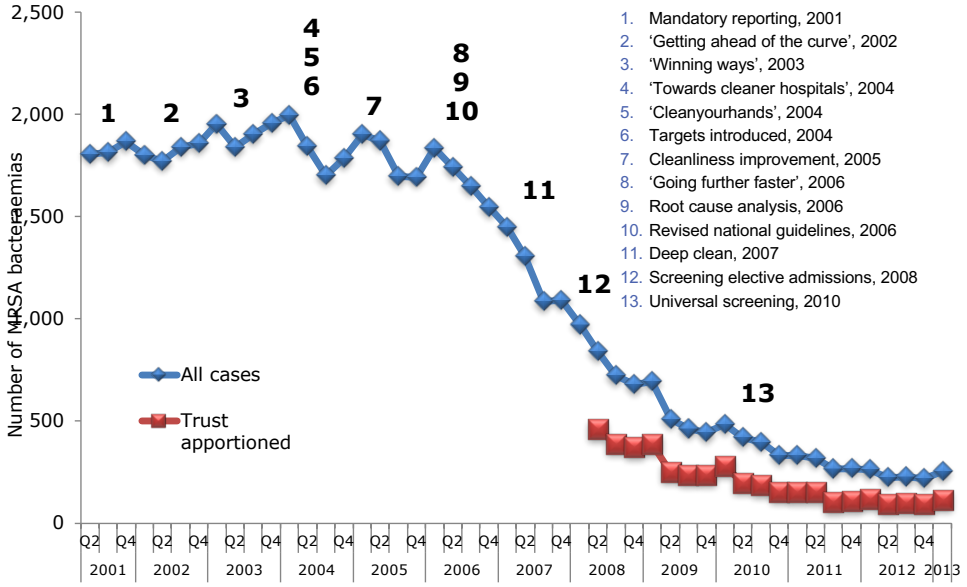
Drivers of GNBSI

Learning from G+ success?

How to tackle GNBSI

MRSA bacteraemia, England 2001-2013

63



1. Mandatory reporting, 2001
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C. difficile infection (CDI), England 2004-2013

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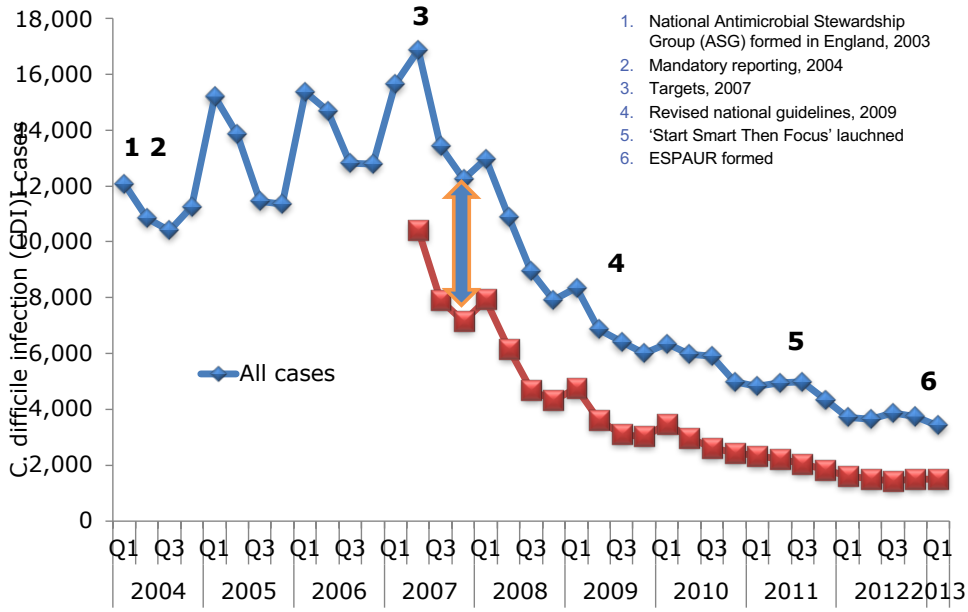


1. National Antimicrobial Stewardship Group (ASG) formed in England, 2003
2. Mandatory reporting, 2004
3. Targets, 2007
4. Revised national guidelines, 2009
5. 'Start Smart Then Focus' lauchned
6. ESPAUR formed

Does hand hygiene explain the reductions?

65

Fig 1 Estimated use of hand hygiene consumables, by quarter

'The Cleanyourhands campaign was associated with sustained increases in hospital procurement of alcohol rub and soap, which the results suggest has an important role in reducing rates of some healthcare associated infections.'

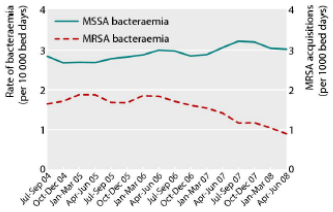


Fig 2 Estimated quarterly rate of bacteraemia (per 10 000 bed days)

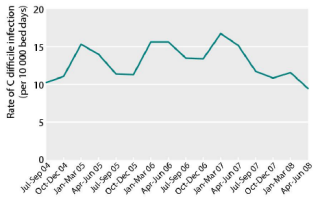
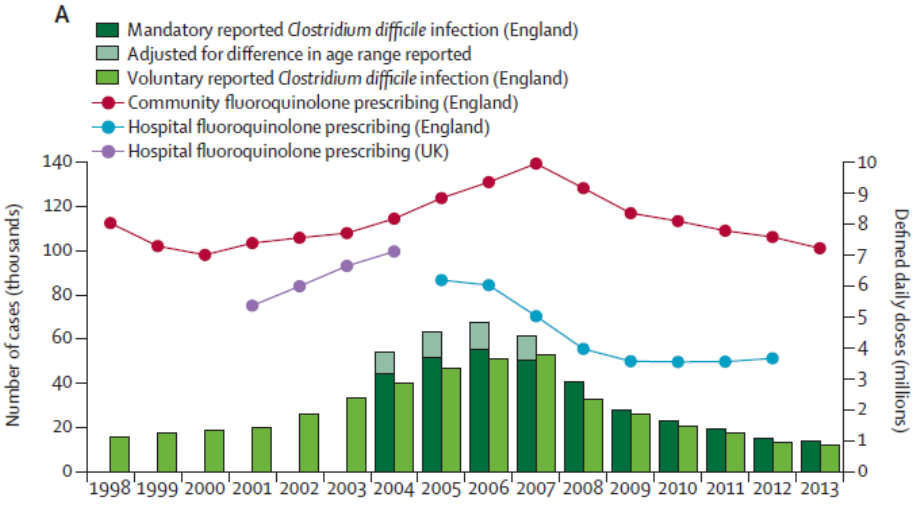


Fig 3 Estimated quarterly rate of *C difficile* infection (per 10 000 bed days)

Stone *et al. BMJ* 2012;344:e3005.

Does antimicrobial stewardship explain the reduction?

66



Dingle *et al. Lancet Infect Dis* 2017 in press.

Spurious correlation?

67

Correlation between national chocolate consumption and rate of Nobel prize winners.

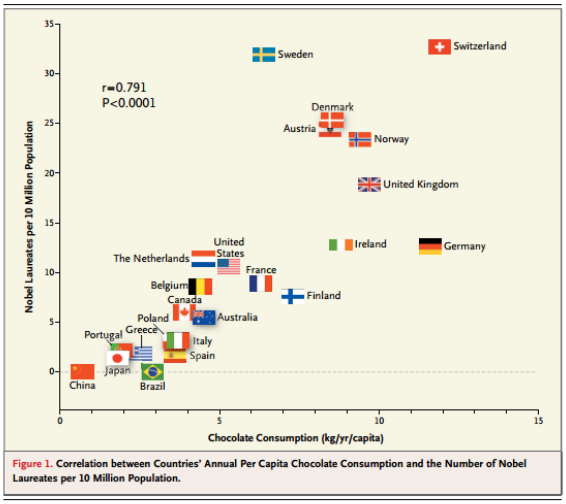
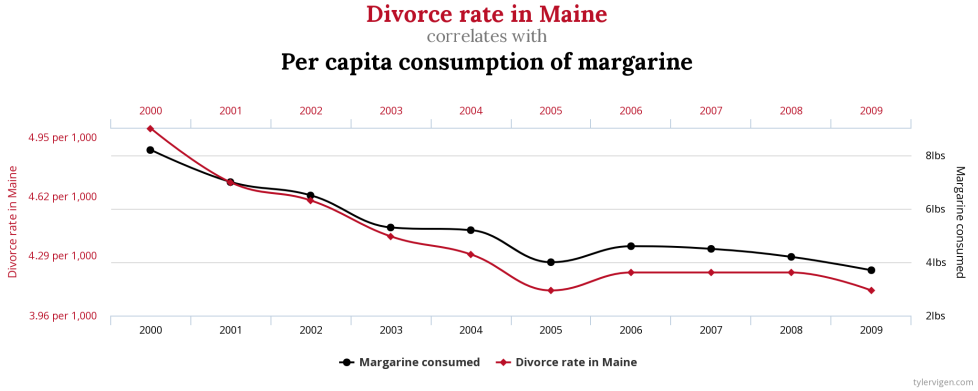


Figure 1. **Correlation between Countries' Annual Per Capita Chocolate Consumption and the Number of Nobel Laureates per 10 Million Population.**

Messerli FH. *New Engl J Med* 2012;367:1562-4.

Spurious correlations

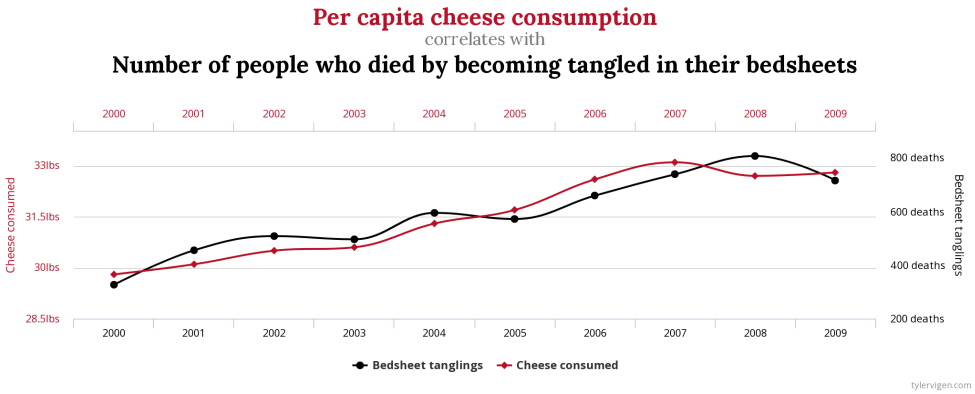
68



http://www.tylervigen.com/spurious-correlations

69

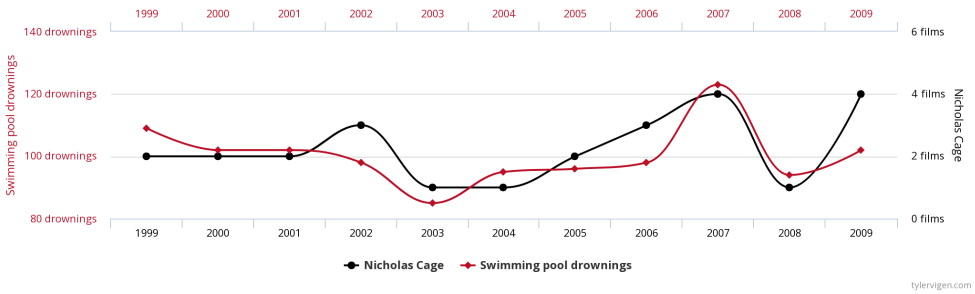
Spurious correlations



http://www.tylervigen.com/spurious-correlations

70

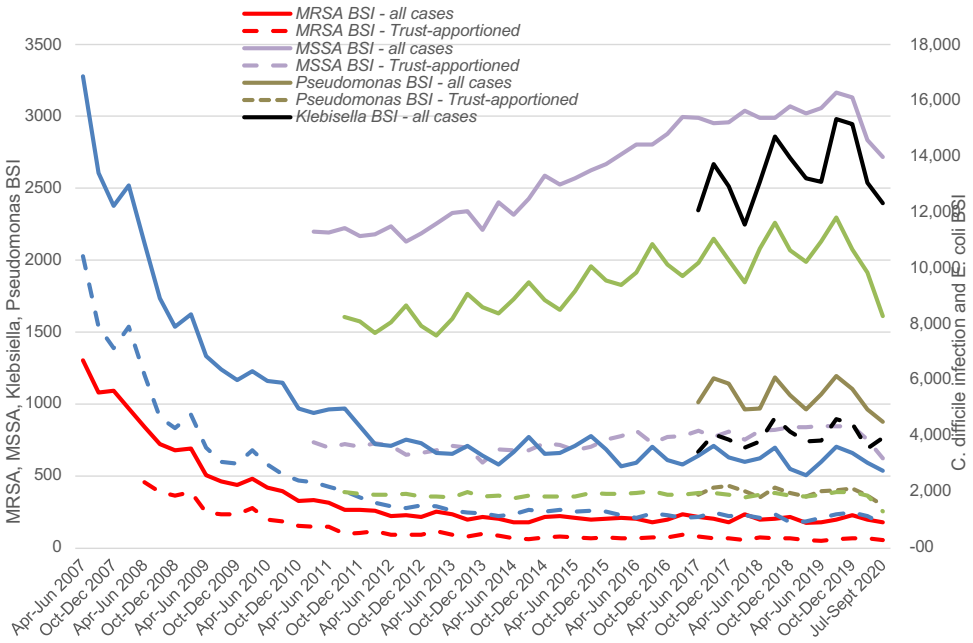
Spurious correlations



http://www.tylervigen.com/spurious-correlations

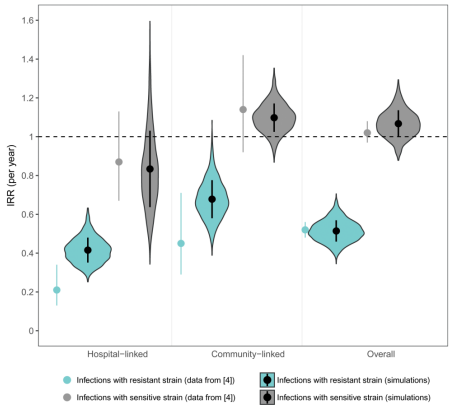
What's driving increases in MSSA and *E. coli* BSI?

71



Why antibiotic susceptible bacteria are resistant to hospital-based IPC intervention

72

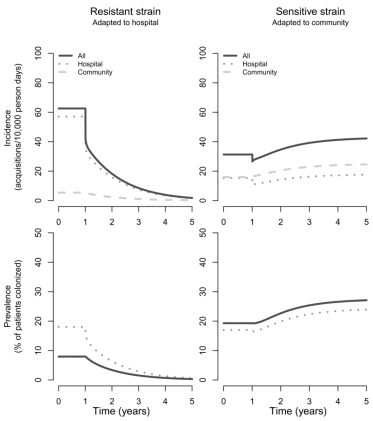


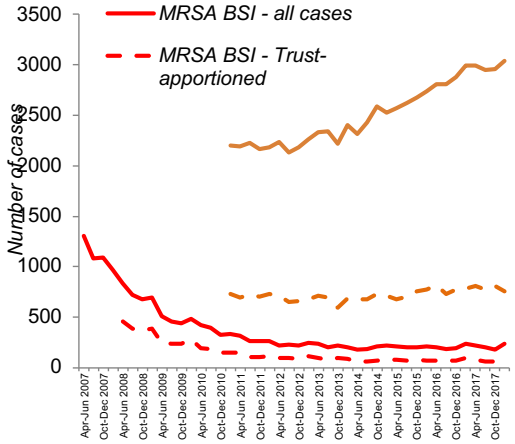
- Mathematical model to investigate transmission in hospitals and their surrounding catchment area.
- Included a competitive advantage for resistant bacteria in hospitals and sensitive bacteria in the community.
- Modelling the impact of improving hand hygiene by 10%.
- Antibiotic-resistant bacteria were disproportionately affected in hospitals!

van Kleef et al. BMC Infect Dis 2013;13:294.

Why antibiotic susceptible bacteria are resistant to hospital-based IPC intervention

73

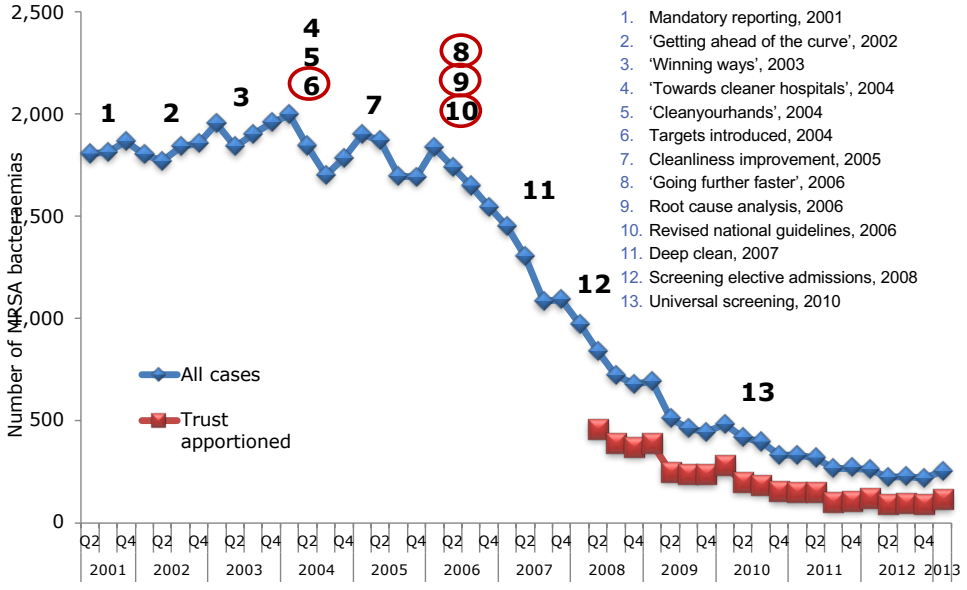




van Kleef et al. BMC Infect Dis 2013;13:294.

MRSA bacteraemia, England 2001-2013

74



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Targeted approach to MRSA infection prevention

75

- Reduction targets introduced in 2004 and reinforced in 2006
- High impact interventions launched in 2006
- Root cause analysis launched in 2006
- Revised national guidelines launched in 2006 (including screening, isolation, and suppression for carriers)

'Going further faster' (2006)

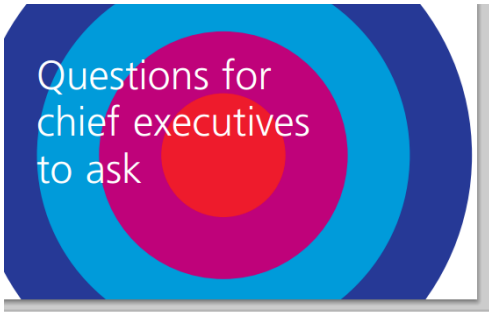
76

Key challenge	Specific Focus
Challenge 1	Engage the board and use performance management at every level
Challenge 2	Ensure clinical ownership across organisation
Challenge 3	Screen and/or decontaminate according to risk assessment
Challenge 4	Use HIIs* to monitor and increase compliance
Challenge 5	Integrate with risk and clinical governance framework
Challenge 6	Ensure infection control is part of induction and ongoing training
Challenge 7	Effectively coordinate bed management with infection control input
Challenge 8	Clean and decontaminate
Challenge 9	Proactively manage your reputation, engage all staff and local community

* HII = high impact interventions: Central venous catheter care bundle; Peripheral intravenous cannula care bundle; Renal catheter care bundle; Care bundle to prevent surgical site infection; Care bundle for ventilated patients; Urinary catheter care bundle; Care bundle to reduce the risk from *Clostridium difficile*.

From 'Going further faster'

77



- Where are MRSA bacteraemias occurring and how often?
- How do you ensure that your data is accurate?
- Does the Trust board understand this agenda and are they engaged in reducing MRSA?
- Who is responsible for leading this work and what resources are needed?
- How are you embedding this in your performance management framework?
- Do you have a non-executive champion for this?
- Is this integrated into your risk management and clinical governance framework?
- How are you engaging patients and the public to increase public confidence in your trust?

Questions for chief executives to ask

From 'Going further faster', 2006

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Drivers of Gram-negative BSI

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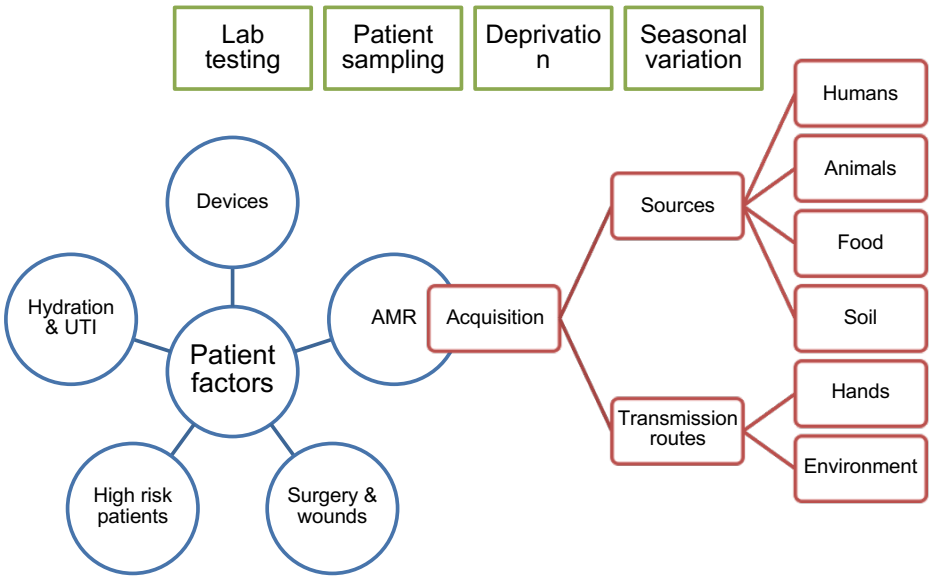
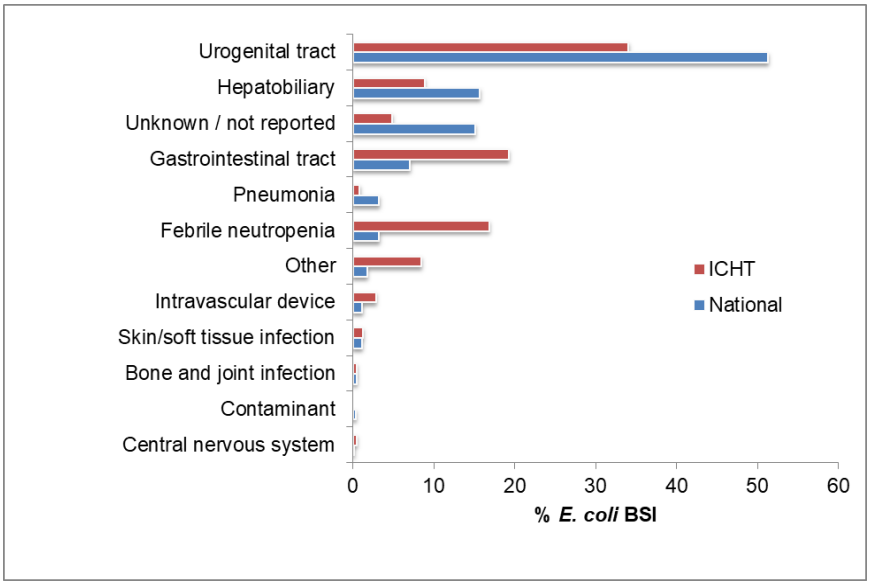


Getting to grips with the source of *E. coli* BSIs

80

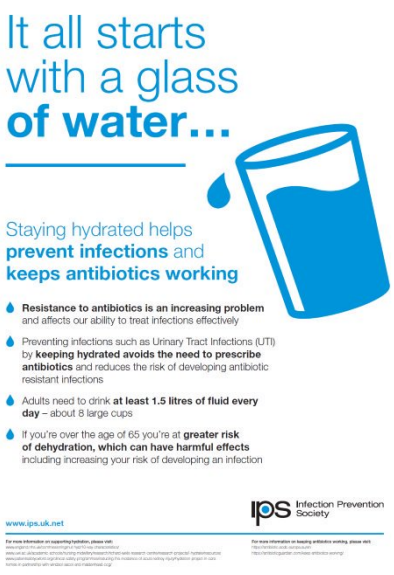
Comparing the source of 250 healthcare-associated *E. coli* BSIs with the national picture, 2015-2017.



Otter et al. J Hosp Infect 2018.

You're givin' me good hydration

81

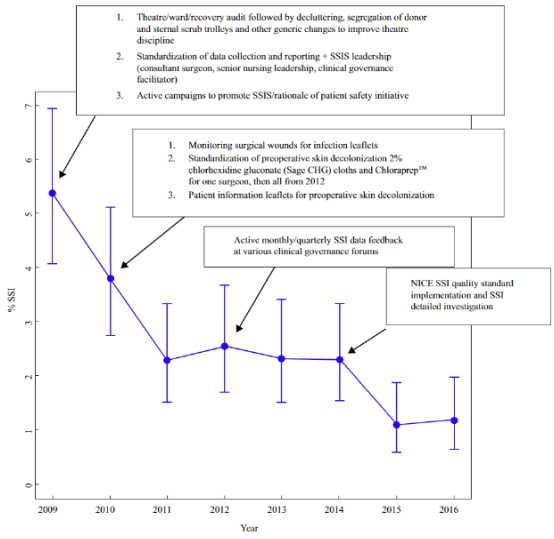


Simple interventions (e.g. offering people a drink and giving them a choice of fluids) made a big impact on hydration levels (Wilson, Clin Nutr, 2019)

Prevent preventable SSIs

82

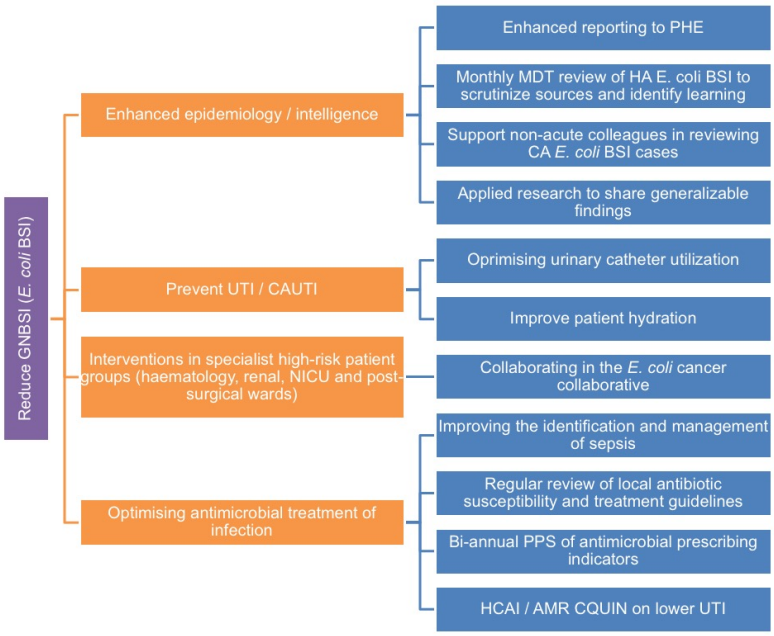
% patients with SSI following cardiothoracic surgery.



Chiwera et al. J Hosp Infect 2018.

Driving down GNBSI?

83



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- Background and epi
- Drivers of GNBSI
- Learning from G+ success?
- How to tackle GNBSI

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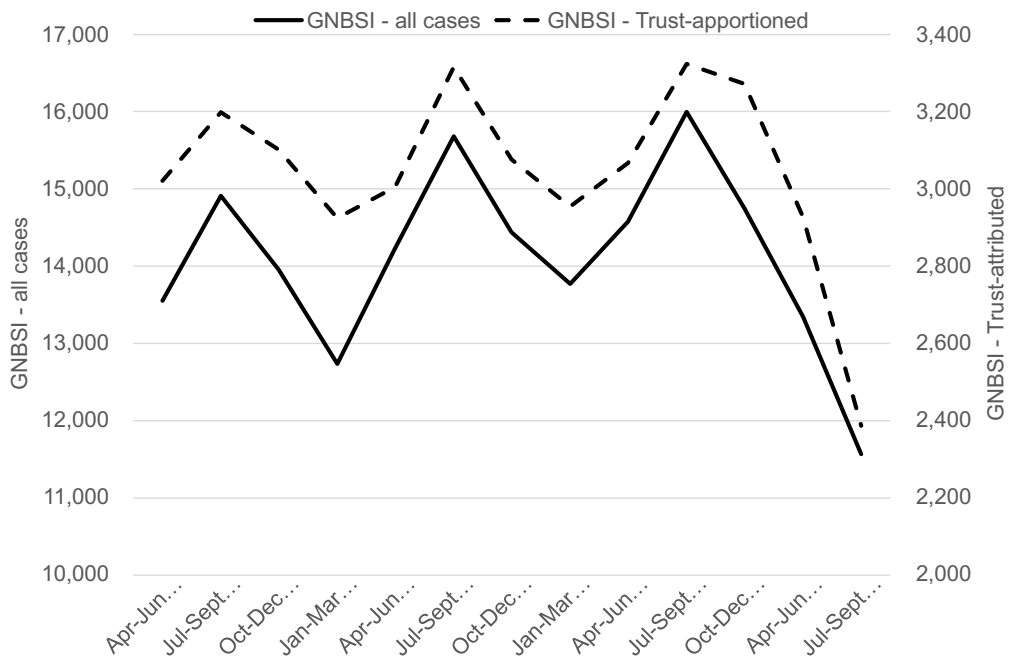
GNBSI - all cases
GNBSI - Trust-apportioned
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
GNBSI - all cases
GNBSI - Trust-attributed
Apr-Jun…
Jul-Sept…
Oct-Dec…
Jan-Mar…
Apr-Jun…
Jul-Sept…
Oct-Dec…
Jan-Mar…
Apr-Jun…
Jul-Sept…
Oct-Dec…
Apr-Jun…
Jul-Sept…

86

GNBSI

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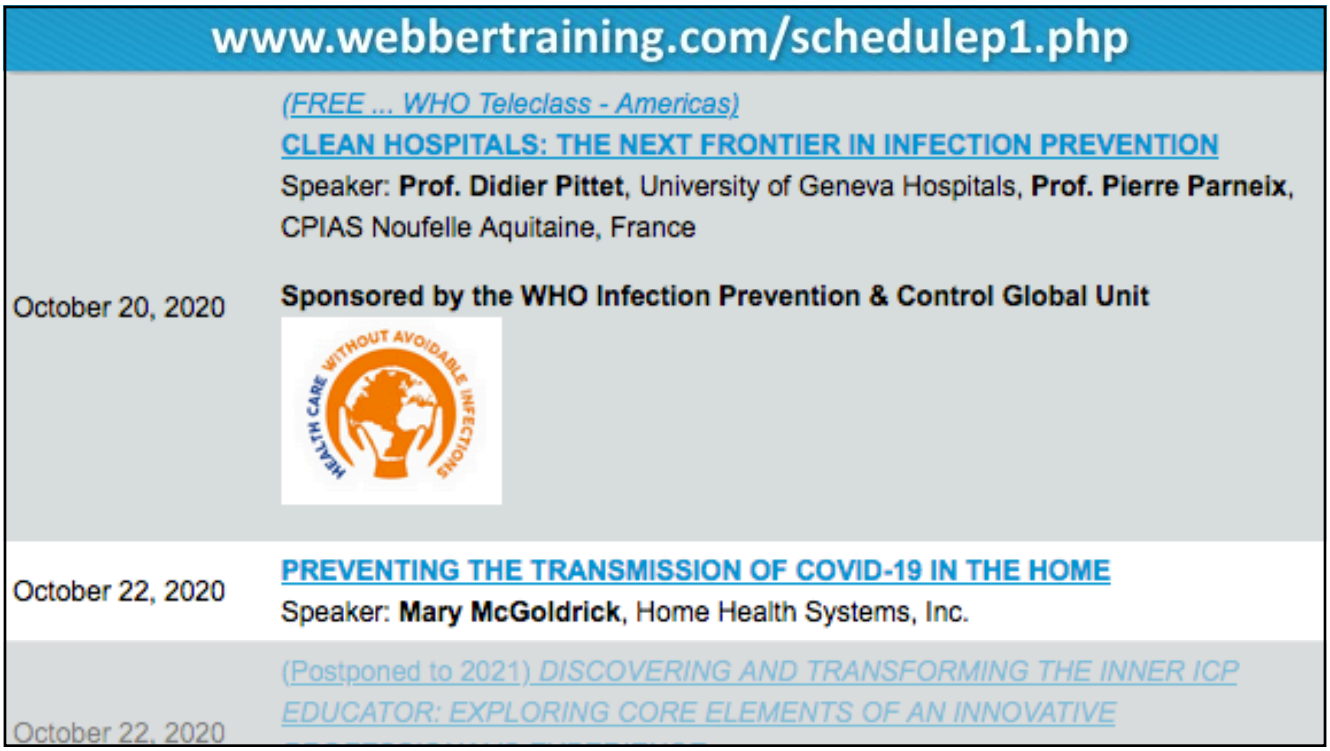
Can we halve Gram-negative BSI?

Jon Otter, PhD FRCPath
Imperial College London

✉ j.otter@imperial.ac.uk
@jonotter
Blog: www.ReflectionsIPC.com

Imperial College London



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